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- **OCHOA, Ana-Maria**  
**23600 MARTOS (ES)**
- **RIOS, José-Manuel**  
**23600 MARTOS (ES)**
- **GALLEGO, Juan-Manuel**  
**23600 MARTOS (ES)**

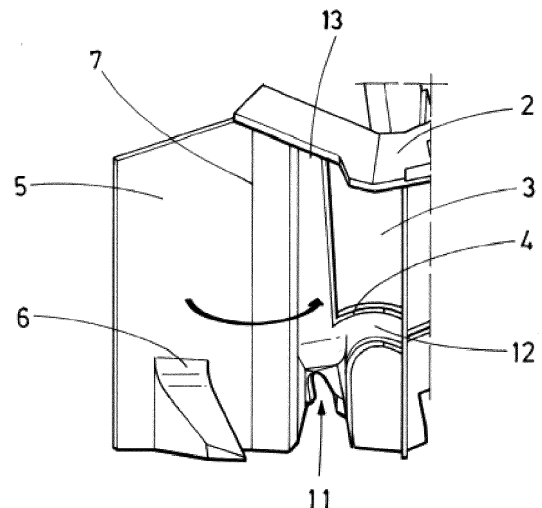
(71) Applicant: **VALEO ILUMINACION**  
**23600 Martos (ES)**

(74) Representative: **Valeo Vision**  
**IP Department**  
**34, rue Saint André**  
**93012 Bobigny (FR)**

(72) Inventors:  
• **GARCIA-MELCHOR, Pedro**  
**23600 MARTOS (ES)**

(54) **AUTOMOTIVE LIGHTING DEVICE AND METHOD FOR MANUFACTURING AN AUTOMOTIVE LIGHTING DEVICE**

(57) The invention provides an automotive lighting device (1) comprising a support element (2, 2') which comprises a first portion (3) and a second portion (5). The first portion (3) comprises a first portion (4) of a channel structure, and the second portion (5) comprises a second portion (6) of a channel structure. The first portion (3) and the second portion (5) of the support element (2, 2') are joined by a foldable slim zone (7). The first portion (4) and the second portion (6) of the channel structure match when the foldable slim zone (7) is folded to form a closed channel structure. The channel structure comprises at least one inlet (11) and at least one outlet (12, 13). A method for manufacturing such an automotive lighting device is also provided.



**FIG.1**

**Description****TECHNICAL FIELD**

[0001] The present invention belongs to the field of lamps for automotive vehicles, and more specifically, to the design of headlamps to avoid fogging in the outer glass.

**STATE OF THE ART**

[0002] Current headlamps have to fulfil different requirements which sometimes involve contradictory design paths. One example of this is related to demisting problems.

[0003] Misting is caused when water vapour condenses on the internal surface of a glass. Micro-drops are unaesthetic and affect the light behaviour, so great efforts are put to solve this problem. However, in order to design modern and efficient lighting devices, lighting devices are growing smaller and walls of opaque materials must surround the light source, to avoid light leakage. But these opaque walls are an obstacle for a free path of dry air to reach the glass surface and avoid condensation.

[0004] Hence, the better a solution is for avoiding light leakage, the worse for avoiding glass condensation because these opaque walls create a tortuous defogging air path that will have a very low flow rate and, consequently, a very slow defogging velocity.

[0005] Further, due to current designs, fogging may appear in different locations of the automotive lighting device, thus adding the need of incorporating several channels to carry the air to these locations and solve the problem.

[0006] A solution for this problem is therefore sought.

**DESCRIPTION OF THE INVENTION**

[0007] The invention provides a solution for improving demisting behaviour by the provision of an automotive lighting device according to claim 1 and a method for manufacturing an automotive lighting device according to claim 11. Preferred embodiments of the invention are defined in dependent claims.

[0008] Unless otherwise defined, all terms (including technical and scientific terms) used herein are to be interpreted as is customary in the art. It will be further understood that terms in common usage should also be interpreted as is customary in the relevant art and not in an idealised or overly formal sense unless expressly so defined herein.

[0009] In this text, the term "comprises" and its derivations (such as "comprising", etc.) should not be understood in an excluding sense, that is, these terms should not be interpreted as excluding the possibility that what is described and defined may include further elements, steps, etc.

