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(54) **Dispensing caps for beverage containers**

(57) A dispensing cap constitutes a one-piece moulding of polymeric material including a first circular section tubular portion (2) of relatively large diameter for connection to a beverage container and a second circular section tubular portion (6) of relatively smaller diameter. One end of the larger tubular portion (2) is connected to one end of the smaller tubular portion (6) by a resilient, annular integral web (4), in which one or more flow openings (18) are formed. The width of the web (4) is greater than the difference between the radii of the larger and smaller tubular portions. The other end of the smaller tubular portion (6) is closed. The smaller tubular portion carries a peripheral flange (20) whose radius is equal to or greater than that of the first tubular portion (2). The two tubular portions are coaxial and relatively movable in the axial direction between an open position, in which the smaller tubular portion is located outside the larger tubular portion and the flow openings are unobstructed, and a closed position in which the said one end of the smaller tubular portion is located within the said one end of the larger tubular portion and the peripheral flange (20) is in sealing engagement with the said one end of the larger tubular portion, whereby the flow openings (18) are prevented from communicating with the atmosphere.

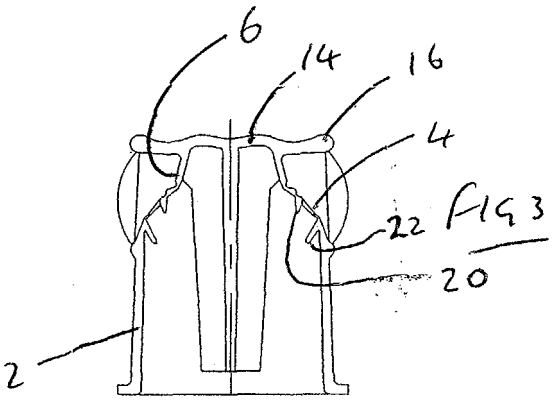

Fig 3

EP 1 632 437 A1

Description

[0001] The present invention relates to dispensing caps for beverage bottles or other beverage containers. Such caps may be fitted to the mouth of a beverage bottle and provide the ability to drink from the bottle without removing the cap. In this form such caps are referred to as drinking caps. Such caps may also be provided on an upper surface of a larger beverage container, e.g. of waxed cardboard, of the type which are commonly used to store milk or fruit juice. In this form one may drink from the cap or use it to pour the beverage into a drinking glass or the like.

[0002] Drinking caps typically include two moulded plastic components which are connected together and are relatively movable between a first position, in which the bottle, to which the cap is connected, is sealed and a second position, in which the interior of the bottle communicates with the exterior through one or more openings through which a liquid in the bottle may flow. Such caps thus also provide a resealing facility.

[0003] Various different constructions of dispensing or drinking cap are known but these all include at least two components which must be moulded separately and then connected together. This is both time-consuming and expensive.

[0004] It is therefore the object of the invention to provide a dispensing cap which is both simple and cheap and, in particular, constitutes a one-piece plastic moulding.

[0005] According to the present invention, a dispensing cap constitutes a one-piece moulding of polymeric material, such as polypropylene, and includes a first circular section tubular portion with a first radius for connection to a beverage container and a second circular section tubular portion with a second radius smaller than the first radius, one end of the first tubular portion being connected to one end of the second tubular portion by a resilient, annular, integral web, in which one or more flow openings are formed, the width of the web being equal to or greater than the difference between the first and second radii, the other end of the second tubular portion being closed, the second tubular portion carrying a peripheral flange whose radius is equal to or greater than that of the first tubular portion, the first and second tubular portions being coaxial and relatively movable in the axial direction between an open position, in which the second tubular portion is located outside the first tubular portion and the flow openings are unobstructed, and a closed position, in which the said one end of the second tubular portion is located within the said one end of the first tubular portion and the peripheral flange is in sealing engagement with the said one end of the first tubular portion, whereby the flow openings are prevented from communicating with the atmosphere.

