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(54) Title: OVERPRESSURE RELIEF DEVICE FOR CLOSED CONTAINERS

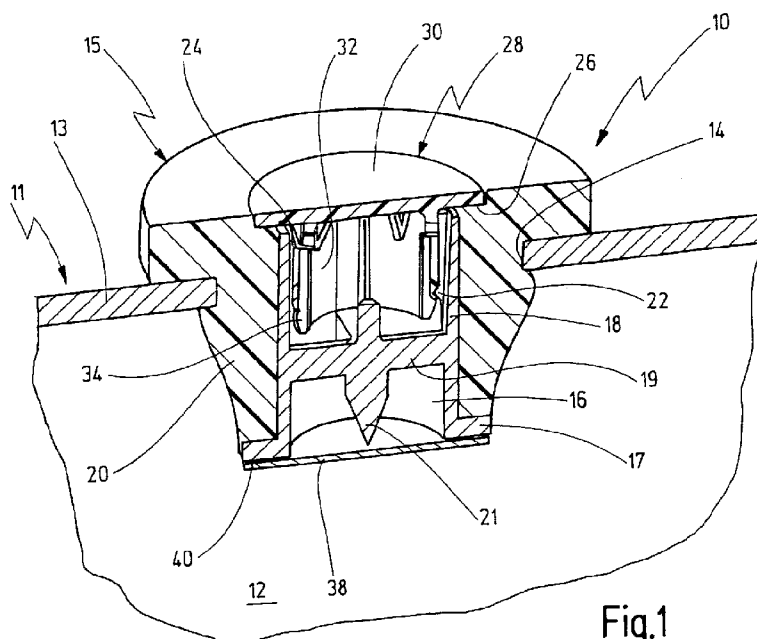


Fig.1

(57) Abstract: The invention discloses a pressure release device (10') for a closed container (11), especially for a pressurized container for beverages, having a plug (15) which can be sealingly fitted on an opening (14) of the container (11) and which comprises a passage opening (16), the passage opening (16) being sealingly closed by a film (38) (Fig. 2).

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Overpressure relief device for closed containers

Recently so-called party barrels with filling volumes of, mostly, 5 or 10 liters have come into use, especially for packaging beer. As part of that development, containers equipped with an integrated CO₂ pressure accumulator are presently being developed. Pressure can be produced for example with the aid of a low-pressure cartridge (compare WO-A-2005 095229) or of a high-pressure cartridge (compare EP-A-1 642 862). Such party barrels are designed as three-piece folded-joint cans. The main body comprises a lengthwise welded seam, the bottom and the upper bottom are connected with the main body by a folded joint. Such a container is dimensionally stable and tight up to a specified hydraulic inner pressure. When pressure rises above that point, the container gets deformed and, finally, becomes untight due to opening of the folded joint. This situation may lead to an abrupt pressure release. The use of an internal pressure accumulator entails the risk that in case of uncontrolled gas release due to some malfunction pressure may rise excessively inside the container and as a result bursting of the container may occur or the folded joint may open, as has been mentioned before.

For safety reasons it is, therefore, necessary to provide a pressure release device through which pressure can be released to the outside in the event an unexpected pressure rise should occur, before the folded joint gets overloaded or the container comes to burst.

Such a pressure release device has been known from EP-A-1 688 814.

However, the pressure release device known from that publication has a relatively complicated structure.

Further, there have been known in the art so-called "bursting disks", used for example in machinery and plant engineering. Such a bursting disk comprises a metal plate or a disk of defined thickness serving as a shutoff member in a pressure-loaded system. When the pressure rises above a defined critical value, the bursting disk will break, thereby releasing a flow passage through which the pressurized medium is permitted to escape.

Before that background, it is the object of the present invention to provide a pressure release device for a container which guarantees reliable operation and which is constructed in the simplest possible way.

That object is achieved by a pressure release device for a closed container, especially for a pressurized container for beverages, having a plug which is designed for being sealingly fitted in an opening of the container and which comprises a passage tightly sealed by a film.

The object of the invention is perfectly achieved in this way.

Closing the passage opening by a film provides a simple and reliable seal that will yield and release the passage opening when a defined pressure is exceeded.

