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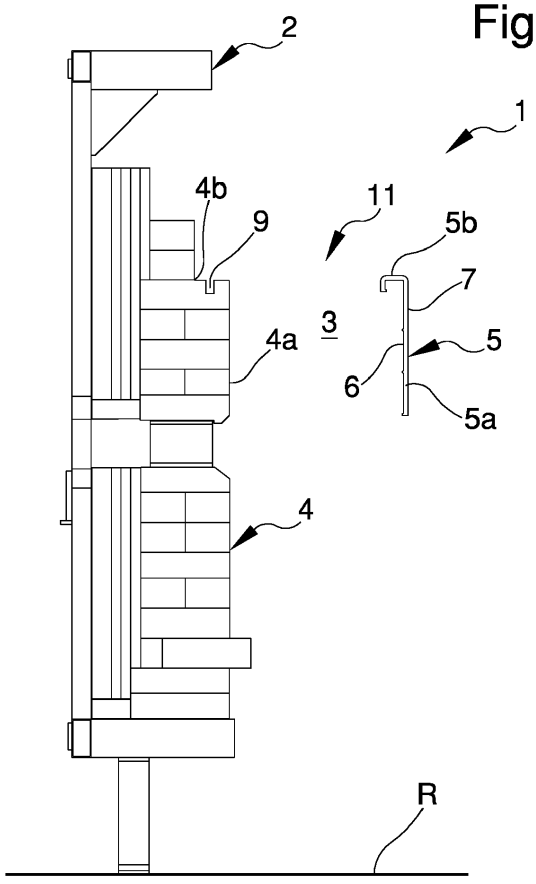
(54) **THERMAL MACHINE FOR CERAMIC ARTICLES**

(57) The thermal machine (1) for ceramic articles, comprising a bearing structure (2) positionable in support onto a reference surface and defining at least one channel (3) for the passage of the ceramic articles, heating means for heating the channel (3) associated with the bearing structure (2), a coating (11) provided with at least one inner coating wall (4) associated with the bearing structure (2) and made of brick material, which defines at least one containment surface (4a) delimiting laterally at least one portion of the channel (3) along its longitudinal extension and at least one upper surface (4b) arranged transversely to the containment surface (4a), wherein the coating (11) comprises at least one covering element (5) of at least one portion of the containment surface (4a) associated in a removable manner with the coating wall (4).

Fig.3



EP 3 572 750 A1

Description

[0001] The present invention relates to a thermal machine for ceramic articles.

[0002] In the ceramic sector, the use is well known of thermal machines, such as kilns and dryers for firing and drying ceramic articles, respectively.

[0003] In particular, the ceramic processes require that the articles, once pressed and decorated, go inside the thermal machines to reduce the percentage of water present inside them to obtain the finished product.

[0004] The thermal machines known today have a bearing structure, which can be positioned on the ground, which defines at least one channel through which the ceramic articles transit, and are provided with heating means of the channel itself.

[0005] In particular, these thermal machines comprise an inner coating wall, associated with the bearing structure, which laterally delimits the relative channel and which is made of brick material. The coating wall has the purpose of thermally insulating the channel through which the ceramic articles transit from the external environment.

[0006] The high temperatures inside the thermal machines, generally ranging from 100°C to 300°C in the dryers and from 1000°C to 1500°C in the kilns, cause the establishment of different chemical reactions as a result of which the glazes release gases into the environment.

[0007] Depending on the type of glaze applied to the ceramic article, the relevant gases released may be chemically aggressive and ruin the coating wall, damaging the same. This phenomenon is particularly evident in the case of inks used for decorating articles with digital machines.

[0008] To avoid this problem it is possible to use special refractory plasters to be applied on the external surface of the coating wall.

[0009] These plasters not only have a limited protective effect over time, but they are also of complex application, as well as high cost, both for the cost of the raw material and for the need to turn to companies specializing in their application. The main aim of the present invention is to devise a thermal machine for ceramic articles that allows preserving the integrity of the relative coating wall by means of a practical, simple to apply and low cost solution.

[0010] Within this aim, one object of the present invention is to simplify maintenance works on the coating walls with respect to the techniques used today.

