(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 March 2010 (04.03.2010)

PCT

(10) International Publication Number
WO 2010/022768 A1

(51) International Patent Classification:
B60J 7/00 (2006.01)

(21) International Application Number:
PCT/EP2008/061198

(22) International Filing Date:
27 August 2008 (27.08.2008)

(25) Filing Language: English

(26) Publication Language: English

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2010/022768 A1

(54) Title: SUNSHADE ASSEMBLY AND OPEN ROOF CONSTRUCTION PROVIDED THEREWITH

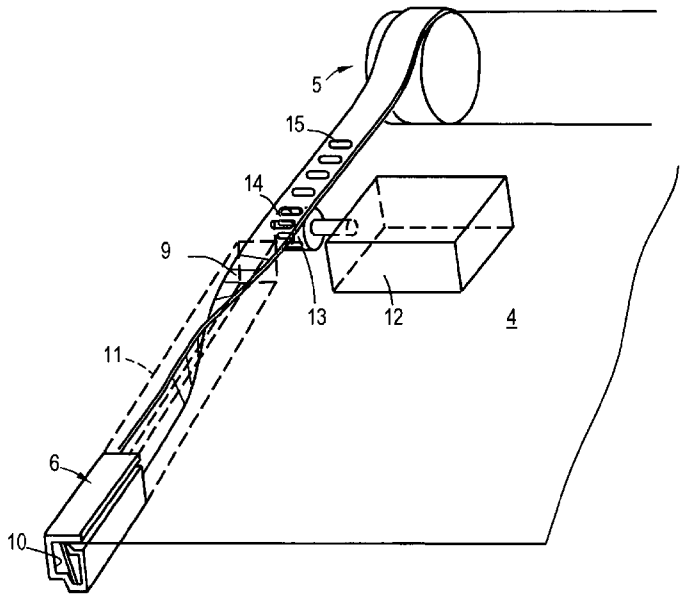


Fig.2

(57) Abstract: A sunshade assembly comprises a flexible sunscreen (4) having an upper and lower side, opposed longitudinal edges and opposed transversal edges. The longitudinal edges are provided with guide strips (9) which are bendable along its length and substantially rigid in transverse direction. A rotatable winding shaft (5) is configured for winding and unwinding the sunscreen and the guide strips at a first one of its transversal edges. Elongated longitudinal guiderails (6, 7) each include a guide channel (10) in which the respective guide strip is accommodated when the sunscreen is unwound. An electric drive (12, 13) is in engagement with at least one of the guide strips to drive the sunscreen between its wound and unwound positions.

Sunshade assembly and open roof construction provided therewith

The invention relates to a sunshade assembly.

A major field of application of sunshade assemblies of the type according to the invention is defined by open roof constructions for vehicles comprising a roof opening in a stationary roof part and a movable closure panel for opening and closing said roof opening, wherein below said roof opening there is provided such a sunshade assembly.

Known sunshade assemblies comprises a rotatable winding shaft configured for winding and unwinding a sunscreen. An operating beam is connected to a free transversal edge of the sunscreen and is guided in guides extending along longitudinal sides of the sunscreen. In prior art sunshade assemblies in which the sunscreen is electrically driven, normally, the winding shaft is driven and the shaft is connected by an additional cable or belt to the operating beam. This makes the drive complicated and increases cost and packaging space.

It is an object of the present invention to provide a sunshade assembly in which these disadvantages have been overcome or at least reduced.

For this purpose the sunshade assembly according to the invention comprises a flexible sunscreen having an upper and lower side, opposed longitudinal edges and opposed transversal edges, the longitudinal edges being provided with guide strips which are bendable along its length and substantially rigid in transverse direction; a rotatable winding shaft configured for winding and unwinding the sunscreen and the guide strips at a first one of its transversal edges; elongated longitudinal guiderails each including a guide channel in which the respective guide strip is accommodated when the sunscreen is unwound; and an electric drive being in engagement with at least one of the guide

strips to drive the sunscreen between its wound and unwound positions.

By using at least one of the guide strips to drive the sunscreen between its wound and unwound positions, it is not necessary anymore to use separate drive means, as the guide strips may perform a double function.

It is particularly advantageous if the guide strips are provided with means to provide rigidity in transverse direction and to promote bendability along its length, while the electric drive is an engagement with these means which may comprise for example transverse grooves, ribs, slits, holes, slots, teeth or the like.

The electric drive may comprise synchronized electric motors on both sides of the sunshade, which electric motors can be a small motor with low torque specification, which leads to a small space requirement and low cost. The electric drive may comprise a drive wheel which is directly driven by the electric motor or through a transmission means and which may have drive members on its circumference, forming a gear wheel or the like, which drive members are in engagement with the means on the guide strip or strips.

The guide strips and the guide channels are advantageously devised such that the guide strip is resistant to push and pull forces exerted by the electric drive on the guide strip. This enables the guide strips to easily transmit the driving forces from the electric drive to the operating beam and the winding shaft. The winding shaft for the guide strips may be constructed such that there is a constant tendency for the sunscreen to be wound on the winding shaft, for example by means of a torsion spring, ensuring that there is always a pulling force on the guide strips between the electric drive and the winding shaft, thereby assisting in winding the sunscreen when the electric drive is actuated for opening the sunscreen.