The film may consist, for example, of metal, such as aluminum, or of a plurality of connected layers of metal or of a plastic material, i.e. of a compound film.

According to a further development of the invention, the film is connected with the plug by a sealed layer.

In an alternative embodiment, the substances of the film and of the plug are connected by a molding operation, preferably by a 2K-technique (2-component-technique).

In 2K-technology, two different plastic materials having different properties, for example a harder and a softer material, are joined one with the other by two successive injection molding operations. This leads to an especially intimate connection with high adhesive strength between the two plastic materials.

This guarantees simple fastening on the plug, with reliable sealing effect, for closing the passage opening.

According to a preferred further development of that embodiment, the passage is closed by a flange on which the film is held.

This facilitates the operation of mounting the film on the plug in sealing relationship.

According to a further embodiment of the invention, that plug comprises a sleeve made from a harder plastic material, in which the passage opening is formed and on which the film is fastened, the sleeve being enclosed by an outer part made from a softer plastic material.

While the outer part consists of a softer material and permits the plug to be sealingly mounted in the opening of the container, the sleeve made from a harder plastic material provides an advantageous way of fastening the film.

In another variant of the invention, the sleeve may also form a predominant portion of the plug while the outer part encloses the sleeve only in the area intended to be sealingly fitted in the opening of the container.

According to a further variant of the invention, the film is coated with a sealable material, preferably a sealable lacquer.

It is possible in this way to make the coating of the film and the sleeve from a chemically very similar or identical material so that both the film and the sleeve will melt locally in the area of the sealable layer when a suitable energy is applied, for example by heating or by ultrasound, whereby a very intimate and sealing connection is achieved between the film and the sleeve.

According to a still further embodiment of the invention, the sleeve is connected with the outer part by a 2K-technique.

This allows a connection with especially good adhering effect to be achieved between the sleeve and the outer part.

According to an alternative variant of the invention, the sleeve is mechanically fitted in an opening of the outer part.

Provided the sleeve and the outer part are shaped adequately, a reliable connection with good adhesive effect can be ensured between the sleeve and the outer part by such a design as well.

According to a further embodiment of the invention, a point facing the film is provided in the sleeve.

Given the fact that under the action of pressure the film will bend from the interior of the container toward the outside it is possible, by arranging a point of suitable form in a suitable position near the film, to define the pressure at which the film will be opened and, thus, pressure will be released, more precisely than on the basis of the strength of the film only. The overpressure at which the pressure release device will respond can be adjusted with high precision in this way.

In a further embodiment of the invention, a protective cover is movably held at the passage opening of the sleeve.

This feature ensures that when the pressure release device responds the content of the container cannot be expelled from the container in the form of a sharp jet. Instead, the content of the container will be permitted to escape only through a gap between the protective cover and the passage opening so that any risks will be avoided.

According to a further embodiment of the invention, the protective cover is sealed relative to an outer surface of the plug in a first closed position.

The inner space of the plug in the area of the passage opening and of the film is thereby protected from external mechanical stresses and contamination.

According to a further embodiment of the invention, the protective cover is located on the sleeve for being mechanically locked in the desired position.

This permits easy mounting of the protective cover on the sleeve.

According to an additional further development of the invention, the protective cover has a first stop position in which the protective cover is fixed on the sleeve in such a way that when a defined retaining force is exceeded the protective cover will be released from the first stop position and will be displaced in axial direction to release the passage.

This ensures simple and reliable operation of the click-in cover, for releasing the passage opening to the outside when the film is open.

Preferably, the protective cover can be fitted in the sleeve from the outside in this case, whereby easy assembly is achieved.

According to an additional further development of that embodiment, the protective cover is provided with stop elements that permit the protective cover to be inserted into the sleeve from the outside, a stop means in a first position and an axial stop on holding elements of the sleeve in a second activated position in which the film has been opened and pressurized liquid in the container is permitted to flow from the interior of the container through the passage against the protective cover and to the outside.

This guarantees reliable operation of the protective cover and easy assembly.

According to further embodiment of the invention, the plug is designed as a closure plug for being tightly inserted into the filling opening of a container.