[0006] Thus the dispersing cap in accordance with the invention includes two circular section tubular portions of different radius, one end of each of which is connected by a resilient web whose width, that is to say length in the generally radial direction, is equal to or greater than the difference between the two radii. The other end of the tubular portion of greater radius is adapted for connection to the mouth of a bottle or the like or to the upper surface of a larger beverage container whilst the other end of the tubular portion of lesser radius is closed. The second tubular portion carries a peripheral flange, preferably at its upper end, whose radius is equal to or greater than that of the first tubular portion. The resilient web has at least one and preferably a number of spaced flow openings formed in it. The tubular portion of lesser diameter is movable in the axial direction with respect to the other tubular portion between an open position, in which it is situated wholly outside the tubular portion of greater diameter and the flow openings are unobstructed, and a closed position in which its end connected to the web is situated inside the adjacent end of the tubular portion of greater diameter. In this closed position, the flow apertures are situated within the tubular portion of greater diameter and the peripheral flange is in sealing engagement with the upper end of the first tubular portion. This means that the flow openings are sealed from, that is to say do not communicate with the exterior, that is to say the atmosphere. The beverage container to which the dispensing cap is connected is thus also sealed and no liquid may leave it.

[0007] It will be appreciated that when the two tubular portions are in the open position and a force is applied to the tubular portion of smaller diameter to move it into the closed position, the initial movement of the tubular portion of the smaller diameter will necessarily result in compression and/or deformation of the web due to the fact that its length is greater than the difference between the radii of the two tubular portions. This compression and/or deformation will result in the web exerting a restoring force on the tubular portion of lesser diameter urging it back towards the open position. However, as the closing force continues to be exerted, the tubular portion of smaller diameter will move progressively in the axial direction towards the tubular portion of greater diameter. As it passes through the position in which the web extends substantially in the radial direction, the force exerted by the web on the tubular portion of smaller diameter will act on it to urge it towards the closed position. The tubular portion of smaller diameter is thus effectively bistable and if no external force is applied to it it will automatically move to either the open or the closed position. The peripheral flange is positioned and dimensioned such that it is moved into sealing contact with the opposing end surface of the tubular portion of larger diameter before the web has reached the fully relaxed position. This means that, in the closed position, the underside of the peripheral flange is biased into contact with the upper end surface of the first tubular portion and forms a constant substantially line seal with it.

[0008] This seal may be sufficient on its own but it is preferred that an additional seal is also provided for ad-

ditional security. In the preferred embodiment, one of the web and the internal surface of the first tubular portion adjacent the said one end carries a projecting annular first sealing flange, whereby when the first and second tubular portions are in the closed position the flow openings are prevented from communicating with the interior of the first tubular portion by the sealing engagement of the first sealing flange with the other of the web and the internal surface of the first tubular portion. In this embodiment, the sealing flange is positioned and dimensioned such that it is moved into sealing contact with the opposing surface on either the internal surface of the tubular portion of larger diameter or the web before the web has reached the fully relaxed position. A secondary seal is thus formed.

[0009] It is preferred that the first sealing flange is integral with the web. It is preferred further that the first sealing flange projects from the web in a direction substantially parallel to the axis of the first and second tubular portions, when they are in the open position. This is particularly convenient because it enables the drinking cap to be readily removed from an injection mould at the end of the injection moulding process in the axial direction. It is also convenient because the web, and thus the first sealing flange integral with it, will typically rotate through about 90° when moving from the open to the closed position, which means that if the first sealing flange extends in the axial direction, when the cap is in the open position, it will extend in the generally radial direction, when the cap is in the closed position, which will mean that its free edge will form a substantially line seal with the opposing surface.

[0010] Whilst the first sealing flange may form a seal directly with the internal surface of the tubular portion of greater diameter, it is preferred that the internal surface of the first tubular portion carries a resilient annular second sealing flange, which projects at an acute angle to the axis of the first of the first and second tubular portions and away from the second tubular portion and is positioned so that it is sealingly engaged by the first sealing flange, when the first and second tubular portions are in the closed position. This second sealing flange will be caused to yield somewhat in the generally radial direction by the engagement of the first sealing flange and this is found to result in a further enhancement of the sealing integrity.

[0011] In order to minimise the risk that the tubular portion of greater diameter might be deformed by physical engagement, when in the closed position, thereby breaking the seal, it is preferred that the first tubular portion carries an external annular stiffening or reinforcing bead adjacent its connection with the web. This stiffening bead will resist deformation forces and thus minimise the risk of inadvertent leakage occurring.

