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(11) **EP 0 968 920 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.01.2000 Bulletin 2000/01

(51) Int. Cl.⁷: **B65B 25/00, B65B 55/16**

(21) Application number: **98117242.2**

(22) Date of filing: **11.09.1998**

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

(30) Priority: **01.07.1998 IT MI981511**

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(54) **Method and plant for the preparation of packages containing precooked fresh food**

(57) The description relates to a continuous and closed-cycle method and the associated plant for the preparation of precooked fresh food, comprising:

- preparation of a packaging containing the pre-cooked, cut and weighed product;

- subsequent pasteurization, in a microwave oven, of the product already arranged inside the packaging;
- cooling in a stream of sterile air which has undergone ultrafiltration beforehand;
- subsequent sealing of the packaging.

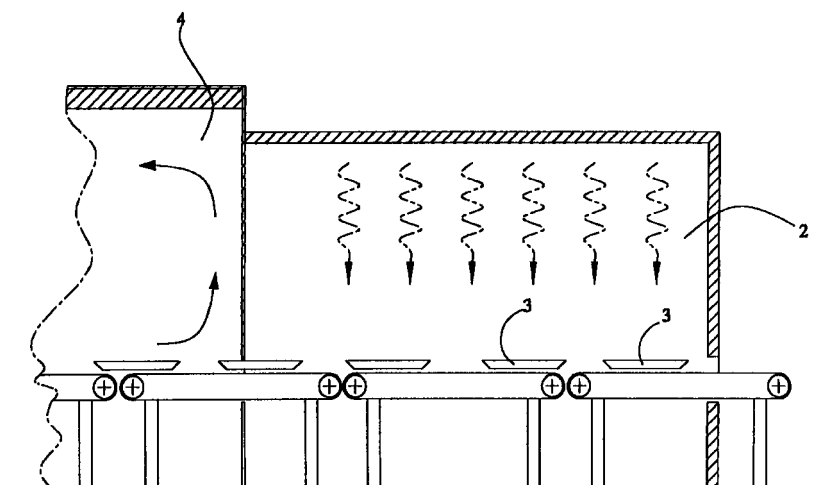


Fig. 2

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Description

[0001] The present invention relates to a method and the associated plant for the preparation of precooked fresh food, comprising:

- preparation of a packaging containing the cut and weighed product;
- subsequent cooking, in a microwave oven, of the product already arranged inside the packaging;
- cooling in a stream of air which has undergone ultrafiltration beforehand;
- subsequent sealing of the packaging.

[0002] The method according to the invention increases drastically the shelf life of the product, allowing precooked fresh food to be prepared, such that its appearance and organoleptic properties remain more or less unchanged for a period of at least three weeks.

[0003] The invention relates to the sector for the production and distribution of precooked food products and is intended to solve the problem of conserving products in an optimum manner and for a sufficiently long period of time, such that this kind of product may be suitable for large-scale distribution and may be produced in a plant also far from the sales outlets.

[0004] At present there exists a considerable demand for precooked food which is sold in different types of packaging and produced using different packaging and conservation techniques.

[0005] In particular the following is currently available on the market: packaged frozen food, food packaged in brine or in oil for long-term conservation in tins or glass containers, vacuum-pasteurized products sold in plastic packaging, and finally precooked fresh products packaged in an aluminium or plastic tray, in a modified atmosphere where applicable, closed with a usually transparent cover.

[0006] The invention relates in particular to this latter type of product which is often preferred by the user because, being fresh, it has a more pleasant taste as well as a more inviting appearance.

[0007] Alongside these advantages, however, fresh precooked products have the drawback of a limited shelf life which, in the cold chain, varies usually from 3 to a maximum of 6-7 days.

[0008] In the manufacturing industries there exists the need for a method which allows the production of fresh precooked food which has a greater duration, preferably of at least 2-3 weeks, so as to make these products suitable for large-scale distribution and also allow the production thereof in plants which are situated far from the consumer sites, for example in plants constructed directly in the production zones with the possibility therefore of processing the product which has just been harvested and providing a food with improved organoleptic properties.

[0009] Another problem associated with this type of production consists in the need to ensure that the appearance of the product remains unchanged, with bright colours, without the formation of condensation on the walls of the packaging and without the leakage of so-called "vegetable liquid" which has a negative effect on the appearance of the product.