[0011] Another object of the present invention is to devise a solution for the protection of the coating wall that is flexible to use and therefore that does not exclude the combined use of other solutions known today.

[0012] Another object of the present invention is to devise a thermal machine for ceramic articles that allows overcoming the mentioned drawbacks of the prior art in the context of a simple, rational, easy, effective to use as well as low cost solution.

[0013] The aforementioned objects are achieved by the present thermal machine for ceramic articles.

[0014] Other characteristics and advantages of the present invention will be more evident from the description of a preferred, but not exclusive, embodiment of a thermal machine for ceramic articles, illustrated by way of an indicative, yet non-limiting example, in the attached tables of drawings in which:

Figure 1 is a sectional view, along a longitudinal plane, of a portion of a thermal machine according to the invention;

Figure 2 is a cross-sectional view, along a transverse plane, of the portion of the thermal machine shown in Figure 1;

Figure 3 is an exploded view of Figure 2;

Figure 4 is an axonometric view of the covering element in Figure 2.

[0015] With particular reference to these illustrations, reference numeral 1 globally indicates a thermal machine for ceramic articles, for example of the type of a dryer or a kiln.

[0016] The thermal machine 1 comprises a bearing structure 2 positionable in support onto a reference surface S, e.g. on the ground, and defining at least one channel 3 for the passage of the ceramic articles that extends along a direction of forward movement of the ceramic articles themselves.

[0017] The illustrations show only one part of the thermal machine 1 and therefore also of the bearing structure 2 and of the channel 3, which are substantially symmetrical with respect to a longitudinal axis.

[0018] As the technician in the sector knows, inside the channel 3 there is a support plane (not shown in the illustrations) for the ceramic articles, movable along the direction of forward movement. The support plane is generally made up of a number of motorized rollers arranged transversely to the direction of forward movement.

[0019] The thermal machine 1 then comprises heating means for heating the channel 3 associated with the bearing structure 2. The heating means, not shown in the illustrations, are e.g. of the type of a plurality of burners facing the channel 3. The thermal machine 1 also comprises a coating, identified in the figures with reference number 11, comprising at least one inner coating wall 4 associated with the bearing structure 2 and made of brick material, generally of the type of bricks. The coating wall 4 defines at least one containment surface 4a delimiting laterally at least one portion of the channel 3 along its longitudinal extension and at least one upper surface 4b arranged transversely to the containment surface 4a.

[0020] The containment surface 4a extends substantially vertical (unless machining or installation tolerances) and delimits at least one section laterally (the section with the highest operating temperature) of the channel 3.

[0021] According to the invention, the coating 11 comprises at least one covering element 5 of at least one

portion of the containment surface 4a associated in a removable manner with the coating wall 4.

[0022] In the embodiment shown in the illustrations, the covering element 5 is associated with the upper portion only of the containment surface 4a, i.e. that placed on top of the support plane of the ceramic articles.

[0023] Advantageously, the covering element 5 is made of a material resistant to temperatures ranging from 400°C to 1300°C and has a porosity ranging between 15% and 25%. These characteristics make the covering element 5 resistant to the gases that are released during the passage of the ceramic articles.

[0024] The covering element 5 is made, e.g., of refractory material.

[0025] Preferably, the covering element 5 is made, e.g., of Cordierite.

[0026] In the preferred embodiment shown in the illustrations, the covering element 5 has a substantially sheet-like body 5a (unless machining tolerances), meaning by this definition that the dimensions of length and width are greater than its thickness. The sheet-like body 5a defines at least one coupling surface 6, arranged, in use (i.e. with the covering element 5 applied to the coating wall 4), in support onto the containment surface 4a, and at least one external surface 7 facing the channel 3.

[0027] Advantageously, the sheet-like body 5a has one or more projections 8 overhanging from the coupling surface 6.

[0028] In the embodiment shown in Figure 4, the sheet-like body 5a has a plurality of projections 8, spaced apart from each other, to define a labyrinthine path for the gases that can flow between the covering element 5 and the containment surface 4a.

[0029] The projections 8 extend, in use, parallel to the longitudinal extension of the channel 3, and are arranged at different heights, i.e. they are spaced apart from each other vertically.