[0012] As mentioned above, the dispensing cap may be attached to the mouth of a beverage bottle and used as a drinking cap. It may, however, also be attached and sealed to an upper surface, which may be horizontal or inclined, of a beverage container of the type which is commonly used to accommodate milk, fruit juice or the like and is typically made of waxed cardboard or a laminate material, typically comprising paper and polyethylene and optionally aluminium. In this event, it will be secured to the surface over an aperture in the container. This aperture is typically sealed by a membrane of polyethylene or other plastic material, aluminium or a laminated material. This membrane must be ruptured before the beverage may be dispensed. In order to rupture this membrane, the dispensing cap may include an elongate piercing member, one end of which is connected to the second tubular portion, the piercing member being so dimensioned and arranged that, when the first and second tubular portions are in the open position, the other end is situated within the first tubular portion and when they are in the closed position it projects beyond the other end of the first tubular portion.

[0013] Thus, in this embodiment, the beverage container would be sold with the dispensing cap in the open position. When it is desired to dispense the beverage, the cap is moved into the closed position so as to move the lower end of the piercing member, which is preferably relatively sharp, out of the first tubular portion. This will press it against the membrane and rupture it, thereby opening the container. The cap is then returned to the open position by grasping the peripheral flange with the fingers and the beverage may be dispensed. If only a proportion of the contents of the container is dispensed, the cap may be moved again into the closed position in which it seals the container by virtue of the seal between the underside of the peripheral flange and the upper edge of the first tubular portion and optionally also the seal formed by the first sealing flange and the surface with which it comes into engagement.

[0014] In order to facilitate the piercing or rupturing of the membrane, it is preferred that the piercing member is of generally cruciform cross-sectional shape, at least at its end remote from the second tubular portion.

[0015] Depending on the material of which the membrane is made, there is a risk that, when the piercing member is retracting after piercing the membrane, the portions of the membrane will return to their original position and reform at least a partial seal of the opening. In order to prevent this happening, it is preferred that the end of the piercing member carries one or more lateral projections adapted to deflect the portions of the ruptured membrane to a position from which they cannot readily return to reform a seal. In the preferred embodiment, each limb of the cruciform shape carries lateral displacement members on each side projecting in opposite directions to the length of the associated limb.

[0016] As mentioned above, the beverage container may be sold with the dispensing cap in the open position. Loss of the beverage will be prevented by the sealing member over the aperture in the beverage container. In order to prevent unintentional depression of the second tubular portion and thus unintentional rupturing of the

membrane, it is preferred that the cap includes removable retaining means which retain the first and second tubular portions in the open position.

[0017] The retaining means may take various forms and they are constituted by an annular strip or band integrally connected to the first tubular portion and to the peripheral flange on the second tubular portion by respective lines of weakness, whereby the annular strip may be manually removed when the cap is first used and will serve, prior to removal, as a tamper evident indicator.

[0018] In order to further enhance the integrity of the seal of the dispensing cap, when closed, it is preferred that the underside of the peripheral flange affords a radial shoulder whose shape and position match those of the upper end of the first tubular portion, whereby when the second tubular portion is moved into the closed position, the underside of the peripheral flange forms a seal with the end surface of the first tubular portion and the side surface of the shoulder forms a seal with a side surface of the first tubular portion adjacent the said end surface.

[0019] Further features and details of the invention will be apparent from the following description of two specific embodiments of dispensing cap in accordance with the invention, which is given by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a side view of the dispensing cap, in the open configuration in which it is sold;

Figure 2 is a side view of the dispensing cap, when closed;

Figure 3 is an axial sectional view of the dispensing cap, in the open configuration in which it is sold;

Figure 4 is an axial sectional view of the drinking cap, when closed;

Figure 5 is a sectional view of the circled portion of the cap in Figure 4 on an enlarged scale; and

Figure 6 is an end view of the piercing member of an alternative embodiment.

[0020] The dispensing cap is a one-piece injection moulded component of polymeric material, such as polypropylene, and comprises a first circular section tubular portion 2 of relatively large diameter, which is integrally connected at one end by a resilient, flexible web 4 to one end of a second circular section tubular portion 6 of relatively smaller diameter.