The invention further relates to an open roof construction for a vehicle, comprising a roof opening in a stationary roof part and a movable closure panel for opening and closing said roof opening, wherein below said roof opening there is provided a sunshade assembly according to the invention.

Hereinafter the invention will be further elucidated with referring to the drawings schematically showing embodiments of the invention by way of example.

Fig. 1 shows, schematically and in a perspective view, a sunshade assembly applied to an open roof construction;

Fig. 2 is an enlarged schematic perspective view of a guide strip and respective electric drive of the sunshade assembly according to the invention.

Fig. 3 is a partial plan view of the subject of Fig. 2.

Fig. 4 is a view corresponding to that of Fig. 3, but showing a further embodiment of the invention.

Fig. 5a-k are cross-sectional views of various variations of the guiderail and guide strip of the sunshade assembly according to the invention.

Fig. 6 is a side view of the subject of Fig. 2 with added counter means of the electric drive.

Fig. 7 is a view corresponding to that of Fig. 6, but showing an alternative embodiment of the counter means.

Figs. 8 - 10 are schematic perspective views of a portion of a guide strip of the sunshade according to the invention, in different embodiments.

Firstly referring to Fig. 1, an open roof construction for a vehicle is illustrated schematically in dotted lines. Said open roof construction comprises a roof opening 1 in a stationary roof part 2 of the vehicle, such as a passenger car, and a movable closure panel 3 which, by means not illustrated in detail but known per se, can be

moved for opening and closing said roof opening 1. In Fig. 1 the closure panel 3 has been illustrated in a position in which it opens the roof opening 1.

Below the roof opening 1 a sunshade assembly in accordance with the present invention is positioned. Basically, said sunshade assembly comprises a flexible sunscreen 4, a rotatable winding shaft 5 for winding and unwinding the sunscreen 4, and two opposite guiderails 6 and 7 for cooperation with two opposite longitudinal edges of the sunscreen 4.

In so far the sunshade assembly has a conventional shape. Further, in a way known per se, the end of the sunscreen 4 opposite the end which is wound onto the winding shaft 5 is provided with an operating beam 8. Normally, this is gripped manually for operating the sunscreen 4 and locating it in a desired position. However, according to the invention, the sunscreen is driven by a motor, in particularly electrically, so that the operating beam is just for limiting and guiding the transverse side of the sunscreen 4 opposite to the winding shaft 5. The opposite ends of the operating beam 8 are guided in guides not illustrated here (extending along with or integrated into the guiderails 6, 7).

Now reference is made to Figs. 2 and 3. These figures show a detail of the sunshade assembly of Fig. 1, in particular a guide strip 9 on one of the longitudinal edges of the sunscreen 4, which is guided in a guide channel 10 in one of the guide rails 6, 7. As is shown in Figs. 2 and 3, the guide strip 9 is in a position substantially in the plane of the sunscreen 4 when the sunscreen is wound on the winding shaft 5, whereas the guide strip 9 is at an acute angle to the sunscreen 4 when it is accommodated in the guide rail 6, 7. To change between these positions, the guide strip 9 is twisted. Preferably, there is provided a twisting guide 11 (indicated by dashed lines) as a separate part in extension of the guide rail 6, 7 to assist in guid-

ing this twisting motion. The twisting angle of the twisting guide 11 depends on the orientation of the guide strip in the guide channel 10 and the orientation of the guide strip in the winding shaft 5, and may be different for different situations.

As mentioned before, the movements of the sunscreen 4 are accomplished by means of an electric drive, in this case comprising on each longitudinal side of the sunscreen 4, and preferably close to the winding shaft 5, an electric motor provided with a gear wheel 13 having on its circumference teeth or other drive members 14 cooperating with engagement means 15 provided on the guide strip 9, at least on the side facing the gear wheel 13. The electric motors 12 at both longitudinal edges of the sunscreen 4 are preferably synchronized, either electronically or mechanically in order to prevent skewing of the sunscreen 4.

The means 15 on the guide strips 9 are arranged to provide rigidity of the guide strips 9 in transverse direction and to promote a bending thereof along the length of the guide strip 9. These means 15 also function to allow the electric drive to engage the guide strips 9, so they have a multiple functionality. In order to allow the driving force of the gear wheel 13 to be transferred to both ends of the guide strip 9, the guide strips and the corresponding guide rails 6 are arranged to withstand push and pull forces in the longitudinal direction of the guide strips 9. For this reason it is preferred that the guide rails 6, 7 and their guide channels 10 extend close to the point of engagement of the gear wheel 13, if necessary on both sides thereof. The guide strips 9 fit in the corresponding guide rails without significant play. Furthermore, the structure of the strips 9 is sufficiently resistant against buckling.

In principle it will be possible to provide the sunshade assembly with means that provide the sunscreen 4 with a tendency to be wound on the winding shaft 5, for ex-

ample by means of a torsion spring on the winding shaft 5 or by a special structure of the guide strip 9 or the like. In that case, the guide strip 9 will also undergo a pulling force in the portion between the point of engagement of the drive wheel 13 and the end of the guide strip which is positioned on the winding shaft 5. However, this is not necessary as the electric drive may drive the guide strips 9 by pushing, in both directions.