[0010] For this purpose the Applicant has carried out numerous experiments in order to check the possibility of producing precooked food obtained from fresh raw material, which lasts over time without the use of additives and preservatives.

[0011] The studies carried out have led to the definition of the method according to the invention which envisages subjecting the products to a heat treatment consisting of cooking and pasteurization after said products have been prepared and placed in the packaging, and then sealing the container in a controlled environment with a modified atmosphere.

[0012] The product is then conveyed into the cold chain, ensuring conservation under optimum conditions for more than three weeks, at the normal storage temperature of between 0 and 6°C.

[0013] The present invention will now be described in detail, by way of a non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 shows schematically the plan view of a possible embodiment of a plant for the preparation of food precooked using the method according to the present invention;
- Figure 2 shows a schematic cross-section through the plant according to Figure 1.

[0014] The preparation method according to the invention comprises the following steps:

- preparation, cutting and introduction of the food into the packaging consisting, for example, of a tray made of barrier polyethylene;
- a cycle involving cooking and pasteurization, in a microwave oven, of the product contained in the tray, at a temperature of between 85-90° and for a period of time varying from 2 to 10 minutes, depending on the weight, the form and the type of food;

- subsequent rapid cooling in air which has undergone ultrafiltration beforehand, until the products reach a temperature of about 5°;
- sealing of the container still in a protected environment.

- 5 **[0015]** A possible lay-out of the plant for implementing the method is illustrated in Figures 1 and 2.
- [0016]** The plant comprises a preparation station, indicated by 1, in which the food is cleaned, cut and placed in a packaging which may consist, for example, of a tray made of barrier polyethylene, i.e. lined internally with a layer of impermeable material which is suitable for contact with food.
- [0017]** The packages then pass into an oven 2, for example a tunnel oven, for the cooking and pasteurization step.
- 10 **[0018]** The product packages, indicated by 3, which are placed on the belt, advance through the tunnel at a variable speed depending on the predefined duration of cooking, cooking which is performed by means of microwave equipment.
- [0019]** The cooking time varies, as mentioned, depending on the type of product and the temperature is preferably between 85 and 90°C.
- 15 **[0020]** Downstream of the oven 2, the plant comprises a cooling tunnel, indicated by 4, in which a stream of air, which has previously undergone ultrafiltration, is passed so as to eliminate entirely the bacterial content.
- [0021]** In the figures, the external structure of the tunnel is shown in cross-section.
- [0022]** Preferably cooling is performed in two stages: the first with a duration of between about 10 and 15 minutes, during which the products are cooled down to a temperature of about 40°C and a second stage during which the products are brought to a final temperature of about +5° in a time period of about 15 minutes.
- 20 **[0023]** In particular, the cooling tunnel preferably comprises two consecutive sections, in each of which one of the two cooling stages is performed: in the first section cooling is performed by means of the circulation of previously filtered air which is at room temperature, while in the second section cooled air is used.
- [0024]** The fact of performing cooling in two stages, during one of which air at room temperature is used, results in savings in energy and allows a limitation in the size of the air cooling plants, which need only process the quantity of air used in the second tunnel section.
- 25 **[0025]** The tunnel, moreover, may advantageously have a U shape, in plan view, which allows the dimensions of the assembly to be limited; in this case, the two cooling stages may be performed respectively in the two sections of the U.
- [0026]** Downstream of the cooling tunnel, the packages are fed, by means of a synchronizing device of the known type 5, to a heat-welding machine, denoted in its entirety by 6, which operates in a protected atmosphere and, without the presence of persons, seals the packaging, applying a film for closing the container.
- 30 **[0027]** The product is now ready to be labelled by means of a labelling machine 7 of the known type and stored in a refrigerating room at a temperature of 0-5°, before being despatched to the retail zones.
- [0028]** All the apparatus forming the plant is arranged in series so that the packages containing the product pass, uninterrupted, from one device to the other, while always remaining in a protected atmosphere.
- 35 **[0029]** In this way it is possible to eliminate or in any case reduce considerably the bacterial content during the cooking and pasteurization step, thus avoiding any possible contamination of the product during the next steps.
- [0030]** The various apparatus which makes up the plant is per se of the known type and therefore a detailed description is not required.
- 40 **[0031]** Numerous experiments were carried out and the results then compared with those obtained using conventional production and packaging techniques.

