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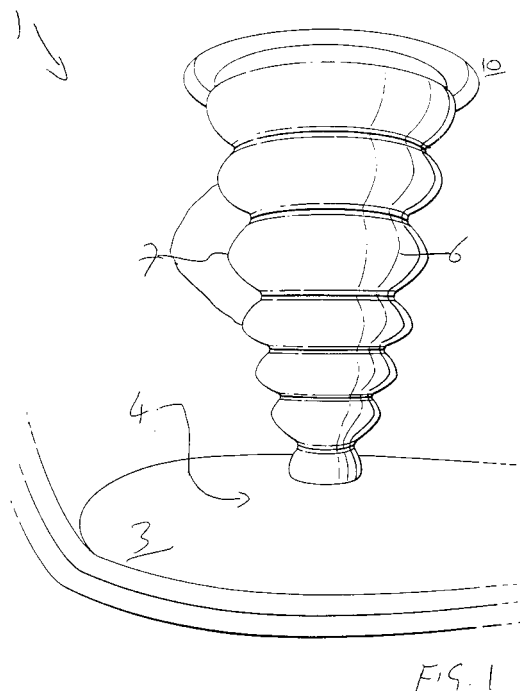
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(54) **Material handling apparatus**

(57) The invention relates to material handling apparatus 1 that is apparatus for handling flowable materials such as powders which should for environmental reasons be isolated within the apparatus to protect ambient atmosphere in general and operators in particular. Thus the apparatus 1 has a container 2 for powder and an outlet 3 therefrom, a device for obturating and opening the outlet 3, actuating means 5 such as a pneumatic piston and cylinder arrangement for raising and lowering the device 4 and a member 6 for sealing the actuating means 5 from the interior of the container. The member 6 is a shroud in the form of a collapsible tapered, convoluted member of plastics or rubber which is secured to a body 10 of the apparatus and to the device 4 by clamping members 8, 9 so that the member 6 joins at an angle of at least 90° to the vertical so that there is no fold or crease in which powder can lodge and which provides easy access for washing.



Description

[0001] The invention relates to material handling apparatus, particularly to such apparatus for handling flowable materials such as powders, pellets, tablets and the like (hereinafter 'powders'). Such powders should usually, for environmental reasons, be isolated within the apparatus to protect the ambient atmosphere in general and operators in particular. This is particularly so where the powders are pharmaceutical powders, powders used in the food industry or powders used in the nuclear industry.

[0002] Apparatus used in handling such powders often has seals to prevent contamination through an outlet, but other parts of the apparatus are often unprotected.

[0003] It is accordingly an object of the invention to seek to mitigate these disadvantages.

[0004] According to the invention there is provided material handling apparatus, comprising a container for material, an outlet therefrom, a device for obturating and opening the outlet, actuating means for raising and lowering the device for obturating and opening the outlet, and a member for sealing the actuating means from the interior of the container.

[0005] The sealing member may comprise a shroud member. This is a relatively simple yet effective construction, particularly where the shroud member may extend between a body of the apparatus and the device.

[0006] The shroud member may comprise a collapsible tubular member. This construction is again relatively simple, and may comprise a tapered member, which suitably may taper from the body to the said device. This provides for selective collapse of the shroud member during operation of the apparatus.

[0007] The shroud member may comprise a bellows-like, member. This is a particularly advantageous construction.

[0008] The convoluted construction provides that the material of the shroud does not fold or crease in an uncontrolled manner, so obviating the trapping of flowable material.

[0009] There may be means to clean the interior of the container, preferably in the form of water wash means. This provides a construction for cleaning the apparatus in place.

[0010] There may be means to clamp the member to the body and device at an angle of at least 90° to the vertical. This provides for thorough cleaning.

[0011] The shroud may be connected with associated parts of the apparatus at such an angle that the wash means may have good access for a positive washing action. The angle may be equal to or greater than 90°.

[0012] The actuating means may comprise a piston and cylinder arrangement. This provides for a positive obturating and opening of the outlet, particularly when a pneumatic piston and cylinder arrangement may be used.

[0013] Material handling apparatus embodying the invention is hereinafter described, by way of example, with reference to the accompanying drawings.

Fig. 1 is a side elevational view of apparatus according to the invention;

Fig. 2 is a schematic view, to an enlarged scale than that of Fig. 1 and partly in section, of the apparatus according to the invention;

Fig. 3 is a side elevational view, partly in section of another embodiment of apparatus according to the invention incorporated in apparatus for transfer of flowable material such as a powder; and

Fig. 4 is a schematic view of the apparatus of Fig. 3 from one side.

