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(72) Inventor: **Wisniewski, Tomasz**
Polska (PL)

(74) Representative: **Panczyk, Jacek**
Kancelaria Patentowa
Jacek Panczyk
41-412 Myslowice
ul. Bernada Waly 5B / 68
Polska (PL)

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(71) Applicant: **WERNER JANIKOWO Spółka z o.o**
Polska (PL)

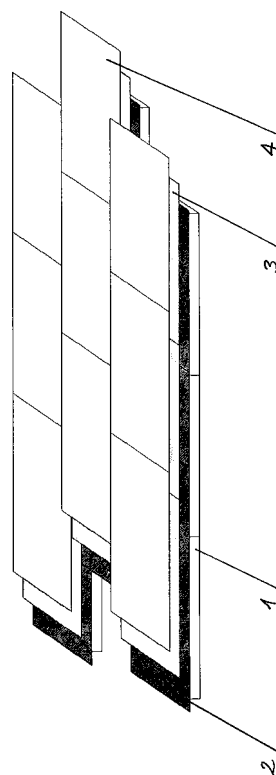
(54) **Multi-layered roof module and the way of constructing roofings from multi-layered roof modules**

(57) The essence of the multi-layered roofing module which consists of thermal and water insulation layers, according to the invention, is that the upper plate of the thermal insulation board (1), in particular of a polystyrene foam board or/and a mineral wool board or/and different types of wool and foam, is covered evenly with a layer of bituminous mass on which there is put a water insulation covering layer (2), in the form of underlay tar paper, which is joined with the thermal insulation board (1) by means of press rollers, then on the water insulation covering layer (2), in the form of underlay tar paper, there is put evenly a layer of bituminous mass on which the second water insulation layer is put (3), in the form of underlay tar paper, all that is joined by means of press rollers, then on the layer of the underlay tar paper (3) there is put a layer of bituminous mass on which the third water insulation layer is put (4), in particular weldable tar paper of outer covering, and all that is joined by means of press rollers creating a multi-layered roofing module.

The water insulation covering layer (2) is wider and longer than the thermal insulation covering layer (1). Subsequent water insulation layers are joined with each other with an appropriate shift so that they create a system of overlaps. The multi-layered roofing module may consist only of two water insulation layers in the form of the water insulation covering layer (2), and water insulation layer, in particular in the form of weldable tar paper of outer covering (4). Making roofing out of the multi-layered roofing modules fastened to the base by means of mechanical fasteners (5) or/and adhesives allowed to be used in the building industry, involves putting the multi-layered roofing modules on the roof surface in such a way that the multi-

layered roofing modules with a system of overlaps joined with the system of overlaps of the other multi-layered roofing modules overlap creating a tight lock and a tight roofing surface. The overlaps are joined by means of welding them, in particular by applying high temperature.

Fig.4



Description

[0001] The subject of this invention is multi-layered roof module and the way of constructing roofings from multi-layered roof modules.

[0002] The multi-layered roof slate, known from the Polish patent description No. P. 339973, and the way of making it which involves placing the slates with overlap in order to create roofing imitating wooden shingles, the roof slates consisting of the upper and lower part. The lower part has got a row of multi-layered protrusions which have got the same number of layers and each protrusion is separated from the neighbouring multi-layered protrusion or protrusions with an interval or intervals and has got an outer layer and at least two bottom layers located under the outer layer.

[0003] Each bottom layer is laminated with the layer situated above in order to make a multi-layered laminated composite, which makes an integral part with the upper part, and the outer part of the highest layer of each protrusion is coplanar with the upper surface of the upper part.

[0004] Also the way of making the roof out of modular elements and the roofing modular element applicable in the construction of light roofs in facilities of industrial and general building, are known from the Polish patent description No. P. 319112. The way involves application of cold bent modular elements made of steel plate, whereby the next modular element is placed on supports and is fastened in four corners by affixing the foot of the modular element to the ground. Then the side surfaces of neighbouring modular elements are joined and the point of joining the elements from the outside is filled with sealing mass. The surface of the roof is covered by waterproof covering layer or waterproof covering layer with insulation.