[0030] Preferably, the covering element 5 comprises removable anchoring means 5b to the coating wall 4. The anchoring means 5b are therefore adapted to allow the application and removal of the covering element itself to the coating wall 4. More specifically, the anchoring means 5b are, e.g., of the type of a substantially hook-shaped element, associated with the sheet-like body 5a and defining an extremity portion of the relative covering element 5. The coating wall 4 has in turn a seat 9 for housing the end section of the hook-shaped element 5b.

[0031] Appropriately, the seat 9 is defined on the upper surface 4b of the coating wall 4.

[0032] The covering element 5 also has at least one through opening 10, e.g. defined at the relevant sheet-like body 5a. The opening 10 can be used, depending on the area of the thermal machine 1 in which it is positioned, to allow the passage of a relevant burner or the visual access to the channel 3.

[0033] In a further embodiment, not shown in the illustrations, the covering element 5 also has an end section, arranged on the opposite side of the anchoring means 5b with respect to the sheet-like body 5a, which is oriented transversely with respect to the coupling surface 6, so as to follow the profile of the containment surface 4a.

[0034] Appropriately, a plurality of covering elements 5 are arranged side by side along the longitudinal extension of the channel 3.

[0035] The operation of the present invention is as follows.

[0036] During the preparation of the coating wall 4, the seat 9 is created on the portion that will define the upper surface 4b.

[0037] The covering elements 5 are then attached to the coating wall 4 by inserting the end section of the hook-shaped element 5b into the seat 9.

[0038] The covering elements 5 are thus arranged side by side, as shown in Figure 1, so that the relevant openings 10 are arranged at the burners or at the relative slots defined on the coating wall 4.

[0039] During the operation of the thermal machine 1, the gases that are released inside the channel 3 will not therefore be in direct contact with the containment surface 4a, but with the external surface 7 of the covering element 5, thus preserving the integrity of the coating wall 4.

[0040] The projections 8 defined on the coupling surface 5a prevent the gases that may be inserted between the covering elements 5 and the coating wall 4 from ruining the upper portions of the relevant containment surface 4a, thus defining an additional barrier to their passage.

[0041] If maintenance operations are to be carried out, such as replacing one or more covering elements 5, simply remove the covering elements 5 to be replaced by taking the hook-shaped elements 5b off their seats 9 and apply other covering elements 5.

[0042] It has in practice been ascertained that the described invention achieves the intended objects and, in particular, the fact is underlined that the thermal machine the present invention relates to, allows preserving the integrity of the coating wall from the chemical aggression of the gases that develop as a result of the passage of the ceramic articles.

[0043] In particular, the application of a covering element separated from the coating wall allows the latter to be effectively protected and at the same time it is easy to implement, since the coating wall and the covering element are made independently of each other and with different materials, and practical to implement, since the positioning and removal of the covering element does not require the use of additional means or equipment.

Claims

1. Thermal machine (1) for ceramic articles, comprising a bearing structure (2) positionable in support onto a reference surface and defining at least one channel (3) for the passage of the ceramic articles, heating

means for heating said channel (3) associated with said bearing structure (2), a coating (11) provided with at least one inner coating wall (4) associated with said bearing structure (2) and made of brick material, which defines at least one containment surface (4a) delimiting laterally at least one portion of said channel (3) along its longitudinal extension and at least one upper surface (4b) arranged transversely to said containment surface (4a),
characterized by the fact that said coating (11) comprises at least one covering element (5) of at least one portion of said containment surface (4a) associated in a removable manner with said coating wall (4).

2. Thermal machine (1) according to claim 1, **characterized by** the fact that said covering element (5) is made of a material resistant to temperatures ranging between 400°C and 1300°C and has a porosity ranging between 15% and 25%.

3. Thermal machine (1) according to claim 2, **characterized by** the fact that said covering element (5) is made of a refractory material.

4. Thermal machine (1) according to claim 2 or 3, **characterized by** the fact that said covering element (5) is made of Cordierite.

5. Thermal machine (1) according to one or more of the preceding claims, **characterized by** the fact that said covering element (5) has a substantially sheet-like body (5a) which defines at least one coupling surface (6) arranged, in use, in support onto said containment surface (4a), and at least one external surface (7) facing said channel (3).

