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(54) **Grinding assembly for glass plates**

(57) In a grinding assembly (5) for grinding a glass sheet (B), a powered grinding wheel (14) is carried by a supporting frame (8) hinged to a fixed structure (6) to rotate to and from a work position, in which the grinding wheel (14) grinds the sheet (B), and the supporting frame

(8) is maintained in a reference position by a positioning device (18) having at least one spherical cap member (24) carried by the supporting frame (8), and at least two sloping reference surfaces (28) carried by the fixed structure (6) and contacting the spherical cap member (24) at at least two diametrically opposite points (P).

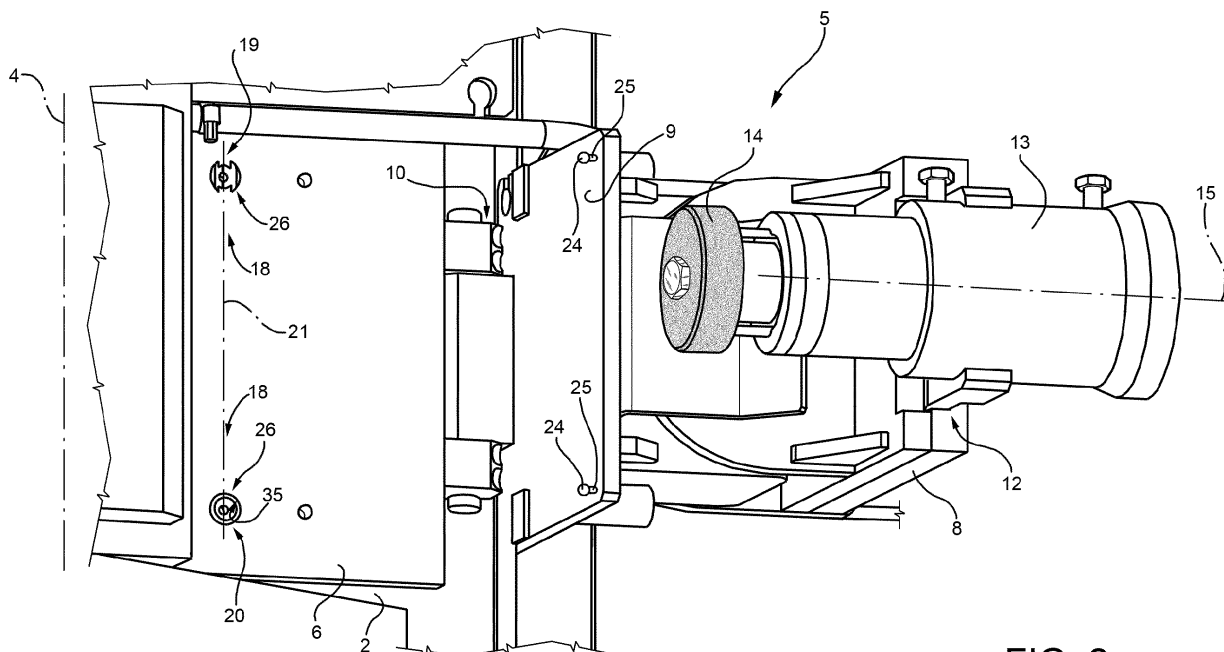


FIG. 2

Description

[0001] The present invention relates to a glass sheet grinding assembly.

[0002] The present invention may be used to advantage, though not exclusively, on two-sided grinding machines, to which the following description refers purely by way of example.

[0003] As is known, on a two-sided grinding machine, the work sheet is fed along a straight grinding path between two opposite grinding assembly units, each for grinding one side of the sheet.

[0004] Each unit comprises a number of independent grinding assemblies, each comprising a frame, and a powered grinding wheel fitted to the frame by a guide-and-slide adjusting assembly for adjusting the position of the grinding wheel in a direction perpendicular to the path. Each frame is connected to the machine structure to rotate about a horizontal axis parallel to the straight path, to rotate the grinding wheel between a work position, in which the grinding wheel extends downwards and rotates about a vertical axis perpendicular to the sheet, and a rest position, in which the grinding wheel axis of rotation is horizontal to change the grinding wheel quickly and easily.