This allows the plug to be advantageously fastened in the filling opening of the container anyway available. The plug can then be integrated in the plug that is anyway required for closing the filling opening.

It is understood that the features of the invention mentioned above and those yet to be explained below can be used not only in the respective combination indicated, but also in other combinations, without leaving the scope of the invention.

Further features and advantages of the invention will become apparent from the description that follows of a preferred embodiment, with reference to the drawing. In the drawing:

Fig. 1 shows a sectional view of a detail of a container with a fitted pressure release device in a closed position; and

Fig. 2 shows the container with pressure release device according to Fig. 1 in an activated position.

In Fig. 1 a detail of a container is indicated generally by reference numeral 11.

The container 11 may, for example, be a party barrel having a capacity of 5 or 10 liters, being filled with beer, for example. Further, the container 11 is pressurized, preferably by a CO₂ cartridge that is maintained by a control unit at an overpressure suitable for beer of approximately 0.2 to 1 bar (i.e. an absolute pressure of 1.2 to 2 bar), as is basically known from WO-A-2005/095229 or EP-A-1 642 862, for example.

The upper bottom 13 of the container 11 comprises a central opening 14 into which a pressure release device 10 according to the invention is inserted after filling.

The pressure release device 11 comprises a plug 15 having a central sleeve 18 made from a relatively hard plastic material and an outer part 20 made from a relatively soft plastic material which surrounds the sleeve 18. A central passage opening 16 is formed in the sleeve 18.

A circumferential groove 36, by which the outer part 20 can be fitted in the filling opening 14 of the container 11 in sealing engagement, is formed in the outer part 20. The plug 15 can thus be used as a closure plug for the filling opening 14.

In order to guarantee a sealing connection, the outer part 20 consists of a suitable plastic material, for example a thermoplastic elastomer (TPE). Compared with that, the sleeve 18 consists of a harder plastic material, such as PP or PE. The sleeve 18 may be produced jointly with the outer part 20 by a 2K-technique, which ensures an especially intimate mechanical connection between the two parts. Alternatively, the sleeve 18 and the outer part 20 may be produced separately one from the other, and the sleeve 18 can then be mechanically fitted in a suitably configured opening of the outer part 20 so that again a sealing connection is achieved between the two parts.

The sleeve 18 has a hollow-cylindrical design and comprises a flange 17 at its lower end facing the interior of the container 12. A film 38 in the form of an aluminum foil

is sealed onto, and is tightly connected with the flange 17 over a circumferential sealing area 40. The film 38 is coated with a material known as "sealable lacquer". The sealable lacquer is plasticized under the influence of heat and/or energy, for example by ultrasonic excitation. Given the fact that the material from which the sleeve 18 is made has similar properties as the sealable lacquer with which the film 18 is coated, the surface of the flange 17 can be plasticized simultaneously as the film 38 is sealed on so that an intimate connection is achieved between the film 38 and the sleeve 18 in the sealing area 40.

Alternatively, the film 38 may be connected with the sleeve 18 also by injection molding.

Now, the thickness of the film 38, its strength and the diameter of the passage opening are mutually adjusted so that when a specified inner pressure is reached in the inner space of the container 12, the film 38 will bend outwardly so that it will come to tear under the effect of the pressure.

In order to ensure the best possible defined response of the pressure release device, a point 21, arranged opposite the film 38, is received on a bridge 19 of the sleeve 18 at a suitable spacing from the film. The spacing between the point 21 and the film 38 is selected to ensure that tearing of the film 38 will occur when a defined overpressure is reached in the space of the container 12, the pressure at which the film will respond and tear being predefinable rather precisely.

In order to prevent pressurized material in the inner space of the container 12 from being expelled from the container through the passage opening 16 in the form of a sharp jet when the pressure release device responds by tearing of the film 38, a protective cover 28 is additionally fixed for axial movement in the passage opening 16. As can be seen in Fig. 1, in a first closed position the cover area 30 of the protective cover 28 comes to lie flush in a recess 26 on the outside of the outer part 20 and is sealed in that position relative to the outer part 20. Both the passage opening 16

and the hollow space above the film 38 are sealed off from the outside in this way. The protective cover 28 is provided for this purpose with a total of four tongues 32 projecting from the bottom of the cover surface 38 in the direction of the interior of the sleeve 18. Stop elements 34 are formed on the lower ends of the tongues 32. In the closed position of the protective cover 28 illustrated in Fig. 1, the stop elements 34 rest against a circumferential inner bead projecting to the inside in the form of a bulge 22. In this way, the protective cover 28 is securely fixed in the closed position.