Fig. 4 shows an alternative embodiment of the guide strip 9 and guiding arrangement. Here, the guide strip 9 is twisted between the guide channel 10 and the winding shaft 5 (by means of the twisting guide 11) in the other direction, so that the guide strip 9 is turned inwardly below the outer portion of the sunscreen 4. Both in this embodiment and in the embodiment of Figs. 2 and 3, it is preferred that the sunscreen 4 can be stretched, at least in transverse direction in order to allow differences in the distance between the longitudinal edges of the sunscreen 4, either by the twisting or due to thermal expansion/shrinkage or tolerances. The sunscreen 4 may be made completely of stretchable material, or it is possible that a part such as the side edge portions of the sunscreen 4 are made of elastically stretchable material.

Fig. 5 shows different embodiments of the guide channel 10 in the guide rails 6, 7. Figs. 5a-d show guide channels that guide the guide strip 9 in a position parallel to the sun screen 4. In Fig. 5a and 5b, the engagement means on the guide strip 9 are provided on the lower side thereof to allow the sunscreen 4 to extend over the guide strip 9. In Figs. 5c and 5d, the means 15 extends either on the bottom (c) or on the top side (d). In the latter case the guide strip 9 is preferably twisted 180° before being engaged by the electric drive. The guide rails of Figs. 5e and 5f substantially correspond to those of Fig. 4 and 2.

In Fig. 5g and 5h, the angle between the guide strips 9 and the sunscreen 4 is greater than 90° and the means 15 are shown on two opposite sides. In Figs. 5i-k, the guide strip 9 is positioned at wide angles to the sunscreen 4 and the situation in Figs. i and j the guide rail is equal but the engagement means 15 are on opposite sides. In Fig. 5k the sunscreen 4 is not fixed to a longitudinal edge of the guide strip 9, but to the middle of one of its faces. Of course, other variations are conceivable.

Fig. 6 shows the embodiment of Fig. 2, however now with an additional counter member 16, here a wheel, opposite to the gear wheel 13 of the electric motor 12 in order to clamp the guide strip 9 between them. The counter member 16 may be kept under tension towards the guide strip 9 and/or is adjustable in that direction to ensure a proper engagement between the gear wheel 13 and the guide strip 9, also during a longer period of time.

Fig. 7 shows an alternative embodiment in which the single counter wheel 16 is replaced by two counter members 17 arranged on the opposite side of the guide strip 9 on either side of the gear wheel 13. The guide strip may be slightly curved between the counter members so as to enlarge the zone of contact between the drive wheel 13 and the guide strip 9.

Figs. 8-10 show variations of the engagement means 15 for the electric drive which also serve to provide rigidity to the guide strip 9 in transverse direction and to promote bendability along the length of the guide strip 9. Fig. 8 show teeth, Fig. 9 shows ribs and Fig. 10 shows transverse slots, positioned at regular intervals and distributed over the length of the guide strips. Fig. 10 also shows longitudinal reinforcing wires in the guide strip 15 to provide pushing resistance.

From the forgoing it is clear that the invention provides a sunshade assembly which has favourable driving

and guiding properties, and a simple construction and small package.

The invention is not limited to the embodiments described before, which may be varied widely within the scope of the invention as defined by the appending claims. For example, the closure panel can be replaced by one or more other closures, such as slats, a foldable cover or a plurality of panels. If only one guide strip is drive by the drive (either electric or other) there should be provided means to prevent skewing of the sunscreen. Further features of the sunscreen are disclosed in the copending application of the same date, the contents of which are incorporated herein by reference thereto.

CLAIMS

1. Sunshade assembly comprising:
a flexible sunscreen having an upper and lower side, opposed longitudinal edges and opposed transversal edges, the longitudinal edges being provided with guide strips which are bendable along its length and substantially rigid in transverse direction;
a rotatable winding shaft configured for winding and unwinding the sunscreen and the guide strips at a first one of its transversal edges;
elongated longitudinal guiderails each including a guide channel in which the respective guide strip is accommodated when the sunscreen is unwound,
an electric drive being in engagement with at least one of the guide strips to drive the sunscreen between its wound and unwound positions.

2. Sunshade assembly according to claim 1, wherein the guide strips being provided with means to provide rigidity in transverse direction and to promote bendability along its length, the electric drive being in engagement with this means acting as engagement means.

3. Sunshade assembly according to claim 1, wherein the engagement means comprises at least one of transverse grooves, ribs, holes, slots, teeth or the like.

4. Sunshade assembly according to claim 3, wherein the electric drive comprises a drive wheel having drive members on its circumference, such as a gear wheel, said drive members being in engagement with the means on the guide strip.

5. Sunshade assembly according to one of the preceding claims, wherein the electric drive includes an electric motor at each of the guiderails.

6. Sunshade assembly according to one of the preceding claims, wherein the guide strip and the guide

channel are devised such that the guide strip is resistant to push and pull forces exerted by the electric drive on the guide strip.

7. Sunshade according to claim 6, wherein the guide channel extends close to the position where the electric drive engages the guide strip.

8. Sunshade according to one of the preceding claims, wherein the guide channels in the guiderails are oriented at an angle transversely to accommodate the strips at an angle with respect to the sunscreen, and wherein the guide strips are turned between the guide channels and the guide shaft in order to be parallel to the sunscreen when they are wound together with the sunscreen, the electric drive being positioned close to the winding shaft where the guide strip is parallel to the sunscreen.