Example

- 45 **[0032]** As a characteristic example, reference is made to the production of grilled aubergines, since this product on its own poses all the problems associated with this system, problems which have been solved with the method according to the invention.
- [0033]** Aubergines were sliced, cooking them externally on a grill, and the externally grilled slices were then placed in a packaging, in quantities of about 200 grammes for each product tray.
- 50 **[0034]** The packages were then introduced into the baking oven, adjusting the feeding speed of the conveyor belt so that the products remained in the oven for 6 minutes at a temperature of about 90°.
- [0035]** From the oven the packages passed directly into the cooling tunnel, where a stream of air at a temperature of about 20°C, which had undergone ultrafiltration beforehand, was circulated.
- [0036]** Cooling is performed in two consecutive stages, bringing the products first to a temperature of 40°C by means of circulation of air at room temperature and then bringing them to the final temperature of +5° by means of circulation of suitably cooled air.
- 55 **[0037]** The cooling times were 12 and 15 minutes, respectively.
- [0038]** At the end, the packages were sealed and stored at a temperature of 6°, together with packages of similar

products prepared, however, using known technologies.

[0039] The packages were tested for verification of the bacterial content and the results are shown in the following table.

Product	Days from date of production	Bacterial content	Conservation temperature °C
Aubergines grilled using traditional method	10	11,000	6
Aubergines grilled using method according to invention	26	50	6

[0040] As can be noted, the aubergines prepared using traditional methods had a bacterial content of 11,000 units already 10 days from the date of production, while the aubergines prepared using the method according to the invention had a bacterial content of 50 units at 26 days from production.

[0041] In the light of the experimental figures and the results of the tests carried out it is thus possible to state that the method according to the invention ensures safeguarding of the organoleptic properties of the products for a period of time of at least three weeks, thus avoiding situations of biological risk associated with the occurrence of anaerobic metabolism phenomena.

[0042] Moreover the products retain an optimum appearance since the method according to the invention avoids the formation of vegetable water.

[0043] The method is applicable to both food of plant or animal origin and to packages which conserve both these types of food.

[0044] An expert may moreover undertake numerous modifications and variations which, however, must be regarded as all falling within the scope of the present invention.

Claims

1. Method for the preparation of fresh precooked food, characterized in that it comprises the following steps:

- preparation of the products already cut and weighed, inside a container intended to form the final packaging of the product;
- subsequent cooking and pasteurization of the product already inserted inside the packaging;
- subsequent cooling in a sterile environment;
- sealing of the packaging.

2. Method according to Claim 1, characterized in that the cooking and pasteurization step is performed by means of microwave equipment.

3. Method according to the preceding claims, characterized in that cooling is performed by means of circulation of air which has undergone ultrafiltration beforehand.

4. Method according to Claim 3, characterized in that cooling takes place in two stages.

5. Method according to Claim 4, characterized in that during the first cooling stage air at room temperature is used, while during the second stage cooled air is used.

6. Method according to any one of the preceding claims, characterized in that the cooking time varies from 2 to 10 minutes, at a temperature of between 85 and 90°.

7. Method according to the preceding claims, characterized in that the cooling step involves a first stage during which the product is cooled to a temperature of between 40 and 45° and a second stage during which the product is brought to the final temperature of about +5°.

8. Plant for the preparation of fresh precooked food using the method according to any one of the preceding claims,

characterized in that comprises, arranged in line:

- a microwave oven;
- a cooling tunnel in which air which has undergone ultrafiltration beforehand is circulated;
- means designed to seal the packaging, by applying a closing film in a modified atmosphere;

there also being provided means designed to convey the packages containing the food along said plant, transferring them from the oven to the equipment downstream without contact with the external environment, there also being provided means suitable for adjusting the speed of feeding of said conveyor means so as to vary the time during which the products remain in the various equipment which makes up the plant.

9. Plant for the preparation of fresh precooked food according to Claim 8, characterized in that the cooling tunnel comprises two sections inside which air at room temperature and cooled air are circulated, respectively.