6. Thermal machine (1) according to claim 5, **characterized by** the fact that said sheet-like body (5a) has at least one projection (8) defined at said coupling surface (6).

7. Thermal machine (1) according to claim 6, **characterized by** the fact that said projection (8) extends, in use, substantially parallel to the longitudinal extension of said channel (3).

8. Thermal machine (1) according to claim 6 or 7, **characterized by** the fact that it comprises a plurality of said projections (8) spaced apart from each other.

9. Thermal machine (1) according to one or more of the preceding claims, **characterized by** the fact that said covering element (5) comprises removable anchoring means (5b) to said coating wall (4).

10. Thermal machine (1) according to claim 9, **characterized by** the fact that said anchoring means (5b) comprise at least one substantially hook-shaped element and associated with said sheet-like body (5a), and by the fact that said coating wall (4) comprises at least one seat (9) for housing the end section of said hook-shaped element (5b).

11. Thermal machine (1) according to claim 10, **characterized by** the fact that said housing seat (9) is defined on said upper surface (4b).

12. Thermal machine (1) according to claim 10 or 11, **characterized by** the fact that said housing seat (9) extends substantially parallel to the longitudinal extension of said channel (3).

13. Thermal machine (1) according to one or more of claims from 5 to 12, **characterized by** the fact that said covering element (5) comprises an end section, arranged on the opposite side of said anchoring means (5b) with respect to said sheet-like body (5a), oriented transversely with respect to said coupling surface (6).

14. Coating (11) for thermal machines (1) for ceramic articles of the type comprising a bearing structure (2) positionable in support onto a reference surface and defining at least one channel (3) which extends along a direction of forward movement and intended, in use, to be crossed by the ceramic articles, comprising:

at least one coating wall (4) associable with said bearing structure (2), made of brick material, which defines at least one containment surface (4a) delimiting laterally at least one portion of said channel (3) along its longitudinal extension and at least one upper surface (4b) arranged transversely to said containment surface (4a);
characterized by the fact that it comprises at least one covering element (5) of at least one portion of said containment surface (4a) associated in a removable manner with said coating wall (4).