[0005] When the grinding wheel is in the work position, the frame rests against a flat horizontal reference surface of the machine structure.

[0006] Though widely used, known positioning assemblies of the above type are not altogether satisfactory, mainly by failing to position the new grinding wheels quickly, accurately, and consistently, and so preventing use of automatic tool-change devices.

[0007] The reason for this lies mainly in machining dust and waste settling on above mentioned flat horizontal surface, between the latter and the frame at the first turn-over of the frame, when the frame is rotated about the horizontal axis, with the result that the actual position of the frame, and therefore of the grinding wheel, deviates increasingly from the theoretical reference position and produces unpredictable positioning errors of the frame and, consequently, of the grinding wheel, thus resulting in variations in the size and geometry of the machined sheets.

[0008] It is an object of the present invention to provide a glass sheet grinding assembly designed to solve the above problem cheaply and easily.

[0009] According to the present invention, there is provided a glass sheet grinding assembly comprising a fixed structure; a movable supporting frame; a powered grinding tool rotating about a respective axis and carried by said movable frame; hinge means interposed between said structure and said frame to allow the frame to rotate, about a horizontal hinge axis, to and from a work position in which the axis of said grinding tool is vertical; and positioning means for positioning said frame with respect to said fixed structure; **characterized in that** said positioning means comprise at least one positioning assembly

bly comprising at least one spherical cap member located on one of said supporting frame and said structure, and at least two reference surfaces for, and located on diametrically opposite sides of, said spherical cap member, and carried by the other of said supporting frame and said structure; said surfaces having respective straight generating lines converging with one another and each forming an angle of other than zero with a horizontal plane.

[0010] In the grinding assembly defined above, the generating lines preferably converge downwards, and the respective reference surfaces define a bottom through discharge opening.

[0011] Preferably, the reference surfaces are flat and contact said spherical cap member at two diametrically opposite points.

[0012] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which :

Figure 1 shows a partial view in perspective of a grinding machine featuring grinding assemblies, each in accordance with a preferred embodiment of the present invention;

Figure 2 shows a larger-scale topside view of one of the Figure 1 grinding assemblies;

Figure 3 shows a plan view of a detail in Figure 2;

Figure 4 shows a larger-scale section of a detail in Figure 1.

[0013] Number 1 in Figure 1 indicates as a whole a machine, e.g. a bevelling machine, for machining a glass sheet B. Machine 1 comprises a fixed structure 2; a conveyor 3 for feeding sheet B in a longitudinal direction 4; and, for each side of sheet B, a succession of grinding assemblies 5 (only some shown in Figure 1) arranged side by side in a direction parallel to the travelling direction 4 of sheet B, and each located over a respective flat horizontal mounting wall 6 fixed to structure 2 and forming part of assembly 5.

[0014] Each grinding assembly 5 comprises a movable supporting frame 8, in turn comprising a mounting plate 9, the edge of which, parallel to direction 4, is hinged to respective wall 6 by a hinge 10 to rotate, with respect to wall 6, about a horizontal hinge axis 11 parallel to direction 4. Each frame 8 is fitted, by means of a respective guide-and-slide assembly 12, with a known powered spindle 13 fitted with a grinding wheel 14 rotating about a respective axis 15.

[0015] Each frame 8 and respective grinding wheel 14 rotate, with respect to flat wall 6 and about axis 11, between a maintenance position shown in Figures 1 and 2, and a work position shown in Figure 1. When frame 8 is in the maintenance position, plate 9 extends vertically upwards from flat wall 6, and respective spindle 13 is positioned horizontally for easy changeover of grinding wheel 14. Conversely, when frame 8 is in the work position, plate 9 extends horizontally and is spaced vertically

apart from flat wall 6, and axis 15 is positioned vertically.