[0010] In a first inventive aspect, the invention provides

an automotive lighting device comprising a support element which comprises

a first portion which comprises a first portion of a channel structure; and  
a second portion which comprises a second portion of a channel structure, wherein  
the first portion and the second portion of the support element are joined by a foldable slim zone;  
the first portion and the second portion of the channel structure match when the foldable slim zone is folded to form a closed channel structure;  
the channel structure comprises at least one inlet and at least one outlet.

[0011] This automotive lighting device takes advantage of an existing element to provide a closed channel structure which will allow air to go to different locations of the automotive lighting device, thus saving space in the interior of the lighting device.

[0012] Further, this device may be manufactured as one single piece by injection, since the closed ducts are divided into two portions, so that the resulting ducts may be demoulded, because a closed duct cannot be demoulded.

[0013] In some particular embodiments, the channel structure comprises two or more outlets. These embodiments solve the problem of demisting two different locations without adding several channels to the automotive lighting device.

[0014] In some particular embodiments, the automotive lighting device further comprises a ventilation element, the ventilation element being located in fluid communication with the inlet of the channel structure.

[0015] A ventilation element provides air from the exterior of the automotive lighting device, to improve the defogging performance of the channel structure.

[0016] In some particular embodiments, the automotive lighting device further comprises a fan element arranged to move the air in the inlet of the channel structure.

[0017] This fan element is advantageous since it may improve the air circulation in the channel structure, thus improving the defogging effect.

[0018] In some particular embodiments, the support element is made of plastic injection.

[0019] Plastic injection is an easy way of obtaining this part. Feasibility is ensured by the division of closed channels in open portions.

[0020] In some particular embodiments, the support element is a bezel. In other particular embodiments, the support element is a housing or a harness cover.

[0021] These elements already exist in an automotive lighting device, so using them as the support element saves space in the lighting device.

[0022] In some particular embodiments, the automotive lighting device comprises more than one foldable slim zones.

[0023] There are some cases when more than one

foldable slim zone is needed, due to the fact that they need some thickness for manufacturing considerations, and they are not able to be completely folded. As a consequence, the fold is made in more than one step.

**[0024]** In some particular embodiments, the automotive lighting device further comprises solid-state light sources.

**[0025]** The term "solid state" refers to light emitted by solid-state electroluminescence, which uses semiconductors to convert electricity into light. Compared to incandescent lighting, solid state lighting creates visible light with reduced heat generation and less energy dissipation. The typically small mass of a solid-state electronic lighting device provides for greater resistance to shock and vibration compared to brittle glass tubes/bulbs and long, thin filament wires. They also eliminate filament evaporation, potentially increasing the life span of the illumination device. Some examples of these types of lighting comprise semiconductor light-emitting diodes (LEDs), organic light-emitting diodes (OLED), or polymer light-emitting diodes (PLED) as sources of illumination rather than electrical filaments, plasma or gas.

**[0026]** In a further inventive aspect, the invention provides a method for manufacturing an automotive lighting device according to the first inventive aspect, the method comprising the steps of

designing a mould with a first portion of the support element and a second portion of the support element joined by the foldable slim zone, wherein the foldable slim zone of the mould is thick enough for a plastic material to flow through  
injecting a plastic material in the mould to form the support element  
unmould the support element  
fold the foldable slim zone to form the closed channel structure.

**[0027]** This method is advantageous since it provides an easy and reliable way of obtaining a lighting device with channels to provide defogging in different portions thereof.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0028]** To complete the description and in order to provide for a better understanding of the invention, a set of drawings is provided. Said drawings form an integral part of the description and illustrate an embodiment of the invention, which should not be interpreted as restricting the scope of the invention, but just as an example of how the invention can be carried out. The drawings comprise the following figures:

Figure 1 shows a particular embodiment of a support element used in an automotive lighting device according to the invention.

Figure 2 shows a schematic lateral view of an automotive lighting device according to the invention.

Figure 3 shows some steps of a manufacturing method for an automotive lighting device according to the invention.

Figures 4a and 4b show a different embodiment of a support element used in an automotive lighting device according to the invention.

Figure 5 shows a lighting device according to a particular embodiment of the invention installed in an automotive vehicle.

## DETAILED DESCRIPTION OF THE INVENTION

**[0029]** The example embodiments are described in sufficient detail to enable those of ordinary skill in the art to embody and implement the systems and processes herein described. It is important to understand that embodiments can be provided in many alternate forms and should not be construed as limited to the examples set forth herein.