[0005] Also known from the patent description No. P. 357412 is an insulation board made from mineral fibre with stiff surface layer, way of making it and application of the insulating material for covering roofs and facades, which means that the invention involves an insulation product made from mineral fibre with insulation layer from mineral fibre and at least one stiff surface layer, where the surface layer is mineral material combined with a binder, whereby the average density of the insulation layer containing mineral fibres and the binder are 50 - 300 kg/m³ and the average density of the stiff surface cover is at least 450 kg/m³.

[0006] Also known from the Polish patent No. 184727 is the way of making the thermal insulation boards, intended especially for roofings, which involves covering a polystyrene foam board with two types of adhesive; polyurethane and synthetic quick-drying one, whereby the quick-drying adhesive is applied on the board of a surface smaller than 5% of the surface of the board, then on the board prepared this way is placed a strip of asphalt tar paper, a little wider than the width of the board, and then it is pressed down. After that the strip of tar paper

is cut in such a way that the tar paper strips are a little longer than the length of the board.

[0007] Also known from the Polish patent No. P. 341745 is fire-resistant roof band, roofing system and manner of placing the roofing on the surface of the roof, intended to be used as the first layer on non-laminated insulation boards which are sensitive to melting. It contains a bitumen layer, a bearing element used near the bottom side of the bitumen layer, and on the bottom side of the roof band a fire-resistant layer of metal foil. The roof band is fastened on the roof mechanically and covered with a bitumen layer of roofing material which is placed by means of the burning method.

[0008] Known methods of making roofings involve separate placing of subsequent layers of a roof, i. e. the thermal insulation layer which consists of one or several layers of polystyrene foam, different kinds of foam, different kinds of wool, the upper layer of which may be covered with underlay tar paper and a layer of water insulation consisting of one or several layers of covering materials, especially tar paper.

[0009] Performing roofing by means of known methods is time-consuming and expensive because it requires placing all layers of the roof separately in the course of the building process, i. e. placing and fastening to the base of the roof the thermal insulation layer, which consists of one or several layers of polystyrene foam, different kinds of foam, different kinds of wool, the upper layer of which may be covered with underlay tar paper and a layer of water insulation containing of one or several layers of tar paper depending on individual requirements for making the roofing. It should be noted that each layer of the tar paper, in the known methods, except for the layer of underlay tar paper which may cover the upper surface of the thermal insulation layer, is placed separately by means of hot-stamping, mechanical fastening or both methods together.

[0010] The essence of the invention rests in simplifying the roofing construction by creating ready-made multi-layered roofing elements whose position in relation to each other on the prepared base and their interconnection allows to obtain roofing which ensures full thermal and water insulation. The full thermal and water insulation are provided on the stage of manufacturing the ready-made modular elements because all layers which comprise a given module are joined together in a manufacturing plant which guarantees perfect fitting of the neighbouring thermal and water insulation layers. The essence of the invention is also reflected in the fact of eliminating many performance mistakes, which are frequently present as a result of making a roof by means of the traditional method, and the possibility of making the roofing by less experienced workers. As ready-made multi-layered modular elements they may be easily supplied to a building site, especially in the case of roof constructions with large inclination or/and multi hipped constructions, and they are suitable both in the case of making new roofings and in renovating old ones. The ready-

made multi-layered roofing modules consist of a thermal insulation layer, in particular polystyrene foam boards, different kinds of foam and mineral wool and a water insulation layer which comprise one or more layers of tar paper or one or several layers of covering materials for which bitumen was used.