9. Sunshade according to claim 8, wherein the guiderails are provided with a torsional guide portion to turn around the guide strip about is longitudinal axis.

10. Sunshade according to one of the preceding claims, wherein the electric drive engages one side of the guide strips while at least one counter member engages the opposite side of the guide strip.

11. Open roof construction for a vehicle, comprising a roof opening in a stationary roof part and a movable closure panel for opening and closing said roof opening, wherein below said roof opening there is provided at least one sunshade assembly according to any of the preceding claims.

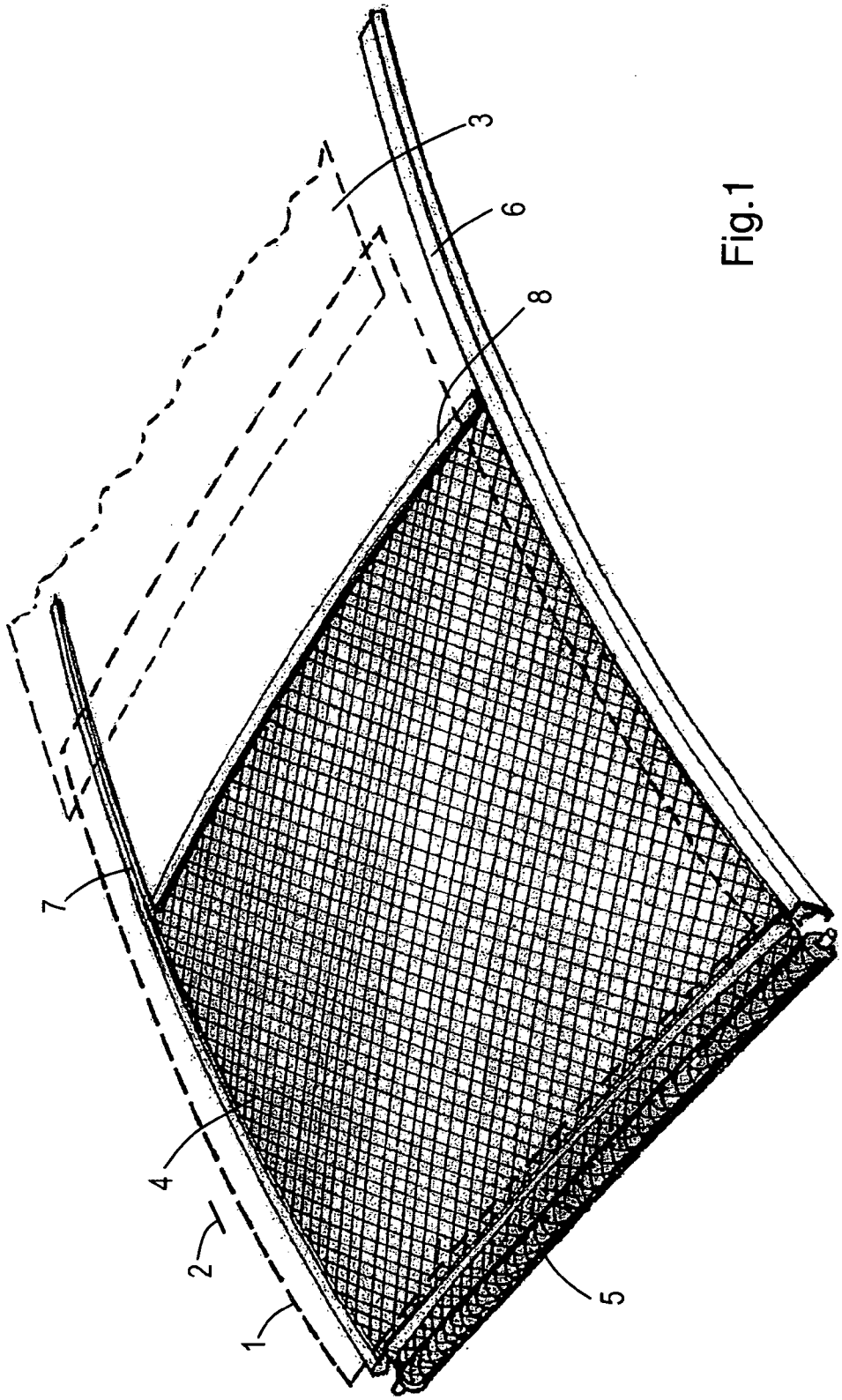


Fig.1

Fig.2

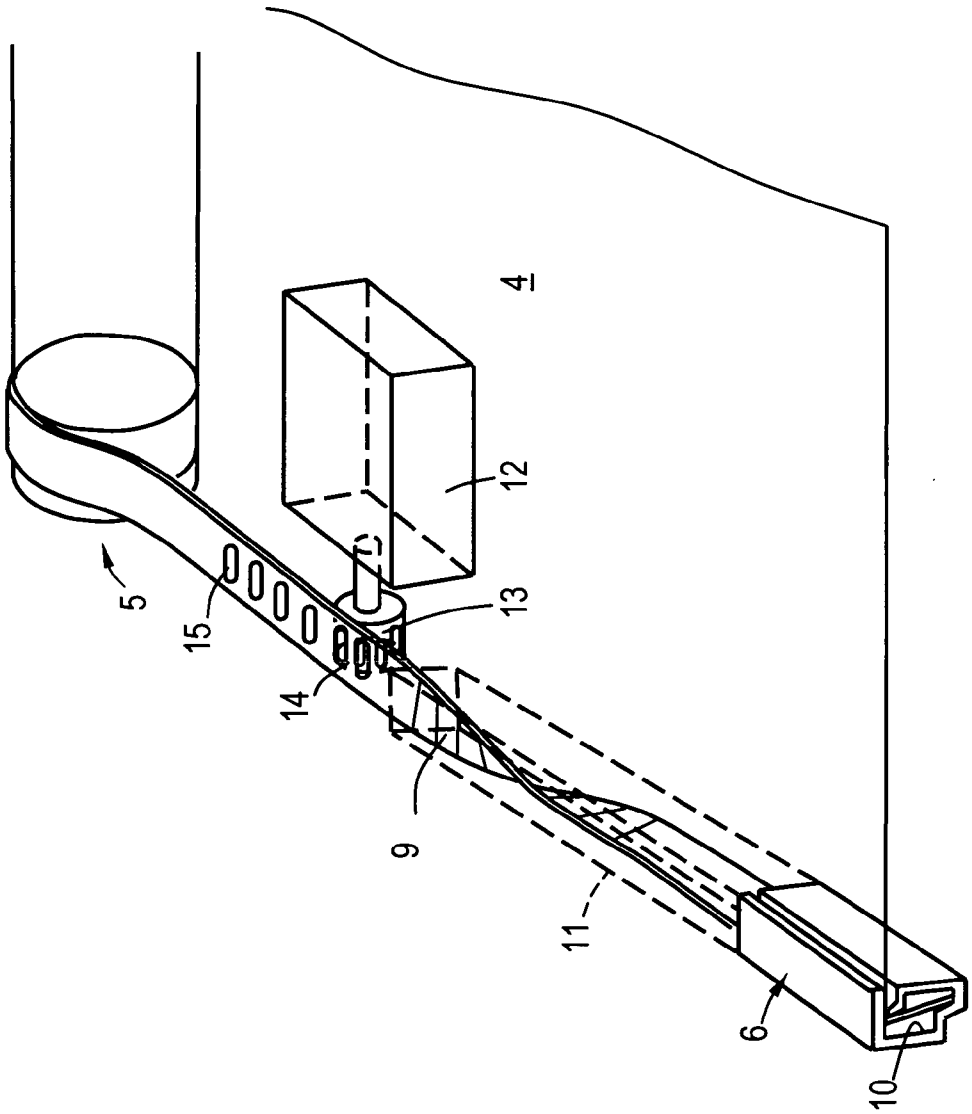
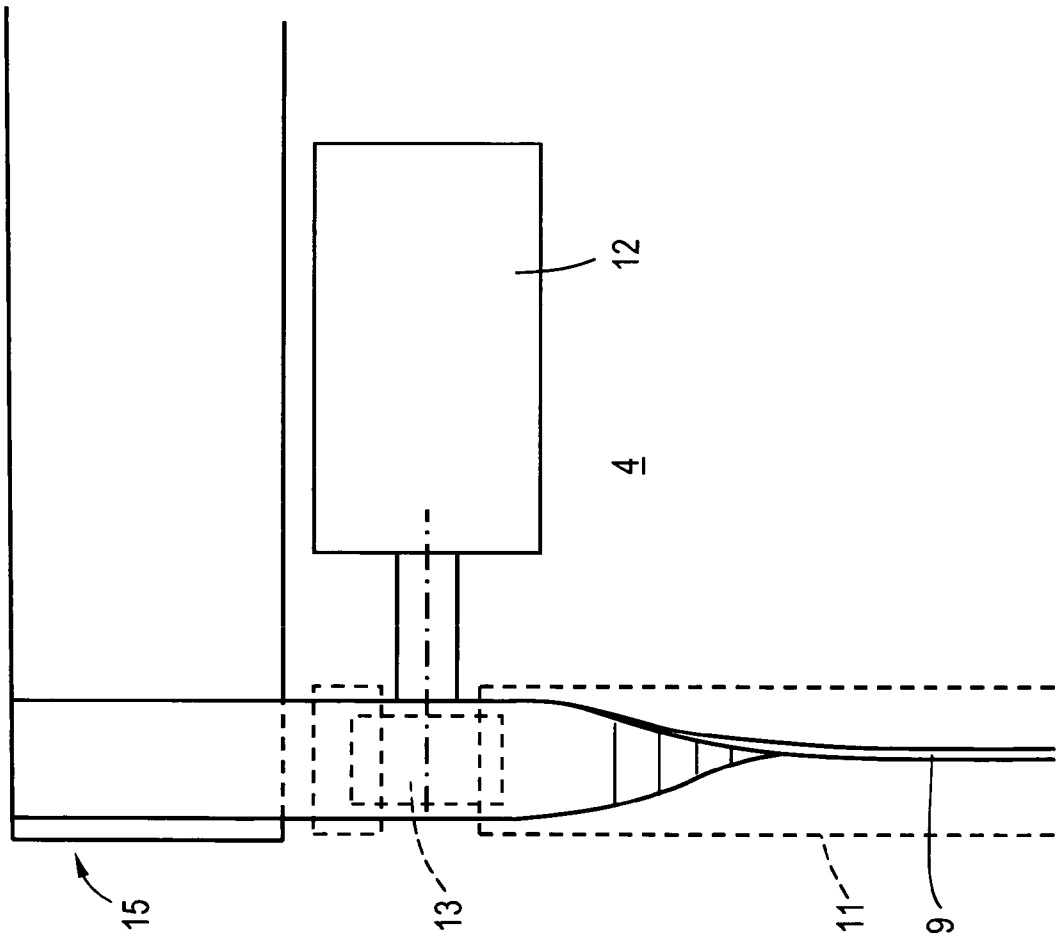