[0016] With reference to Figure 2, each assembly 5 comprises a positioning device 18 interposed between wall 6 and plate 9 to always set the frame, and therefore grinding wheel 14, to the same work position. In the example described, each device 18 comprises two positioning assemblies 19 and 20 spaced apart along an axis 21, which is parallel to axis 11 of hinge 10 and spaced transversely apart from axis 11 towards conveyor 3.

[0017] With reference to Figures 3 and 4, each assembly 19, 20 comprises a spherical cap member 24 forming the end of a rod 25 (Figure 4), which is parallel to axis 15, is connected integrally to and projects from relative plate 9, and is spaced apart from relative hinge 10; and a corresponding housing seat 26 formed in the respective flat wall 6.

[0018] As shown in Figures 3 and 4, each seat 26 is bounded by two opposite surfaces 28 located on opposite sides of spherical cap member 24, as shown in Figure 4, when spherical cap member 24 engages seat 26.

[0019] Each surface 28 comprises a flat bottom reference portion 29 connected to the top face of wall 6 by a flat top lead-in portion 30. Bottom reference portions 29 slope and converge downwards to form a bottom inlet opening 31 to a machining waste discharge channel 32 formed through wall 6, and have respective straight generating lines, each forming an angle A of other than zero with a horizontal plane (Figure 4).

[0020] Each spherical cap member 24 is sized so that, when it engages seat 26, it is detached from opening 31 and rests on bottom reference portions 29 at two diametrically opposite points P (Figure 4).

[0021] With reference to Figure 2, assembly 20 differs from assembly 19 by seat 26 being bounded by a conical surface 35 and communicating downwards with discharge channel 31. In this solution, spherical cap member 24 rests on conical surface 35 along a circle, or at least along two portions of a circle, if conical surface 35 has a non-circular directrix.

[0022] In a variation not shown, assembly 20 is replaced with one identical to and oriented the same way as assembly 19; and, in a further variation, assembly 20 is replaced with one identical to but turned 90° with respect to assembly 19 about an axis perpendicular to the wall, so each frame 8, and therefore each grinding wheel 14, are positioned with reference to four contact points located along two axes of a cross.

[0023] From the above explanation it appears that, in each assembly 5, the constructional features of the described positioning device 18 - in particular the point, or at least linear, contact areas between the contacting parts - provide for repositioning frame 8, and therefore respective spindle 13 and grinding wheel 14, extremely accurately - to within a hundredth of a millimetre - regardless of any external contaminants, such as glass dust, lubricating and cooling fluid, and/or sludge formed by mixing of the two. More specifically, plate 9 of each grinding assembly 5 is set to a raised position with respect to

wall 6 of the machine structure; and, using reference surfaces sloping with respect to, and formed in, wall 6, any dust, fluid or other contaminants are discharged automatically and continually into discharge channels 32, and so prevented from settling between and altering the relative positions of spherical cap members 24 and reference surfaces 28. Accurately positioning the frames to within a hundredth of a millimetre removes any obstacle to employing automatic tool-change systems and running the machine fully automatically.

[0024] Clearly, changes may be made to assemblies 5 as described herein. In particular, seats 26 may be formed in plates 9, and spherical cap members 24 carried by wall 6 of structure 2. In which case, one or more machining waste discharge openings may be formed around spherical cap members 24, and channels 32 eliminated.

[0025] Also, seats 26 may be formed in parts associated with walls 6, as opposed to being formed directly in walls 6.

[0026] And finally, any other machining tool may be substituted for grinding wheel 14.