[0011] The multi-layered roofing module, according to the invention, consists of a thermal insulation layer, in particular of a polystyrene foam board or/and a mineral wool board or/and different types of wool and foam whose upper plate is covered evenly with bituminous mass by means of e. g. combs. On such a surface prepared this way is put a water insulation covering layer, in the form of underlay tar paper, which is joined with the thermal insulation board by means of press rollers. The press rollers apply appropriate pressure and allow to join the thermal insulation layer with the water covering layer precisely and tightly, eliminating all air bubbles caught between the neighbouring layers. Then, on the element prepared this way there is put once again the bituminous mass which is covered with the second water insulation layer in the form of the underlay tar paper, and all that is joined by means of press rollers. Then on the underlay tar paper layer there is put again the bituminous mass which is covered with the third water insulation layer in the form of weldable tar paper of outer covering, and all that is joined by means of press rollers creating a multi-layered roofing module. Using the press rollers several times allows to obtain a multi-layered roofing module whose layers are joined tightly and inseparably and are deprived of air bubbles. The water insulation covering layer applied in the multi-layered roofing module on the basis of the invention, in particular in the form of underlay tar paper, is wider and longer than the thermal insulation board. The subsequent water insulation layers applied in the multi-layered roofing module on the basis of the invention, in particular in the form of underlay tar paper and weldable tar paper of outer covering, are joined with each other and with the water insulation covering layer with an appropriate shift so that they create a system of overlaps. According to the invention the multi-layered roofing module may consist only of two water insulation layers in the form of the water insulation covering layer, in particular in the form of underlay tar paper and water insulation layer, in particular in the form of weldable tar paper of outer covering.

[0012] Making roofing out of the multi-layered roofing modules fastened to the base by means of mechanical fasteners or/and adhesives allowed to be used in the building industry, according to the invention involves putting the multi-layered roofing modules on the roof surface in such a way that the multi-layered roofing modules with a system of overlaps joined with the system of overlaps of the other multi-layered roofing modules overlap creating a tight lock and a tight roofing surface. According to the invention making roofing out of the multi-layered roofing modules involves joining the overlaps by means of welding them, in particular by applying high temperature.

ture.

[0013] In the multi-layered roofing module, which consists of thermal and water insulation layers, according to the invention, the upper plane of the thermal insulation board (1), in particular a board of polystyrene foam or/and mineral wool or/and different types of wool and foam, is evenly covered with bituminous mass, on which there is put water insulation covering layer (2), in particular in the form of underlay tar paper (1), which is joined with the thermal insulation board by means of press rollers, and then on the thermal insulation covering layer (2) in the form of underlay tar paper there is put the bituminous mass on which the second water insulation layer (3) is placed, in particular in the form of underlay tar paper, and all that is joined by means of press rollers, and then on the layer of the underlay tar paper (3) there is put bituminous mass on which the third water insulation layer (4) is placed, in particular in the form of weldable tar paper of outer covering and all that is joined by means of press rollers creating the multi-layered roofing module.

[0014] According to the invention the essence of the multi-layered roofing module is that the water insulation covering layer, in particular in the form of underlay tar paper (1), joined with the thermal insulation board (2), is wider and longer than the thermal insulation board (1). According to the invention the essence of the multi-layered roofing module is that subsequent water insulation layers, in particular in the form of underlay tar paper (3) and layers of the weldable tar paper of outer covering (4), are joined with each other and the water insulation covering layer (2) with an appropriate shift so that they create a system of overlaps.

[0015] According to the invention the essence of the multi-layered roofing module is that it consists only of two water insulation layers in the form of water insulation covering layer (2), in particular in the form of underlay tar paper, and the water insulation layer (4), in particular in the form of the weldable tar paper of outer covering.

[0016] Making roofing out of multi-layered roofing modules fastened to the base by means of mechanical fasteners (5) or/and adhesives allowed to be used in the building industry, according to the invention, involves putting the multi-layered roofing modules on the roof surface in such a way that the multi-layered roofing modules with a system of overlaps joined with the system of overlaps of the other multi-layered roofing modules overlap creating a tight lock and a tight roofing surface. According to the invention making roofing out of the multi-layered roofing modules involves joining the overlaps by means of welding them, in particular by applying high temperature.

[0017] The invention is presented on the example of making it, in the drawings where:

Drawing 1/4 depicts the multi-layered roofing module in the top plan,

Drawing 2/4 depicts the side view of the multi-layered roofing module,

Drawing 3/4 depicts the side view of the way of making the roofing,
 Drawing 4/4 depicts the way of making the roofing in the top plan.