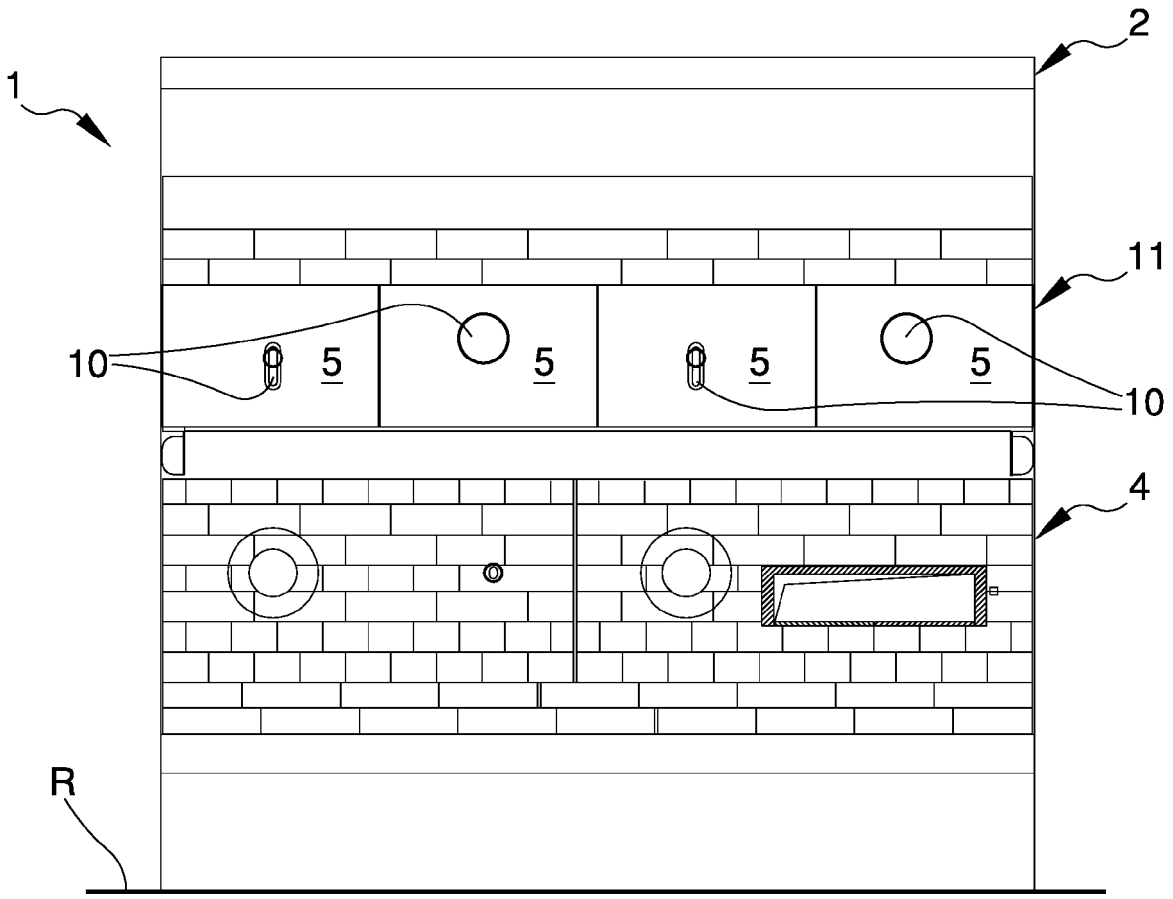


Fig.1

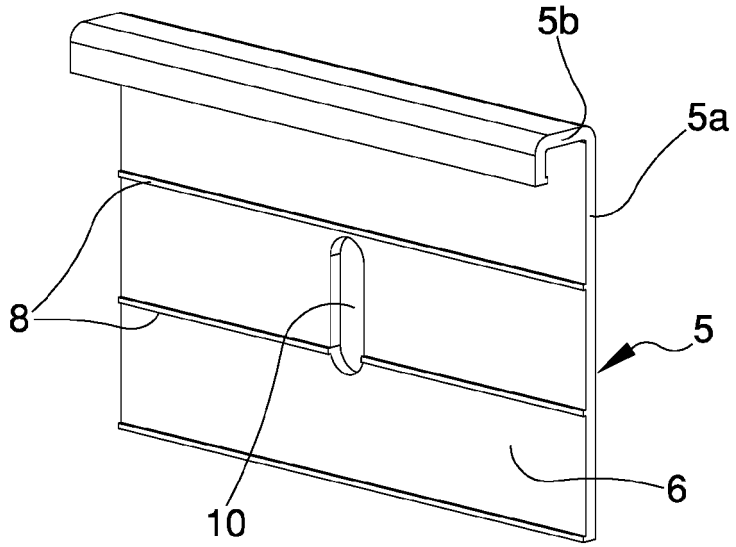


Fig.4

Fig.3

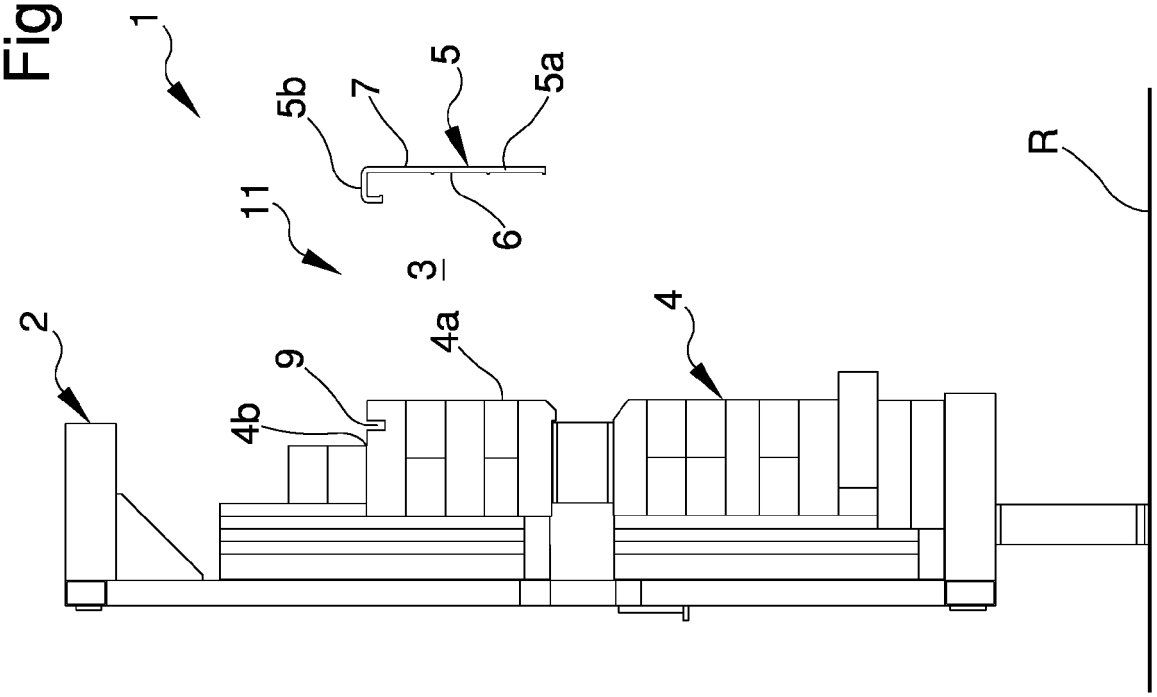
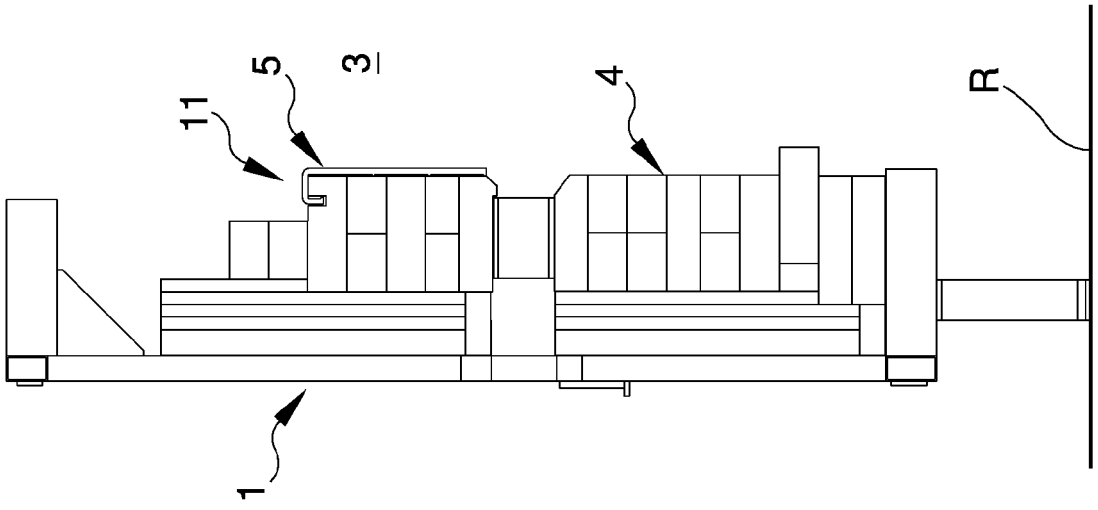


Fig.2



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EUROPEAN SEARCH REPORT

Application Number
EP 19 17 6257

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2010 175159 A (ISOLITE INSULATING PROD; NIPPON STEEL CORP) 12 August 2010 (2010-08-12) * paragraphs [0001], [0007], [0008], [0019], [0040]; claim 7; figures 1,4,6,7 *	1-14	INV. F27D1/16 F27B9/34
X	US 2015/226486 A1 (CARTER DOUGLAS SCOTT [US] ET AL) 13 August 2015 (2015-08-13) * paragraphs [0001], [0008]; claims 1-3,5; figures 5,11,12 *	1-5,14	

TECHNICAL FIELDS SEARCHED (IPC)

F27D
F27B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 August 2019	Momeni, Mohammad

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 17 6257

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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07-08-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82