Claims

1. A glass sheet grinding assembly comprising a fixed structure; a movable supporting frame; a powered grinding tool rotating about a respective axis and carried by said movable frame; hinge means interposed between said structure and said frame to allow the frame to rotate, about a horizontal hinge axis, to and from a work position in which the axis of said grinding tool is vertical; and positioning means for positioning said frame with respect to said fixed structure; **characterized in that** said positioning means comprise at least one positioning assembly comprising at least one spherical cap member located on one of said supporting frame and said structure, and at least two reference surfaces for, and located on diametrically opposite sides of, said spherical cap member, and located on the other of said supporting frame and said structure; said surfaces having respective straight generating lines converging with one another and each forming an angle of other than zero with a horizontal plane.
2. A grinding assembly as claimed in Claim 1, **characterized in that** said generating lines converge downwards, and the respective reference surfaces define a bottom through discharge opening.
3. A grinding assembly as claimed in Claim 1 or 2, **characterized in that** said surfaces are flat and contact said spherical cap member at two diametrically opposite points.
4. A grinding assembly as claimed in Claim 1 or 2, **characterized in that** said surfaces form part of a conical

surface, and contact said spherical cap member at least along respective portions of a circle.

5. A grinding assembly as claimed in any one of the foregoing Claims, **characterized by** comprising at least one further said positioning assembly; said positioning assemblies being located along a direction parallel to said hinge axis. 5
6. A grinding assembly as claimed in Claim 5, **characterized in that** said further positioning assembly is oriented the same way as or turned 90° with respect to said positioning assembly; said reference surfaces contacting the respective said spherical cap members at four points located along two axes of a cross. 10 15
7. A grinding assembly as claimed in any one of the foregoing Claims, **characterized in that** said reference surfaces at least partly define a seat formed in said structure. 20
8. A grinding assembly as claimed in any one of the foregoing Claims, **characterized in that** said fixed structure and said movable frame comprise a first and a second substantially flat wall respectively; said first and second wall being positioned facing and spaced apart vertically when said movable frame is in said work position; and said reference surfaces being carried by said first wall, and said spherical cap member projecting from said second wall. 25 30