[0018] The multi-layered roofing module and way of making the roofing out of the multi-layered roofing modules according to the invention are marked by:

- simplification of the roofing construction by creating ready-made multi-layered roofing elements whose position in relation to each other on the prepared base and their interconnection allows to obtain roofing which ensures full thermal and water insulation, 10
- elimination of many performance mistakes which are frequently present as a result of making a roof by means of the traditional method, 15
- providing the possibility of making the roofing by less experienced workers,
- easy delivery to a building site, especially in the case of roof constructions with large inclination or/and in multi hipped constructions, 20
- suitability both in the case of making new roofings and in renovating old ones,
- reduction of costs by making roofing in the place where it will be used, 25
- reduction of works connected with using open fire during the assembly of elements. 30

Claims

1. The multi-layered roofing module which consists of thermal and water insulation layers, **characterized in that** the upper plate of the thermal insulation board (1), in particular of a polystyrene foam board or/and a mineral wool board or/and different types of wool and foam, is covered evenly with a layer of bituminous mass on which there is put a water insulation covering layer (2), in the form of underlay tar paper, which is joined with the thermal insulation board (1) by means of press rollers, then on the water insulation covering layer (2), in the form of underlay tar paper, there is put evenly a layer of bituminous mass on which the second water insulation layer is put (3), in the form of underlay tar paper, all that is joined by means of press rollers, then on the layer of the underlay tar paper (3) there is put a layer of bituminous mass on which the third water insulation layer is put (4), in particular weldable tar paper of outer covering, and all that is joined by means of press rollers creating a multi-layered roofing module. 35 40 45 50
2. The invention, according to claim 1, **characterized in that** the water insulation covering layer (2), in the form of underlay tar paper, joined with the thermal insulation board (1), is wider and longer than the thermal insulation board (1). 55

3. The invention, according to claim 1, **characterized in that** the subsequent water insulation layers, in particular in the form of underlay tar paper (3) and layers of the weldable tar paper of outer covering (4), are joined with each other and the water insulation covering layer (2) with an appropriate shift so that they create a system of overlaps. 5
4. The invention, according to claim 1, **characterized in that** it consists of only two layers of water insulation in the form of the water insulation covering layer (2), in particular underlay tar paper, and water insulation layer (4), in particular in the form of weldable tar paper of outer covering. 10 15
5. Making roofing out of multi-layered roofing modules fastened to the base by means of mechanical fasteners (5) or/and adhesives allowed to be used in the building industry, **characterized in that** the multi-layered roofing modules, according to claims 1 and 4, involves putting the multi-layered roofing modules on the roof surface in such a way that the multi-layered roofing modules with a system of overlaps joined with the system of overlaps of the other multi-layered roofing modules overlap creating a tight lock and a tight roofing surface. 20 25 30
6. Making roofing out of the multi-layered roofing modules, according to claim 5, **characterized in that** it involves joining the overlaps by means of welding them, in particular by applying high temperature. 35 40 45 50