**[0030]** Accordingly, while embodiment can be modified in various ways and take on various alternative forms, specific embodiments thereof are shown in the drawings and described in detail below as examples. There is no intent to limit to the particular forms disclosed. On the contrary, all modifications, equivalents, and alternatives falling within the scope of the appended claims should be included. Elements of the example embodiments are consistently denoted by the same reference numerals throughout the drawings and detailed description where appropriate.

**[0031]** Figure 1 shows a particular embodiment of a support element 2 used in an automotive lighting device according to the invention.

**[0032]** This support element 2 comprises a first portion 3 and a second portion 5 joined by a foldable slim zone 7.

**[0033]** The first portion 3 of this support element 2 comprises a first portion 4 of a channel structure and the second portion 5 of this support element 2 comprises a second portion 6 of a channel structure.

**[0034]** These portions 4, 6 of a channel structure are configured to match with each other and form a closed channel structure when the second portion 5 of the support element 2 is bended over the first portion 3 of the support element 2 by means of the joint zone 7.

**[0035]** As may be seen in this figure, the resulting channel structure comprises one inlet 11 and two outlets 12, 13.

**[0036]** Figure 2 shows a schematic lateral view of an automotive lighting device 1 according to the invention, comprising a housing 2 which comprises the channel structure with the inlet 11 and the outlets 12, 13. A light source 20 may be seen in the background of this view.

**[0037]** This lighting device further comprises a venti-

lation element 8, the ventilation element 8 being located in fluid communication with the inlet 11 of the channel structure.

**[0038]** This lighting device further comprises a fan element 9 arranged to move the air in the inlet 11 of the channel structure, thus providing a flow which may improve the defogging behaviour.

**[0039]** Figure 3 shows some steps of a manufacturing method for an automotive lighting device according to the invention.

**[0040]** A first step of this method would be the provision of a mould 50 which contains a first portion 3 of the support element and a second portion 5 of the support element joined by the foldable slim zone 7. The size of the foldable slim zone is carefully calculated by mould flow simulations, so that this part of the mould is thick enough for a plastic material to flow through.

**[0041]** Then, the plastic material is injected in the mould to form the support element and, once the injection process is finished, the support element is unmoulded, thus obtaining a support element as the one of figure 1.

**[0042]** To finish the support element, the foldable slim zone 7 will be folded to form the closed channel structure.

**[0043]** Figures 4a and 4b show a different embodiment of a support element used in an automotive lighting device according to the invention.

**[0044]** Figure 4a shows a harness cover 2' which is intended to be placed as an "eyebrow" in the lighting device. This harness cover 2' comprises a first portion 3 and a second portion 5, which are joined by a foldable slim zone 7. The first portion 3 comprises one inlet 11 and several outlets 12, 13, which are arranged to provide the required ventilation to the outer lens.

**[0045]** Figure 4b shows the harness cover of figure 4a in a closed position, to be installed in an automotive lighting device.

**[0046]** Figure 5 shows a lighting device 1 according to the invention installed in an automotive vehicle 100. This automotive lighting device 1 comprises a plurality of LEDs 20 and a harness cover 2' which encloses a channel structure with outlets 12, 13 to provide demisting to some zones of the lighting device 1.

**[0047]** This automotive vehicle 100 will have their headlamps easily demisted without using additional channels or active elements, thus being able to keep its compact size.

## Claims

1. Automotive lighting device (1) comprising a support element (2, 2') which comprises

a first portion (3) which comprises a first portion (4) of a channel structure; and  
a second portion (5) which comprises a second portion (6) of a channel structure, wherein the first portion (3) and the second portion (5) of

the support element (2, 2') are joined by a foldable slim zone (7);

the first portion (4) and the second portion (6) of the channel structure match when the foldable slim zone (7) is folded to form a closed channel structure;

the channel structure comprises at least one inlet (11) and at least one outlet (12, 13).

2. Automotive lighting device according to claim 1, wherein the channel structure comprises two or more outlets (12, 13).

3. Automotive lighting device according to any of the preceding claims, further comprising a ventilation element (8), the ventilation element (8) being located in fluid communication with the inlet (11) of the channel structure.

4. Automotive lighting device (1) according to any of the preceding claims, further comprising a fan element (9) arranged to move the air in the inlet of the channel structure.