[0014] Referring firstly to Figs. 1 and 2 of the drawings, the apparatus 1 shown has a container 2 for material such as a flowable powder (not shown) and an outlet 3 therefrom, a device 4 for obturating and opening the outlet 3, actuating means 5 for raising and lowering the device 4 for obturating and opening the outlet 3, and a member 6 for sealing the actuating means 5 from the interior of the container.

[0015] The member 6 is a shroud having a bellows-like or convoluted tapered form 7 made of a soft flexible material such as a plastic and is washed in place by wash means such as water wash medium which is directed into the interior of the container 2 and towards the shroud 6 by a system which includes a combined wash nozzle and non return valve (not shown).

[0016] The convolutions 7 of the shroud obviate folding or creasing of the shroud 6 in an uncontrolled manner, which in turn provides that material in the container 2 such as a pharmaceutical powder is not trapped in folds or creases formed uncontrollably, which means that the shroud 6 can collapse and extend as the actuating means 5 is raised and lowered and the wash media can be directed to a smooth, ribbed and grooved surface 7 on which there are no hidden pockets in which powder is lodged or entrapped. The shroud 6 is secured to a body 10 of the apparatus 1 at the top, as viewed, and at the bottom, as viewed, to the device at such an angle that good access is provided as shown at X, Y, Z to the wash media, again with no entrapment or lodging of powder.

[0017] The angle is in the embodiment 90° or greater to the vertical as provided by clamping components 8, 9 securing the shroud 6 respectively at top and bottom, which assists in providing no entrapment or lodging of powder and ease of washing.

[0018] Referring now to Figs. 3 and 4, the container 2 is part of a containment transfer system 100 in which the powder is contained without contamination of the environment, the powder being fed to the container

through a hopper 12. The top (as viewed) of the container 2 is sealed by a planar closure 13 which is part of the body 10 and supports the actuating means 5, which is in the form of a pneumatic (in the embodiment) piston and cylinder arrangement, the cylinder 14 being externally positioned with respect to the interior of the container 2, and the piston 15 extending down to and being connected with the obturating and opening device 4 comprising an internal cap or cone 16 and a suction cup 17 for connection with an inlet closure of say an I.B.C. for transferring powder through the outlet 3 when the piston 15 raises the cone 16 and suction cup 17 which latter raises the inlet closure (not shown) of the I.B.C. on actuation of a vacuum.

[0019] To clean the interior of the container 2, there is purging means in the form of an array of wash nozzles 18 to inject jets of washing liquid such as water to flush the internal surfaces of the container 2. As in Figs. 1 and 2, to protect the piston 15 so that powder which could adhere thereto and be carried to the exterior, into the cylinder when the piston rises, there is provided the member 6 in the form of a shroud which is a tube which encloses the piston 15 and extends from the closure 8, to which it is clamped, and the device 4 to which it is also clamped. The shroud 6 tapers downwardly (as viewed) to the device 4 and is of convoluted, bellows-like construction so that it readily collapses and extends to accommodate retraction and extension of the piston 15 during transfer operations. The shroud 6 can be made of any suitable material, for example a rubber material or plastic material, and may be reinforced as for example by metal or plastic reinforcements such as wire 11 in the folds.

[0020] The shroud 6 thus seals the piston 15 against contact with the powder and during washing is itself washed whilst at the same time again protecting the piston 15 against contact with the washing water and powder entrained therein. The convolutions and the way of securing the shroud 6 at the body and device 4 also ensure no lodging of powder and ease of washing, as in Figs. 1 and 2.

[0021] The apparatus 1 includes an external lifting cylinder 19 for raising and lowering the container, there being air lines 20 for the respective cylinders. There may also be means to purge the container with an inert substance, for example nitrogen. There is also a vent connection 21 with a blanking cap or cover which is in place when purging is not taking place.

[0022] It will be understood that apparatus 1 embodying the invention and described herein with reference to the drawings provides a fully hygienic, and washable, apparatus for transferring powder from one site to another at a transfer station.

er for material, an outlet therefrom, a device for obturating and opening the outlet, actuating means for raising and lowering the device for obturating and opening the outlet, characterised by a member (6) for sealing the actuating means (5) from the interior of the container (2).