Fig.1

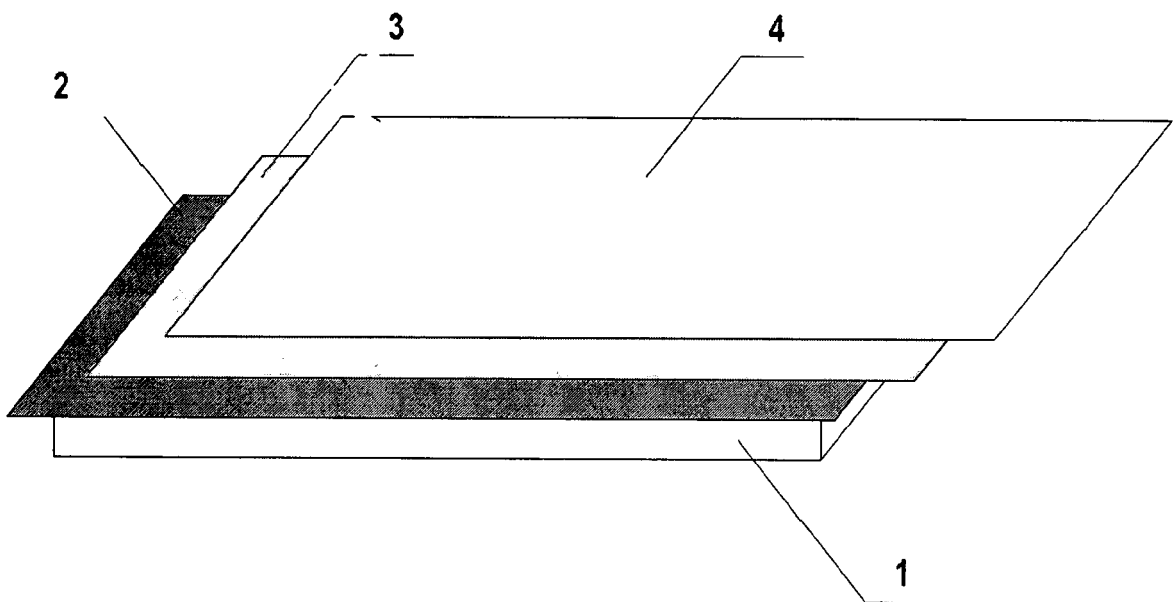


Fig.2

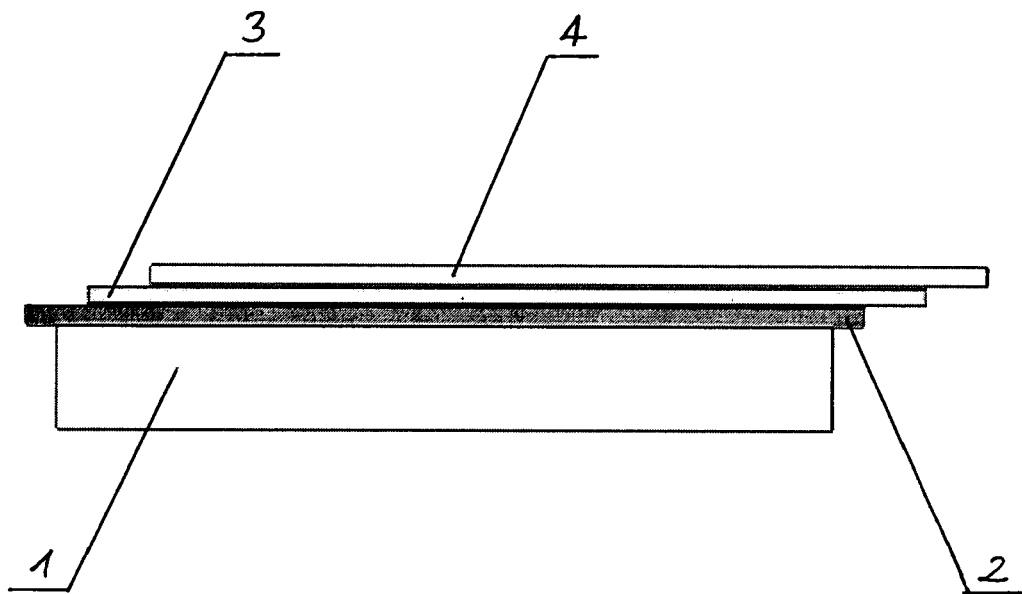


Fig.3

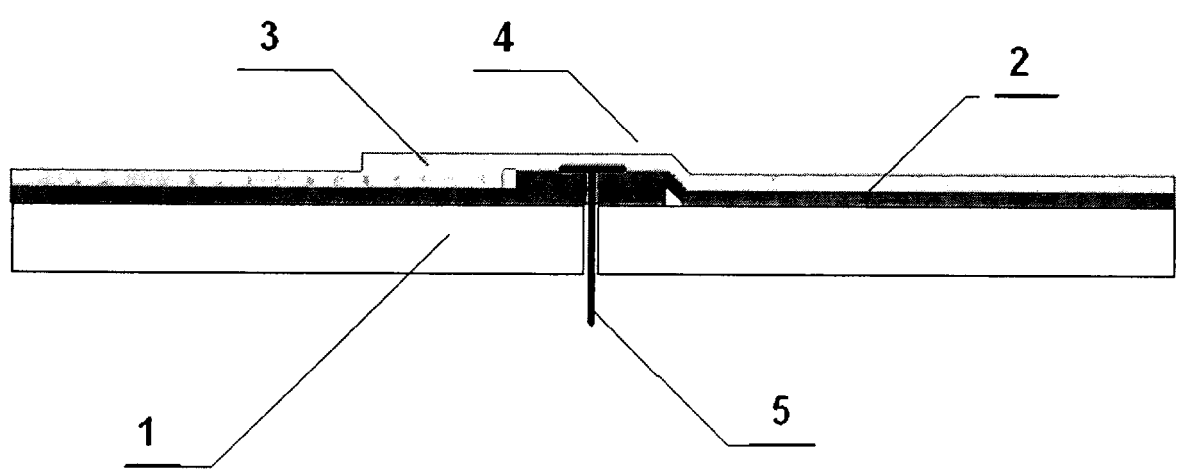
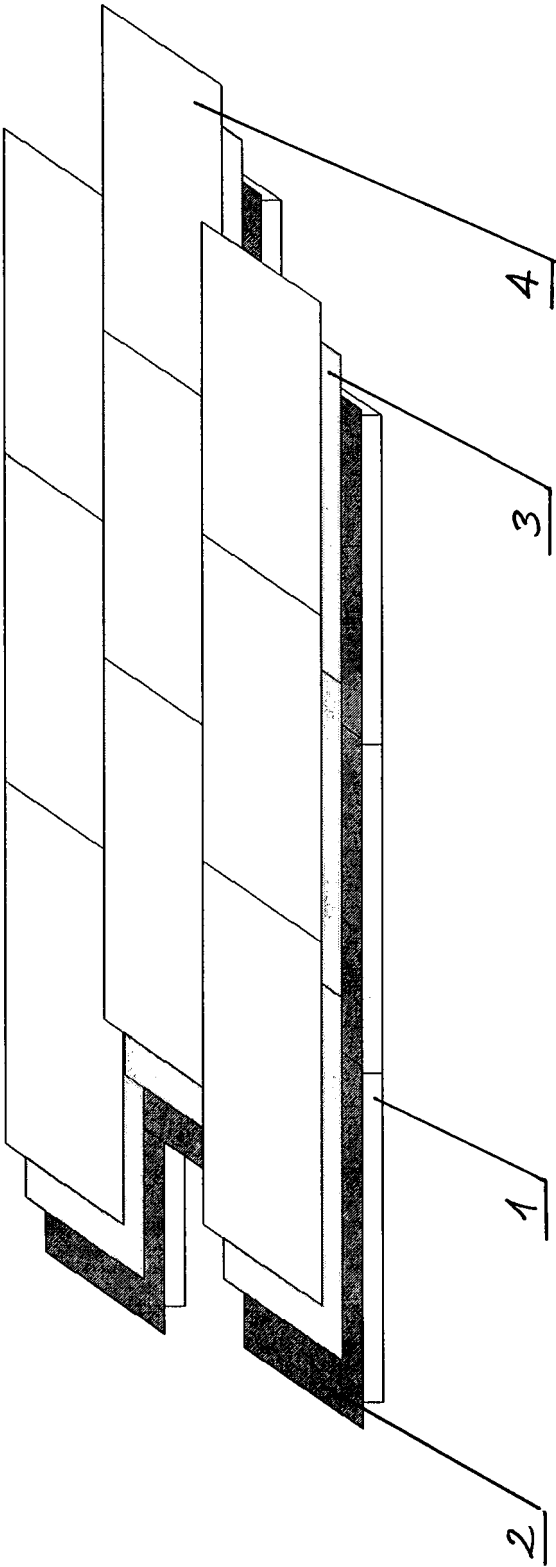


Fig.4





EUROPEAN SEARCH REPORT

Application Number
EP 09 46 0034

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	GB 2 052 387 A (TAJIMA ROOFING CO) 28 January 1981 (1981-01-28) * figure 3 *	1	INV. E04D3/35 E04D3/36 E04D5/14
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		12 April 2010	Bauer, Josef
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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