When the pressure release device 10 responds, i.e. when the film 38 tears, the pressurized material in the container escapes from the inner space 12 and enters the passage opening 16, and the pressure acting on the bottom surface of the cover area 30 causes the stop elements 34 to be released from their engaged position and the protective cover 28 to be displaced in outward direction until the stop elements 34 come into contact with a circumferential engaging edge 24 at the upper end of the sleeve 18. This then constitutes the second stop position illustrated in Fig. 2, where the pressure release device is indicated by reference numeral 10'. The pressurized material in the container can then escape to the outside through the passage opening 16 and the remaining annular gap between the cover surface 30 and the outer part 20.

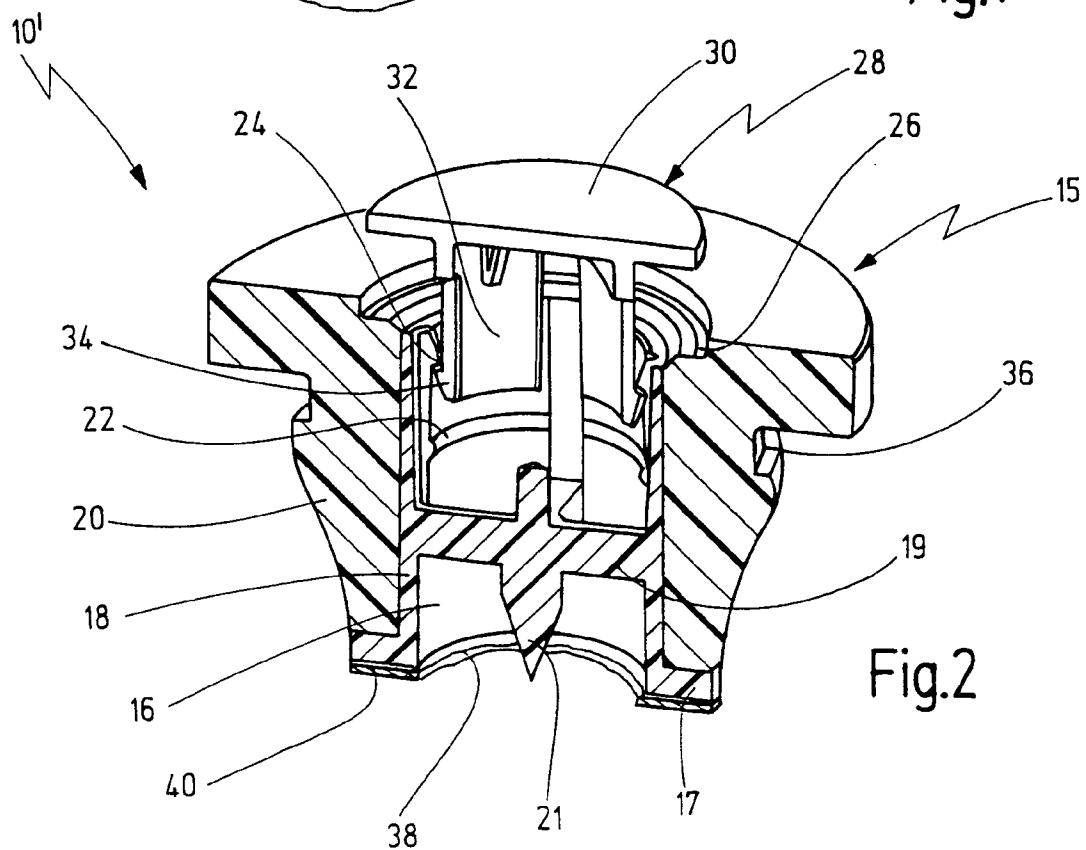