5. Automotive lighting device (1) according to any of the preceding claims, wherein the support element is made of plastic injection.

6. Automotive lighting device (1) according to any of the preceding claims, wherein the support element is a bezel.

7. Automotive lighting device (1) according to any claims 1 to 5, wherein the support element is a housing (2).

8. Automotive lighting device (1) according to any claims 1 to 5, wherein the support element is a harness cover (2').

9. Automotive lighting device (1) comprising more than one foldable slim zones (7).

10. Automotive lighting device (1) according to any of the preceding claims, further comprising solid-state light sources (20).

11. Method for manufacturing an automotive lighting device according to any of the preceding claims, the method comprising the steps of

designing a mould (50) with a first portion of the support element (3) and a second portion of the support element (5) joined by the foldable slim zone (7), wherein the foldable slim zone of the mould is thick enough for a plastic material to flow through;  
injecting a plastic material in the mould to form

the support element (2, 2');  
unmould the support element (2, 2'); and  
fold the foldable slim zone (7) to form the closed  
channel structure.

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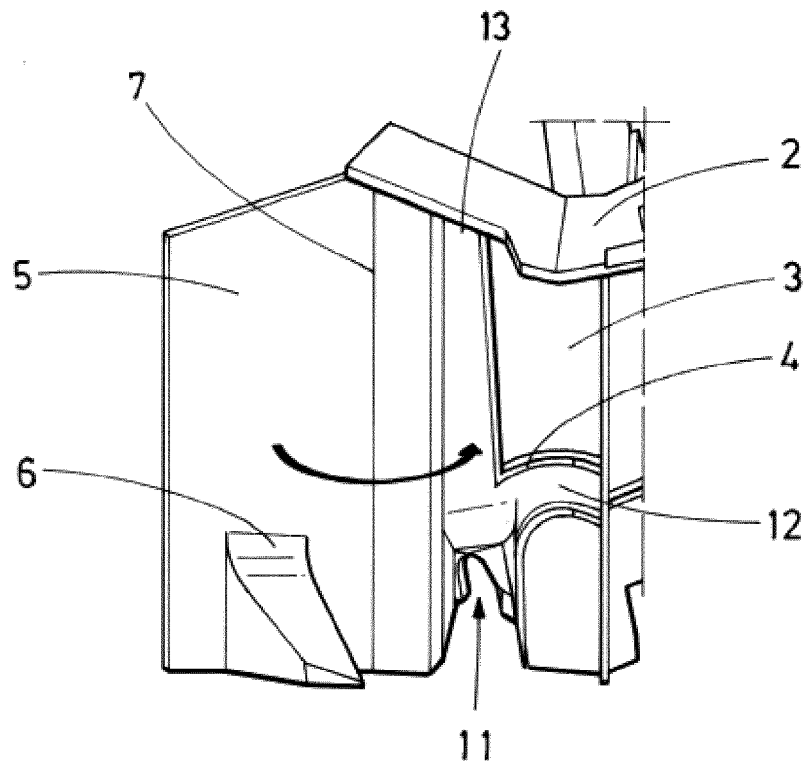