[0021] The larger tubular portion 2 is adapted to be connected and sealed to an upper surface of a beverage container around a dispensing aperture, which is initially sealed by a membrane. The upper end of the smaller diameter tubular portion 6 is closed by an integral lid 14, the diameter of which is greater than that of the tubular portion 6, whereby its radially outer edge constitutes a projecting peripheral flange or lip 16, which may be grasped by the user and whose radius is equal to that of the larger tubular portion 2.

[0022] As may be seen in Figure 1, a plurality of holes 18 is formed in the resilient web 4. As best seen in Figure 4, the width of the resilient web 4, that is to say its length between the lower end of the tubular portion 6 and the upper end of the tubular portion 2, is greater than the difference between the radii of the two tubular portions. Integral with the internal surface of the web 4 is a first annular sealing flange 20, which extends substantially in the axial direction, when the cap is in the open position illustrated in Figure 3. Integral with the internal surface of the upper end of the larger tubular portion 2 is a second resilient sealing flange 22, which extends both downwardly, that is to say away from the smaller diameter tubular portion 4, and inwardly towards the axis of the cap, whereby it subtends an acute angle with the axial direction of the cap. The underside of the peripheral flange 16 has an annular shoulder 8 formed in it with a radius equal to that of the upper edge of the tubular portion 2, whereby this underside has an annular portion whose shape precisely matches that of the upper edge of the tubular portion 2. The upper end of the lower tubular portion thus forms a seal not only with the underside of the flange 16 but also with the side surface of the shoulder 8.

[0023] When the cap is in the open position shown in Figures 1 and 3, the tubular portion 4 is located wholly outside the tubular portion 2. The web 4 extends upwardly out of the tubular portion 2 and also inwardly in the axial direction and the flow openings 18 communicate with the interior of the cap, whereby liquid in the container to which the cap is connected can flow out through the openings 18. If a downward force is exerted on the cap 14, the tubular portion 6 begins to move downwardly. This results in compression and distortion of the web 4, which thus exerts a restoring force on the tubular portion 6 urging it back towards the fully open position. As the force continues to be exerted on the cap 14, the tubular portion 6 moves downwardly until the web 4 extends approximately horizontally, that is to say in the radial direction. As the tubular portion 6 moves through and beyond this "dead centre" position, the force exerted by the web 4 on the tubular portion 6 acts in the downward direction. The tubular portion 6 continues to move downwardly and this is accompanied by continuing rotation of the web 4. This movement continues until the underside of the peripheral flange 16 engages the upper surface of the tubular portion 2 and the free edge of the sealing flange 40 engages the surface of the resilient sealing flange 22. This occurs before the web 4 is fully relaxed, whereby when the downward force on the cap 14 is removed, the force exerted by the web 4 continues to urge the underside of the flange 16 against the upper surface of the tubular portion 2 to form a sealed line contact and to urge the two sealing flanges 20, 22 into contact and the free edge of the flange 20 makes sealed line contact with the surface of the seal-

ing flange 22. The first contact line is above the flow openings 18 and thus seals them from the atmosphere whilst the second contact line is situated below the flow openings 18, which means that these flow openings are sealed from the interior of the cap. The interior of the bottle is thus sealed and no liquid can flow out through the openings 18. If it is desired to reopen the bottle, an upward force is exerted on the peripheral flange 16 and the process described above is reversed until the cap is again in the open position illustrated in Figures 1 and 3.

[0024] As mentioned above, when the cap is in the closed position, the interior of the liquid container is sealed from the exterior. If, however, a significant lateral force were exerted on one side of the tubular portion 2, there is a risk that it could deform sufficiently to break the seal, thereby permitting liquid within the container to escape through the openings 18. This risk is minimised by the provision of an annular external stiffening or reinforcing bead 24 on the upper portion of the tubular portion 2 in the vicinity of its connection to the web 4. This stiffening bead will resist deformation of the tubular portion 2 and thus minimise the risk of leakage occurring.

[0025] The dispensing cap as so far described is suitable for application to the mouth of a bottle for use as a drinking cap. However, the illustrated cap is particularly intended for connection to the surface of a beverage carton or the like over an aperture in the surface sealed by a rupturable membrane. In order to rupture this membrane, the cap is provided with an elongate piercing member 30, the upper end of which is integral with the tubular portion 6 or the lid 14, which coaxially downwardly. The length of the piercing member is such that it is wholly within the cap, when the cap is in the open position, but protrudes below the lower end of the tubular portion 2, when the cap is in the closed position.