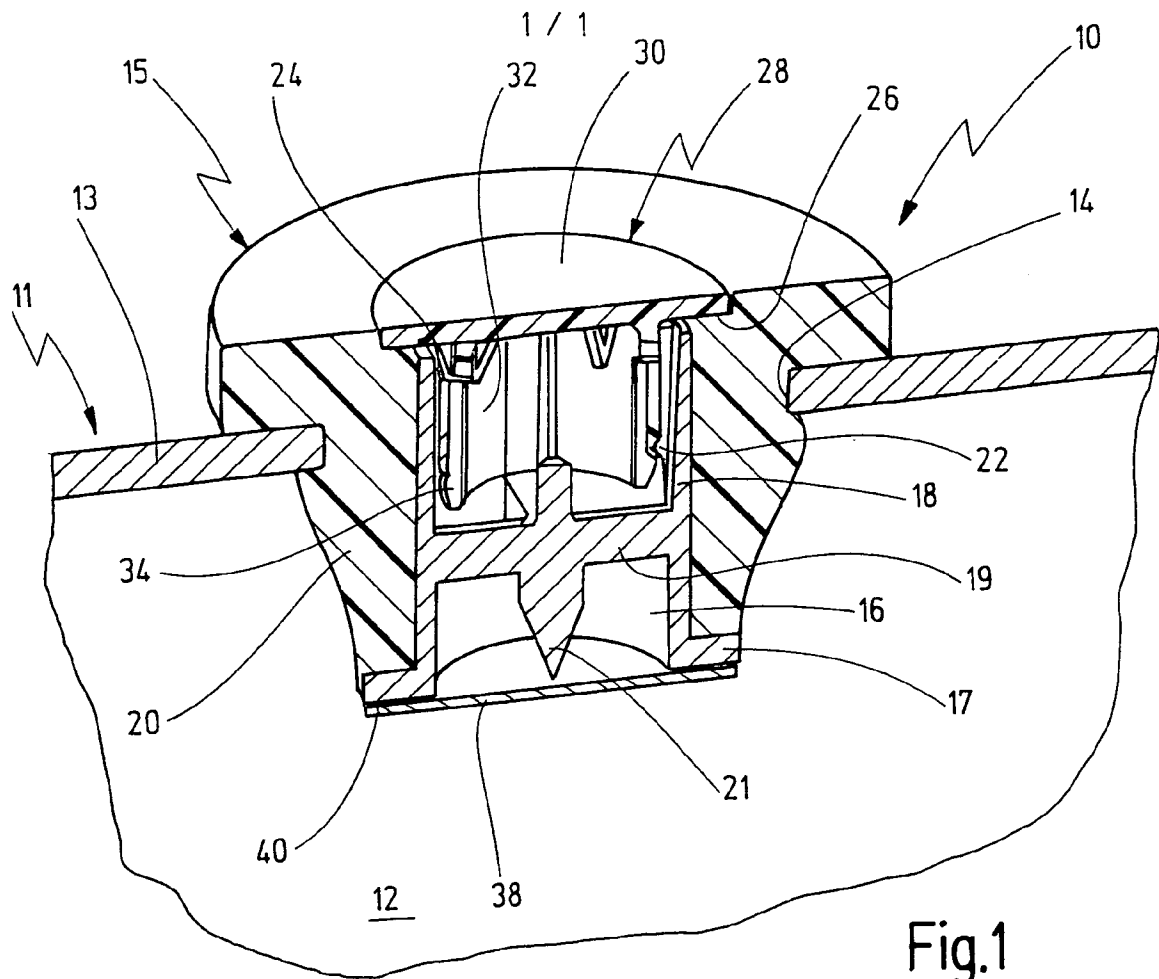
The engaging edge 24 and the stop elements 34 are adapted one to the other so that for mounting the protective cover 28 it is initially inserted into the sleeve 18 from the outside over the engaging edge 24, for being engaged in the first closed position illustrated in Fig. 1, against the inner bead or the bulge 22. This then constitutes the closed position where the protective cover 28 occupies its first locked position. Further, the stop elements 34 and the engaging edge 24 are adapted one to other so that in the second activated position the stop elements 23 will safely come to rest against the engaging edge 24 and the protective cover 28 will be safely held in the second engaged position or the activated position illustrated in Fig. 2 even when material escapes from the container under pressure.