Fig.3



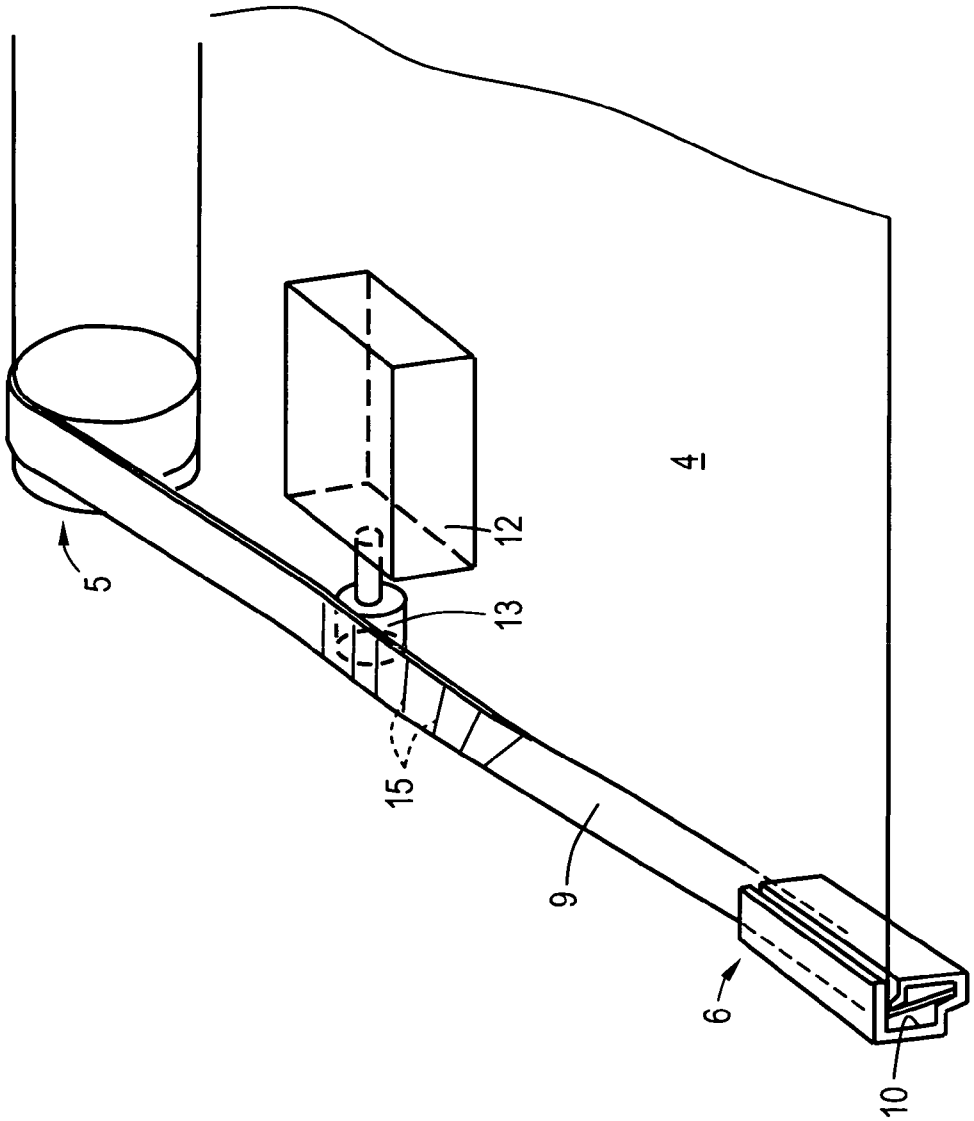


Fig.4

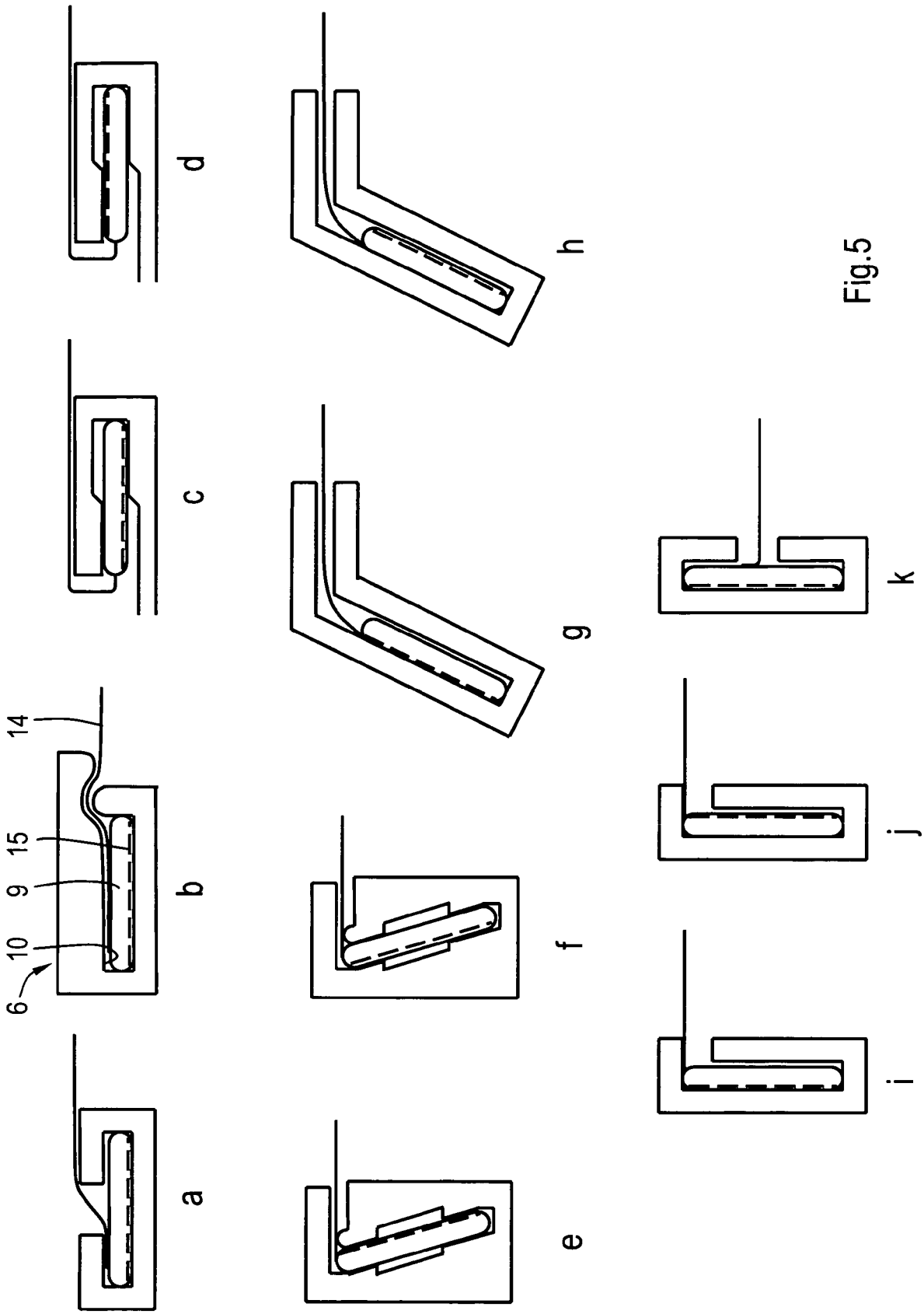


Fig.5

Fig.6

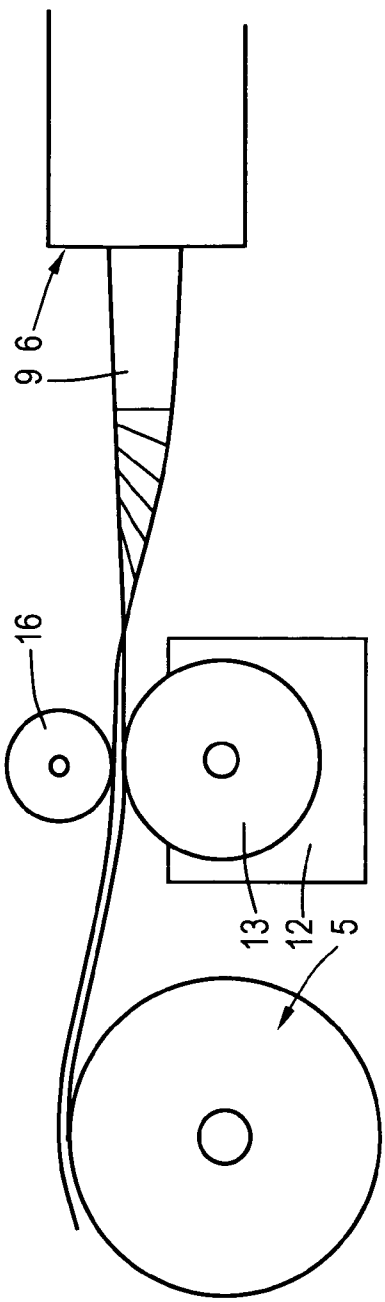


Fig7

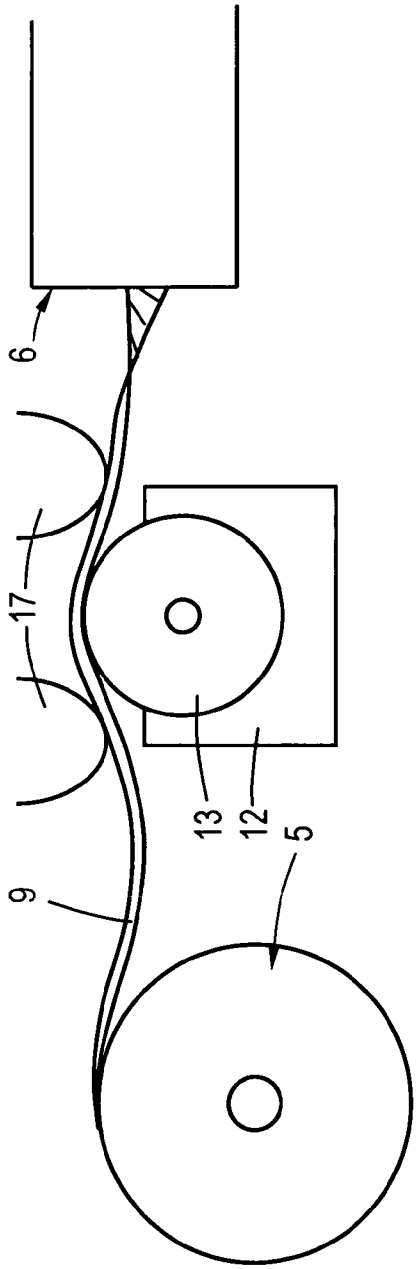


Fig.8