FIG.1

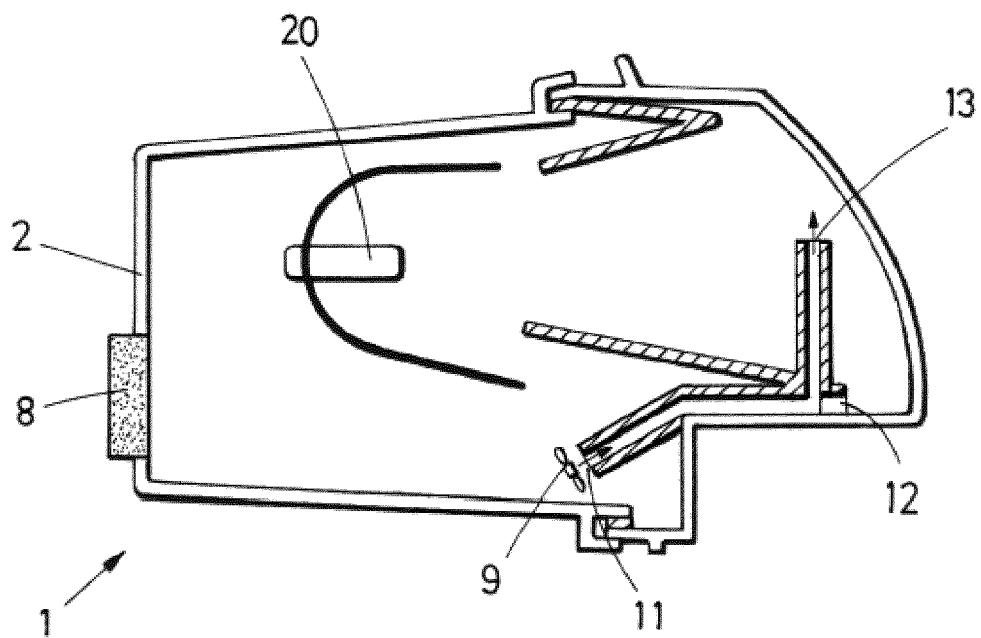
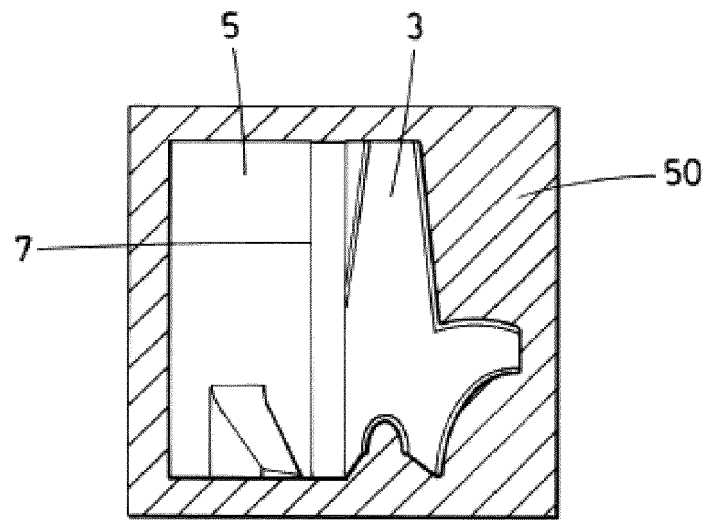
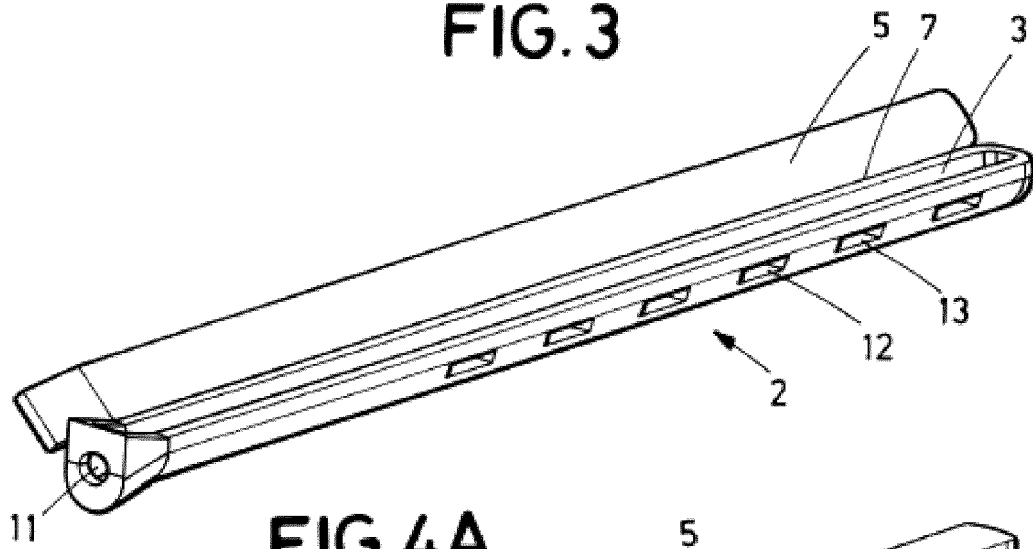