Claims

1. A pressure release device for a closed container (11), in particular for a pressurized container for beverages, having a plug (15) which can be sealingly fitted in an opening (14) of the container (11) and which comprises a passage opening (16) sealingly closed by a film (38).
2. The pressure release device of claim 1, wherein the film (38) consists of a metal film, preferably an aluminum film, or comprises a plurality of connected layers consisting of metal and/or a plastic material.
3. The pressure release device as of 1 or claim 2, wherein the film (38) is connected with the plug (15) by a sealed layer (40).
4. The pressure release device of any of claims 1 to 2, wherein the substances of the film (38) and of the plug (15) are connected by a molding operation, preferably by a 2K-technique.
5. The pressure release device of claim 1 or claim 2, wherein the passage opening (15) is closed by a flange (17) on which the film (38) is held.
6. The pressure release device of any of the preceding claims, wherein the plug (15) comprises a sleeve (18) made from a harder plastic material, in which the passage opening (16) is formed and on which the film (38) is fastened, the sleeve (18) being enclosed by an outer part (20) made from a plastic material softer than the harder plastic material.
7. The pressure release device of claim 4, wherein the sleeve (18) is connected with the outer part (20) by a 2K-technique.

8. The pressure release device of claim 7, wherein the sleeve (18) is mechanically fitted in an opening of the outer part (20).
9. The pressure release device of any of claims 6 to 8, wherein the outer part (20) is made from a thermoplastic elastomer (TPE).
10. The pressure release device as defined in any of claims 6 to 9, wherein the sleeve (18) is made from polypropylene (PP) or from polyethylene (PE).
11. The pressure release device of any of claims 1 to 10, wherein the film is coated with a sealable material, preferably a sealable lacquer.
12. The pressure release device of any of claims 6 to 11, wherein a point (21) facing the film (38) is provided in the sleeve (18).
13. The pressure release device of any of claims 6 to 12, wherein a protective cover (28) is movably held in the passage opening (16) of the sleeve (18).
14. The pressure release device of any of claims 6 to 13, wherein the protective cover (28) is sealed relative to an outer surface of the plug (15) in a closed position.
15. The pressure release device of any of claims 6 to 14, wherein the protective cover (28) is located on the sleeve (18) for being mechanically locked in the desired position.
16. The pressure release device of claim 15, wherein the protective cover (28) has a first stop position in which the protective cover (28) is fixed on the sleeve (18) in such a way that when a defined retaining force is exceeded the protective cover (28) will be released from the first stop position and will be displaced in axial direction to release the passage opening (16).

17. The pressure release device of claim 16, wherein the protective cover (28) can be fitted on the sleeve (18) from the outside.
18. The pressure release device of claim 17, wherein the protective cover (28) is provided with stop elements (34) that permit the protective cover (28) to be inserted into the sleeve (18) from the outside, as well as a stop means for the protective cover (28) in a first position and an axial stop on the sleeve (18) in a second activated position in which the film (38) has been opened and pressurized fluid in the container (11) is permitted to flow from the interior of the container (11) through the passage opening (16) against the protective cover (28) and to the outside.
19. The pressure release device of any of the preceding claims, wherein the plug (15) is designed as a closure plug for being sealingly inserted into the filling opening (14) of the container (11).



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/004982

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D83/14

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)

B65D

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 515 308 A (HAYES JOHN A ET AL) 2 June 1970 (1970-06-02) column 3 - column 6; figures 1-7	1-5, 7, 10, 11, 19
X	FR 2 685 303 A (OREAL [FR]) 25 June 1993 (1993-06-25) page 4 - page 6; figures 1-4	1, 6, 8, 9, 12, 19
X	US 5 232 124 A (SCHNEIDER SCOTT W [US] ET AL) 3 August 1993 (1993-08-03) column 3 - column 6; figures 1-5	1, 13-17
A	US 3 880 187 A (KNEUSEL RAYMOND H P) 29 April 1975 (1975-04-29) abstract	13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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