2. Material handling apparatus according to Claim 1, characterised by the sealing member (6) comprising a shroud member.
3. Material handling apparatus according to either preceding claim, characterised by the shroud member (6) comprising a collapsible tubular, convoluted member.
4. Material handling apparatus according to Claim 3, characterised by convolutions (7) being reinforced by means (10).
5. Material handling apparatus according to Claim 4, characterised by the member (6) comprising a tapered member.
6. Material handling apparatus according to Claim 5, characterised by the member (6) tapering from a body of the apparatus to the said device (4).
7. Material handling apparatus according to Claim 6, characterised by means (8, 9) to clamp the member (6) to the body (10) and device (4) at an angle of at least 90° to the vertical.
8. Material handling apparatus according to any preceding claim, characterised by means (18) to clean the interior of the container (2).
9. Material handling apparatus according to Claim 8, characterised by the cleaning means comprising water wash means.
10. Material handling apparatus according to any preceding claim, characterised by the actuating means (5) comprising a piston and cylinder arrangement, particularly a pneumatic piston and cylinder arrangement.

Claims

1. Material handling apparatus, comprising a contain-

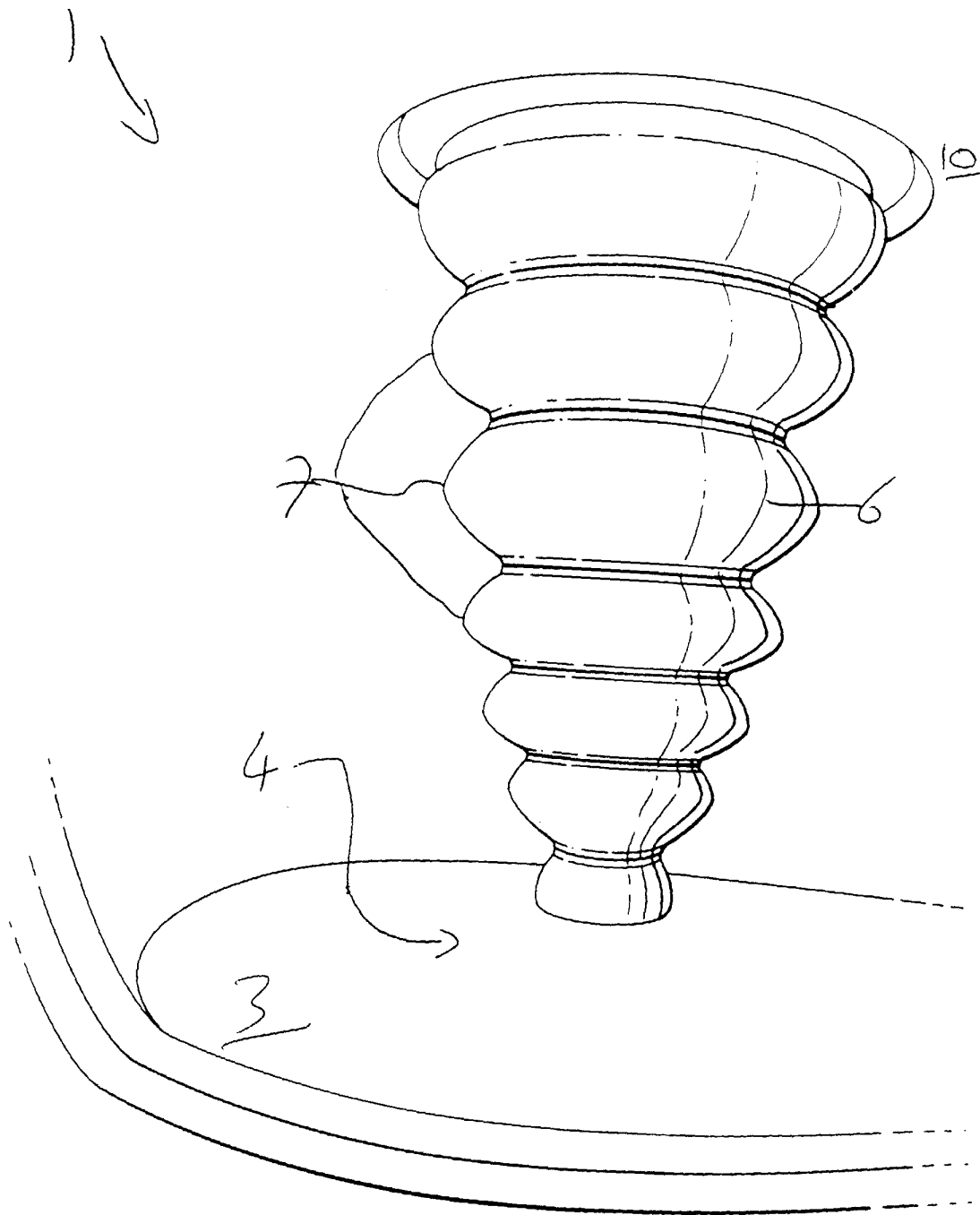
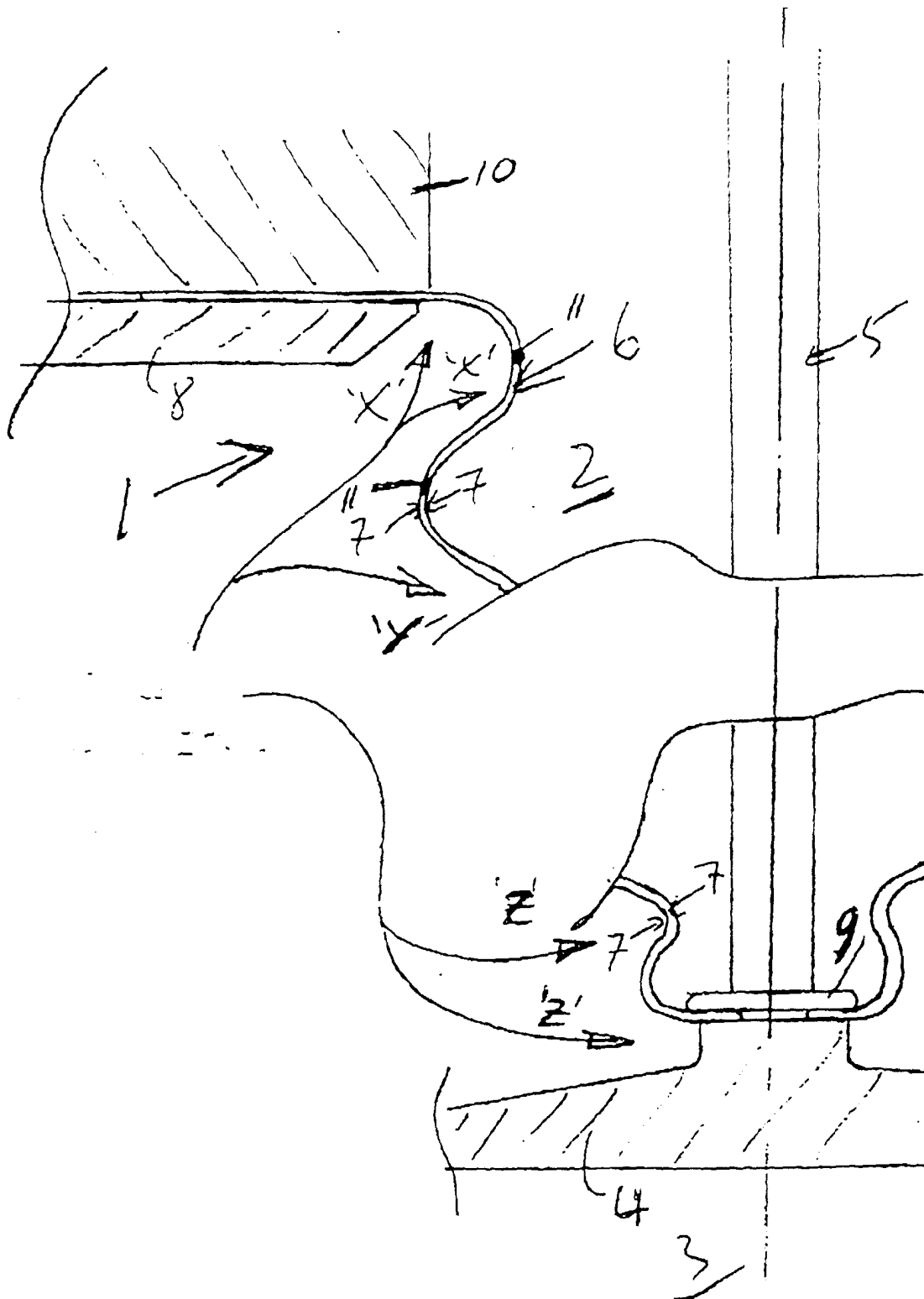
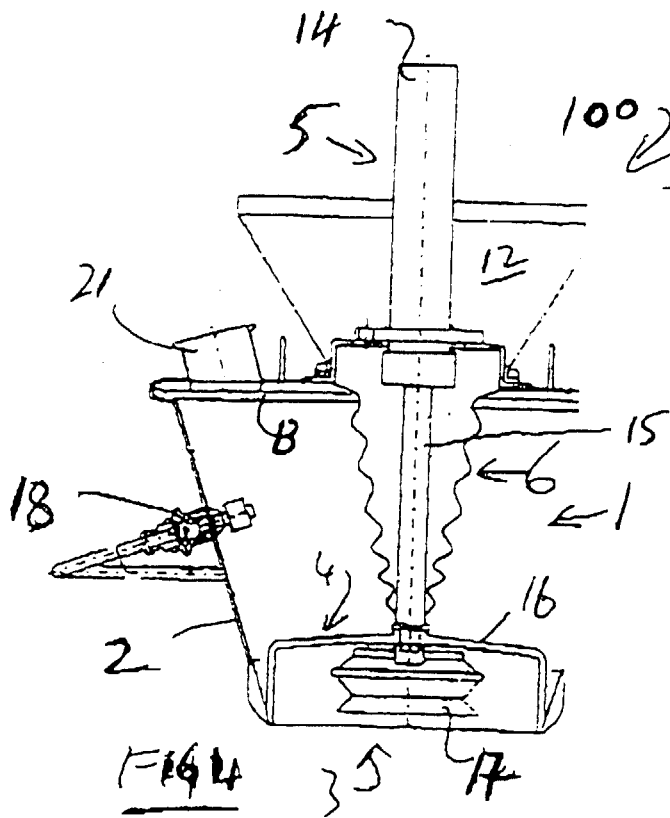
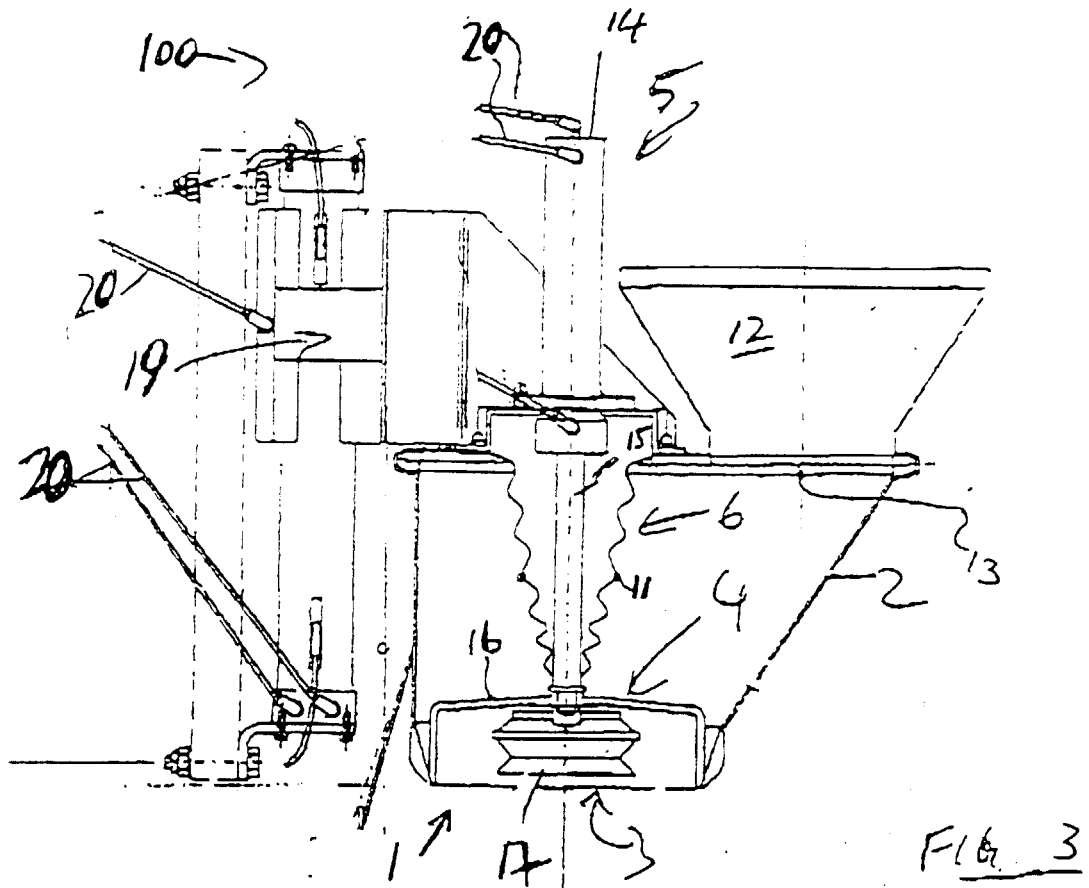


FIG. 1







European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 5223

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 September 1999	Examiner Vantomme, 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 99 30 5223

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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