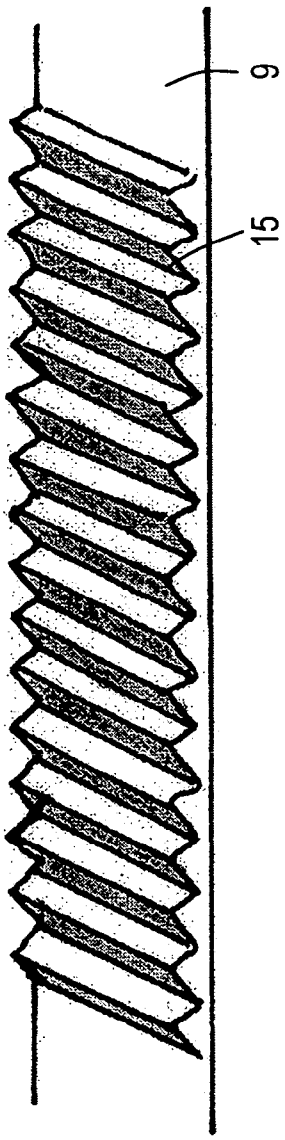


Fig.9

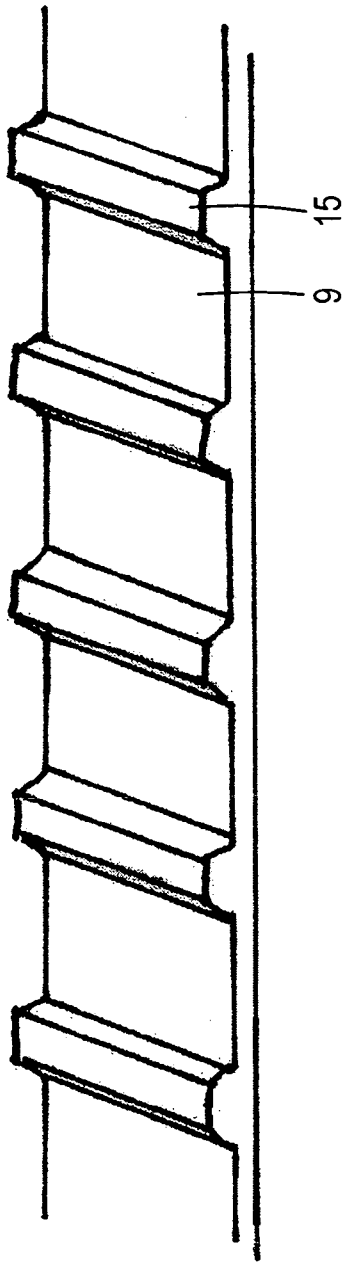
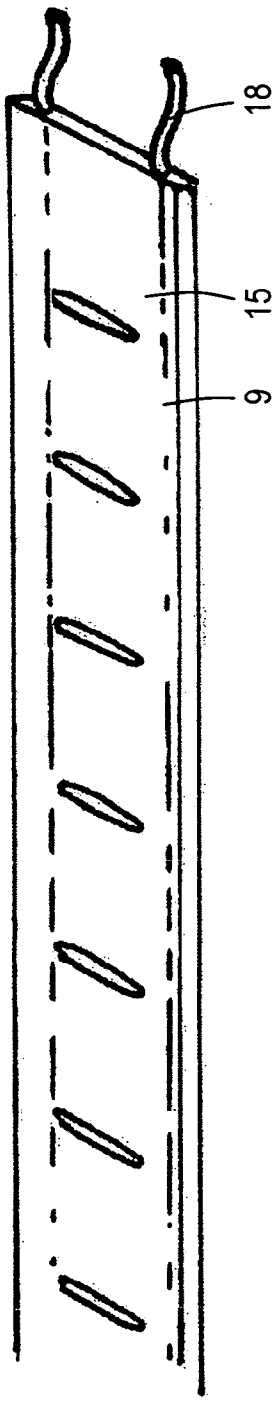


Fig.10



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/061198

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60J7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
12 May 2009	29/05/2009

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/061198

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