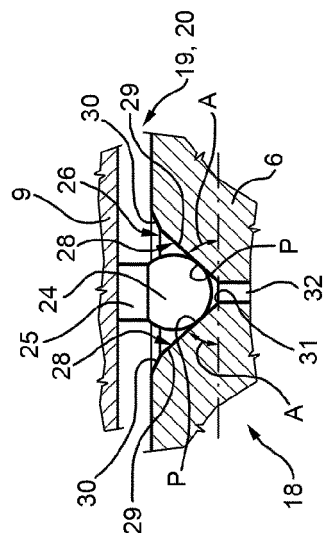
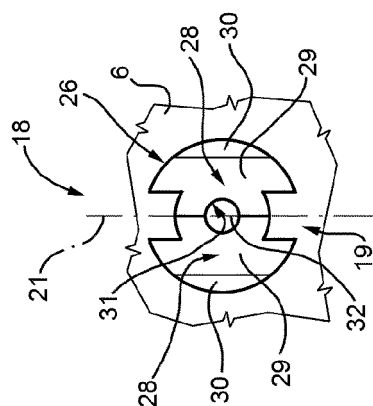
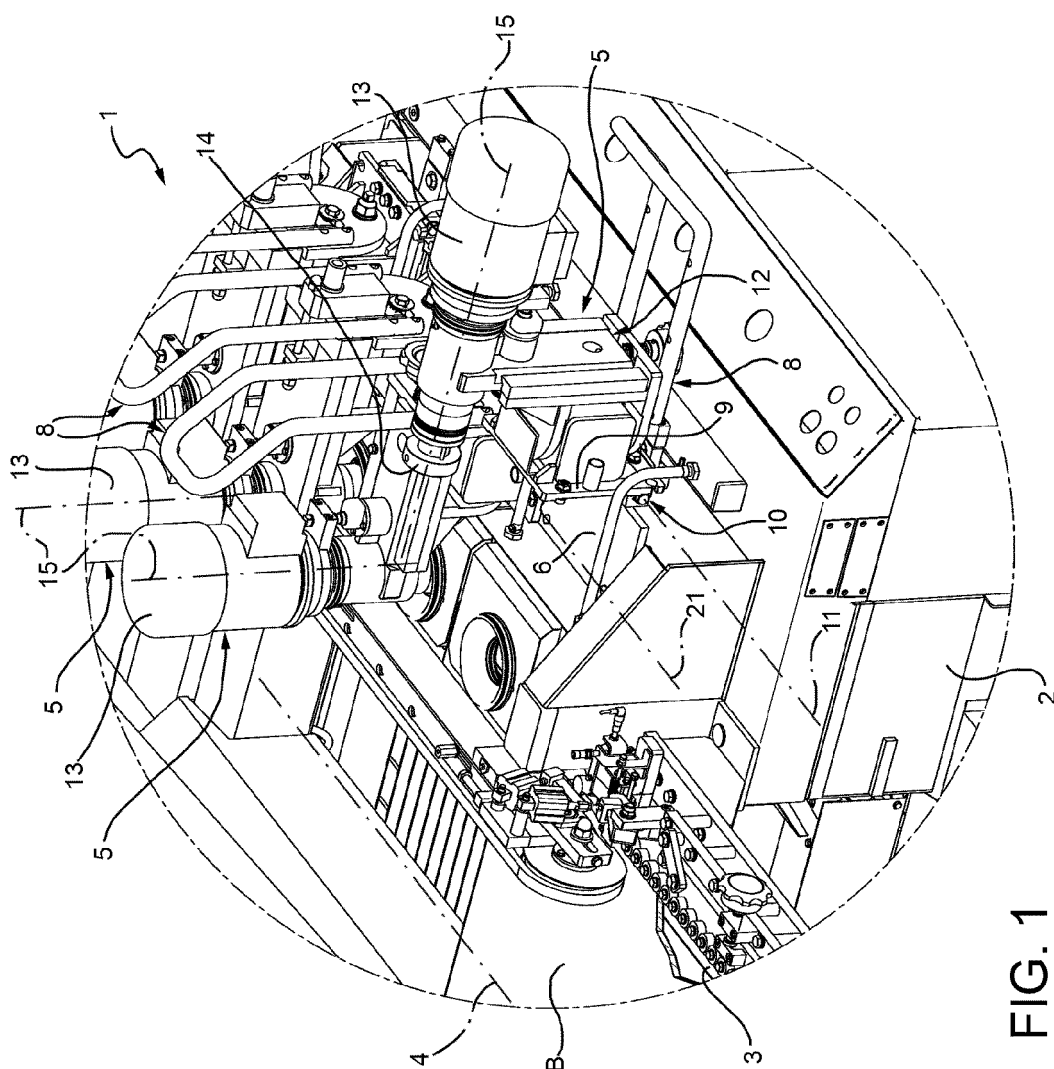
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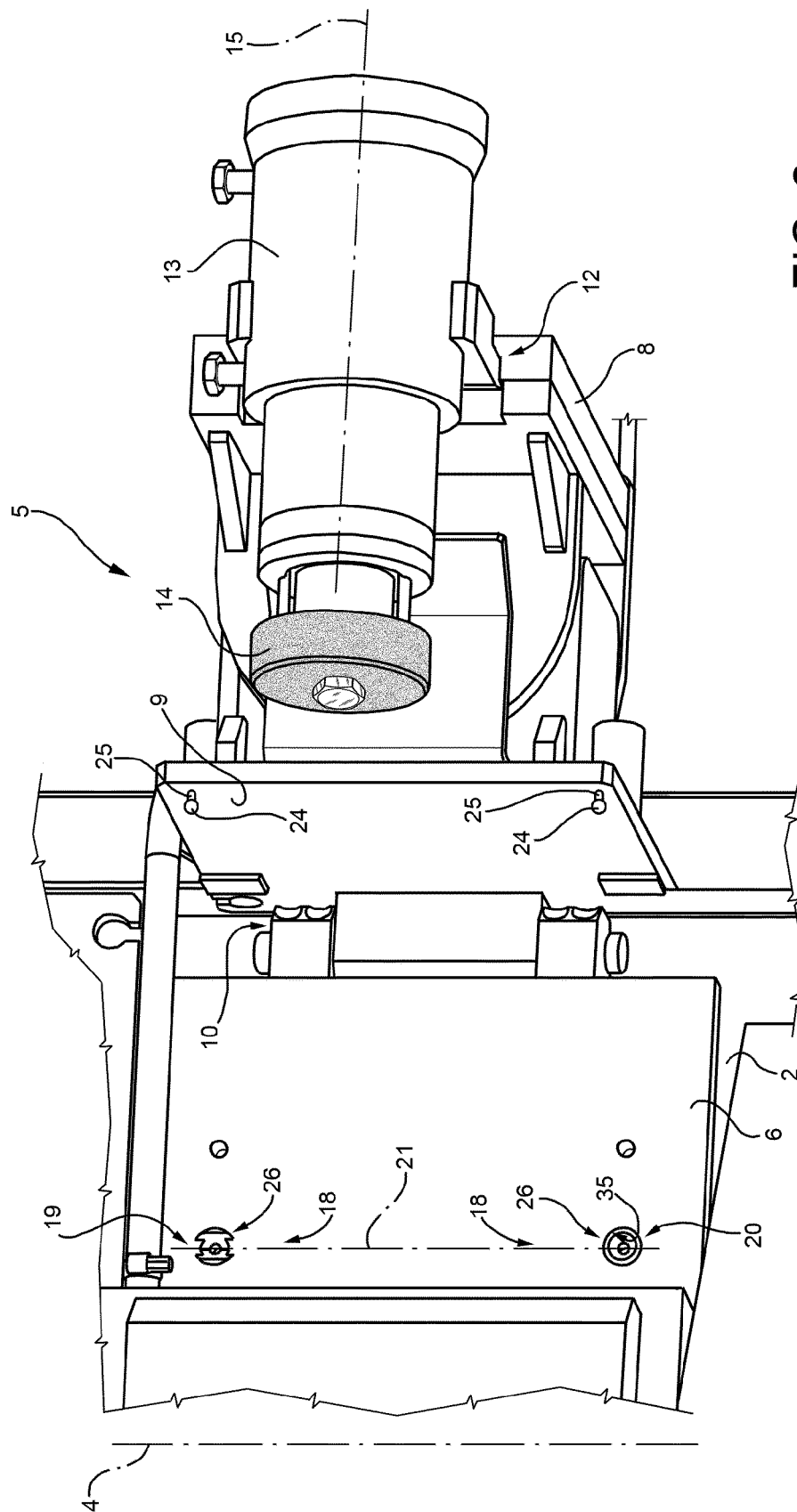


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 12 17 1884

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 2 246 151 A1 (BOTTERO SPA [IT]) 3 November 2010 (2010-11-03) * figure 1 * * paragraphs [0001], [0017] * -----	1-8	INV. B24B7/24 B24B41/02 B24B27/00 B23Q3/18
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Y	US 4 390 172 A (GOTMAN ALEXANDER) 28 June 1983 (1983-06-28) * abstract; figures 1,3,4,5,13,16 * -----	1-8	
A	US 3 722 360 A (BLAKEY A ET AL) 27 March 1973 (1973-03-27) * figures 9,11 * * column 11, line 61 - line 65 * * column 12, line 30 - line 34 * -----	2	
A	EP 0 468 383 A2 (HELLER GEB GMBH MASCHF [DE]) 29 January 1992 (1992-01-29) * figure 1 * * column 2, line 55 - column 3, line 6 * -----	8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) B24B B23Q
Place of search Munich		Date of completion of the search 31 August 2012	Examiner Endres, Mirja
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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