[0026] In order to ensure that the cap and thus the beverage container are not opened earlier than desired by the inadvertent application of pressure to the lid 14, the cap is provided with an integral tear-away plastic band 32 which is connected to the peripheral flange 16 and the tubular portion 2, which restrains relative movement of the two tubular portions. When it is desired to open the container and dispense some of the beverage in it, the plastic band 32 is grasped by a projecting tag or the like and torn away from the cap. The tubular portion is then moved downwardly into the closed position and this causes the lower end of the piercing member to extend out of the lower end of the tubular portion 2 and thus rupture the membrane sealing the aperture in the container. beverage may now be dispensed, whereafter the cap may be closed again. The fact that the plastic band has been removed is clearly visible and this band thus acts also as a tamper evident indicator.

[0027] In the embodiment of Figures 1 to 5, the piercing member is of simple, regular cruciform shape in cross-section, preferably with a relatively sharp lower end in order to facilitate rupturing the membrane. However, it is found that under certain circumstances the four portions or flaps of the ruptured membrane can return to their original position after the piercing member has been withdrawn and recreate a substantial seal. This problem is eliminated in the modified embodiment shown in Figure 6, in which the piercing member is again of generally cruciform cross-section. However, at the lower edge of each limb 34 of the cruciform there are two lateral projections 36 extending transversely to the limb. These projections force the flaps of the ruptured membrane aside to positions from which they are unlikely to be able to return to their original position. Accordingly, use of this embodiment results in the beverage container remaining able to dispense beverage, once the membrane has been ruptured and eliminates the risk of a seal being recreated by the flaps of the ruptured membrane.

Claims

1. A dispensing cap constituting a one-piece moulding of polymeric material including a first circular section tubular portion with a first radius for connection to a beverage container and a second circular section tubular portion with a second radius smaller than the first radius, one end of the first tubular portion being connected to one end of the second tubular portion by a resilient, annular, integral web, in which one or more flow openings are formed, the width of the web being equal to or greater than the difference between the first and second radii, the other end of the second tubular portion being closed, the second tubular portion carrying a peripheral flange whose radius is equal to or greater than that of the first tubular portion, the first and second tubular portions being coaxial and relatively movable in the axial direction between an open position, in which the second tubular portion is located outside the first tubular portion and the flow openings are unobstructed, and a closed position, in which the said one end of the second tubular portion is located within the said one end of the first tubular portion and the peripheral flange is in sealing engagement with the said one end of the first tubular portion, whereby the flow openings are prevented from communicating with the atmosphere.

2. A cap as claimed in Claim 1 in which one of the web and the internal surface of the first tubular portion adjacent the said one end carries a projecting annular first sealing flange, whereby when the first and second tubular portions are in the closed position the flow openings are prevented from communicating with the interior of the first tubular portion by the sealing engagement of the first sealing flange with the other of the web and the internal surface of the first tubular portion.

3. A cap as claimed in Claim 2 in which the first sealing

flange is integral with the web.

4. A cap as claimed in Claim 3 in which the first sealing flange projects from the web in a direction substantially parallel to the axis of the first and second tubular portions, when they are in the open position.

5. A cap as claimed in Claim 3 or 4 in which the internal surface of the first tubular portion carries a resilient annular second sealing flange, which projects at an acute angle to the axis of the first of the first and second tubular portions and away from the second tubular portion and is positioned so that it is sealingly engaged by the first sealing flange, when the first and second tubular portions are in the closed position.

6. A cap as claimed in any one of the preceding claims in which the first tubular portion carries an external annular stiffening bead adjacent its connection with the web.

7. A cap as claimed in any one of the preceding claims including an elongate piercing member, one end of which is connected to the second tubular portion, the piercing member being so dimensioned and arranged that, when the first and second tubular portions are in the open position, the other end is situated within the first tubular portion and when they are in the closed position it projects beyond the other end of the first tubular portion.

8. A cap as claimed in Claim 7 in which the piercing member is of generally cruciform cross-sectional shape, at least at its end remote from the second tubular portion.