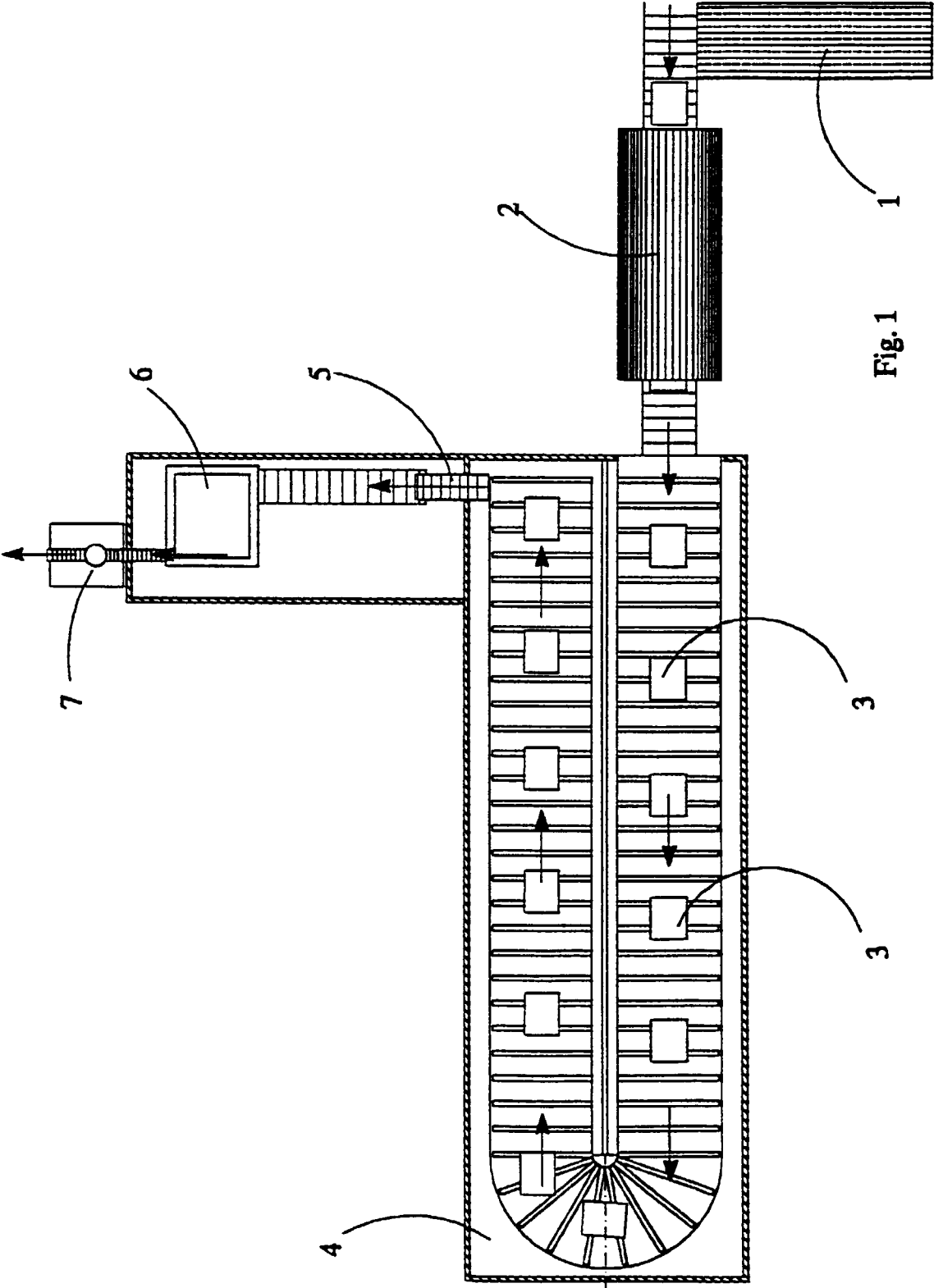


Fig. 1

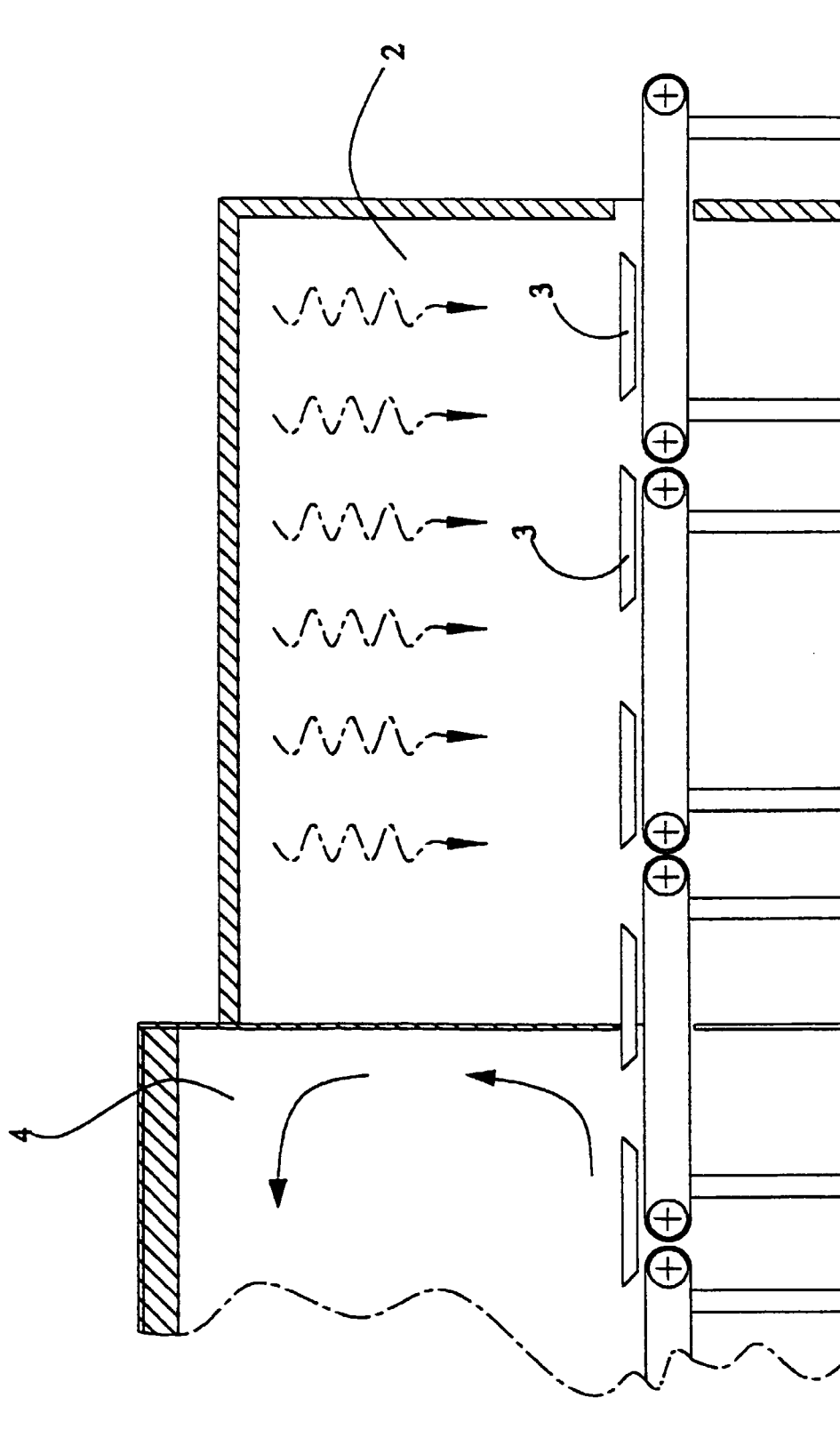


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 7242

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Y	* column 7, line 28 - column 10, line 17; figures *	6	
X	FR 2 690 413 A (ALTEC SRL) 29 October 1993 * page 2, line 20 - page 3, line 10; figures *	1	
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Y	EP 0 395 317 A (APV CORP LTD) 31 October 1990 * column 3, line 14 - column 6, line 49 *	6	
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A	DE 38 30 867 C (H. BERSTORFF) 18 January 1990		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
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Place of search	Date of completion of the search	Examiner	
THE HAGUE	5 July 1999	Jagusiak, A	
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 98 11 7242

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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