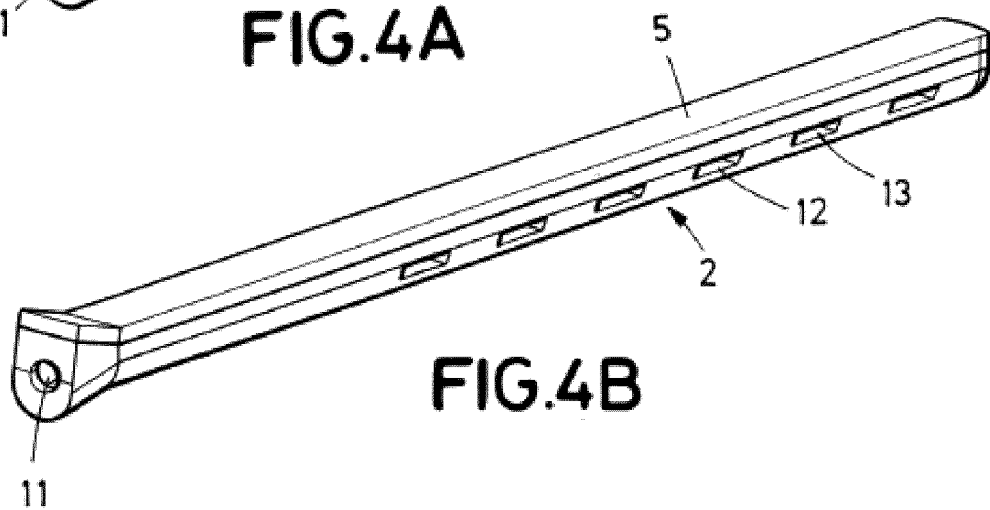
FIG.2



**FIG. 3**



**FIG. 4A**



**FIG. 4B**

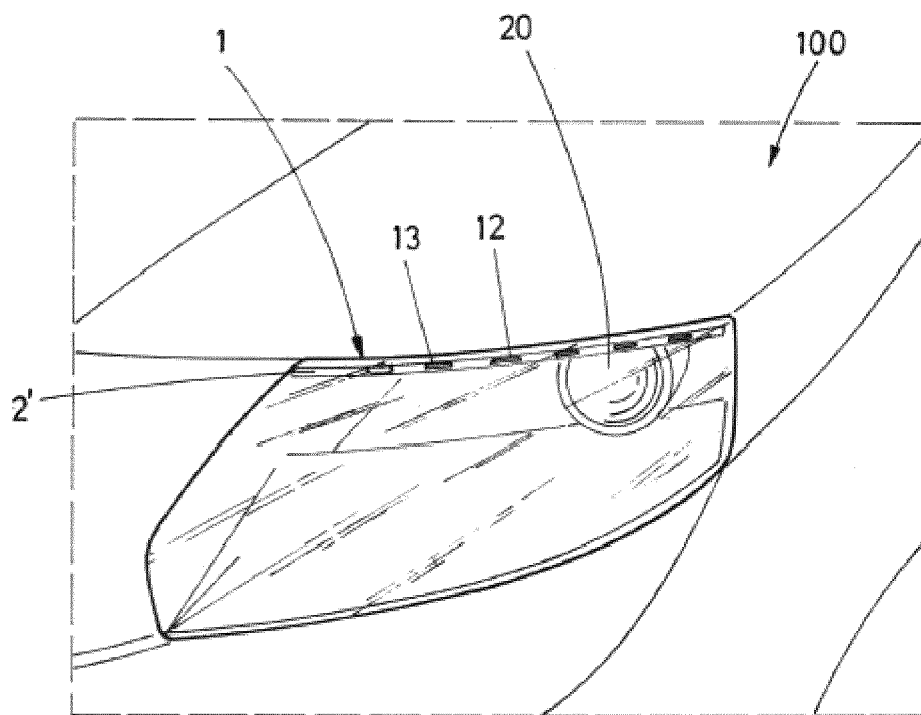


FIG.5



## EUROPEAN SEARCH REPORT

 Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                             |                                                                                                                                                                                                                                                                                       |                                         |
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| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                               | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC) |
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|                                                                                                                                                                                                                                                        | * paragraph [0040] - paragraph [0051] *                                                                     |                                                                                                                                                                                                                                                                                       | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
|                                                                                                                                                                                                                                                        | -----<br>F21S                                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                             |                                                                                                                                                                                                                                                                                       |                                         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                       |                                                                                                             | Date of completion of the search<br><b>10 September 2019</b>                                                                                                                                                                                                                          | Examiner<br><b>Schulz, Andreas</b>      |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                             | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                         |

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5 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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