9. A cap as claimed in Claim 8 in which each limb of the cruciform shape carries lateral displacement members on each side projecting in opposite directions to the length of the associated limb.

10. A cap as claimed in any one of Claims 7 to 9 including removable retaining means which retain the first and second tubular portions in the open position.

11. A cap as claimed in Claim 10 in which the retaining means are constituted by an annular strip integrally connected to the first tubular portion and to the peripheral flange on the second tubular portion by respective lines of weakness, whereby the annular strip may be manually removed when the cap is first used and will serve, prior to removal, as a tamper evident indicator.

12. A cap as claimed in any one of the preceding claims in which the underside of the peripheral flange affords a radial shoulder whose shape and position match those of the upper end of the first tubular portion, whereby when the second tubular portion is moved into the closed position, the underside of the peripheral flange forms a seal with the end surface of the first tubular portion and the side surface of the shoulder forms a seal with a side surface of the first tubular portion adjacent the said end surface.

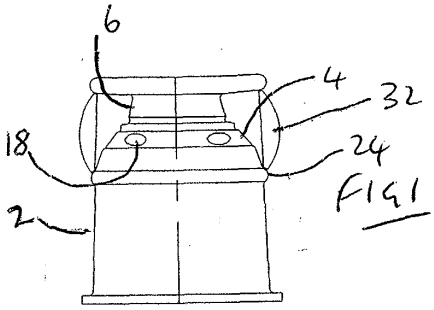

FIG 1

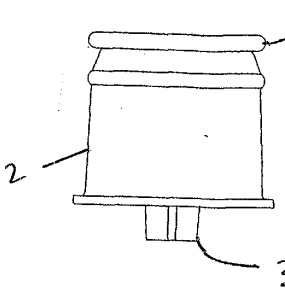

FIG 2

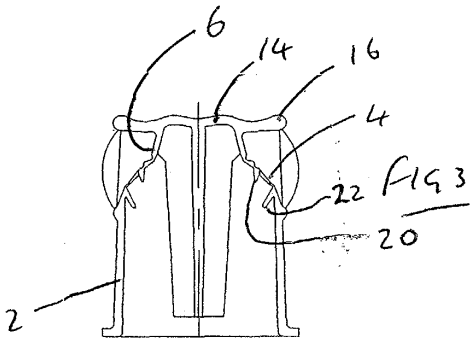

FIG 3

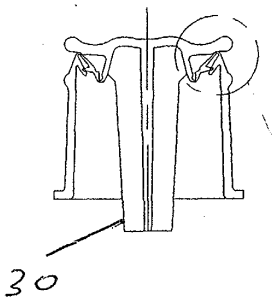

FIG 4

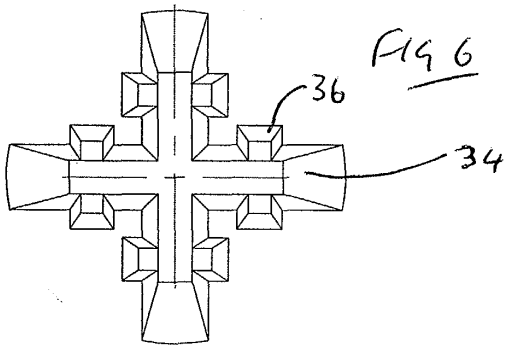

FIG 6

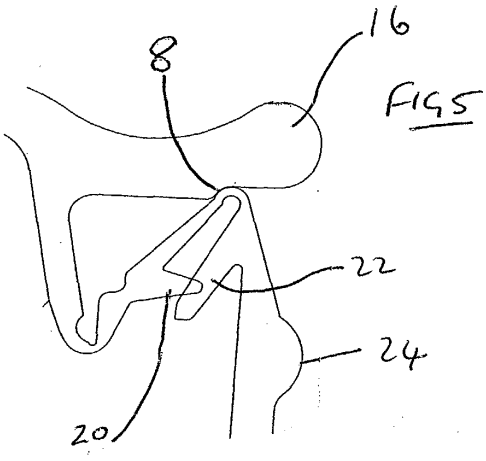

FIG 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 5277

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 January 2005	Grondin, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 25 5277

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82