



(51) International Patent Classification:

F03D 1/06 (2006.01) F03D 80/40 (2016.01)

(21) International Application Number:

PCT/DK2017/050138

(22) International Filing Date:

04 May 2017 (04.05.2017)

(25) Filing Language:

English

(26) Publication Language:

English

Published:

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

(30) Priority Data:

PA 2016 70297 04 May 2016 (04.05.2016) DK

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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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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,

(54) Title: IMPROVED ELECTRO-THERMAL HEATING

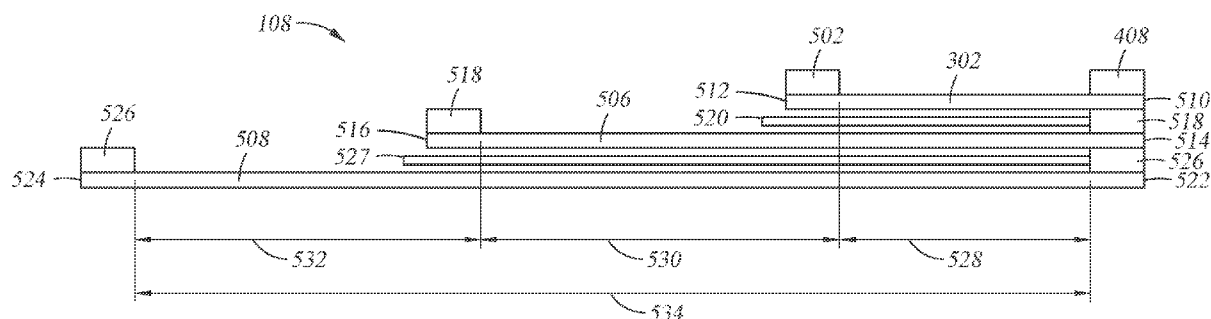


Fig. 5C

(57) Abstract: Examples of the present disclosure generally relate to wind turbine blades configured to minimize or eliminate buildup of ice on the blades. In order to maintain an ice free surface on a wind turbine blade, a plurality of ETH panels are embedded in the wind turbine blade to heat the wind turbine blade. Two or more ETH panels of the plurality of ETH panels are overlapping in order to provide a predetermined heat flux over a region covered by the two or more ETH panels.



IMPROVED ELECTRO-THERMAL HEATING

BACKGROUND

Field

Examples presented in this disclosure generally relate to Electro-Thermal
5 Heating of wind turbine blades.

Description of the Related Art

Modern power generation and distribution networks increasingly rely on
renewable energy sources, such as wind turbines. In some cases, the wind turbines
may be substituted for conventional, fossil fuel-based generators. The formation of
10 ice on the surface of the blades of a wind turbine is a relatively common problem,
even in moderate climates. The build-up and spread of ice on the blade surface, in
particular on the tip portion of the blade, changes the blade aerodynamics and may
also lead to increased vibrations and loading on the blade, all of which lead to a
reduction in power output. In more severe cases, the turbine may need to be shut
15 down upon accumulation of ice to prevent excessive loading of the blades, which
may damage or prematurely fatigue the blade components.

Therefore, an improved wind turbine is needed which includes methods and
apparatus for preventing accumulation of ice on wind turbine blades.

SUMMARY

20 One example of the present disclosure relate to a wind turbine blade including
a layer and a plurality of Electro-Thermal Heating (ETH) panels disposed on the
layer. Two or more electro-thermal heating panels of the plurality of electro-thermal
heating panels overlap.

Another example of the present disclosure relates to a wind turbine generator
25 including a tower, a nacelle connected to the tower, a hub connected to the nacelle,
and a plurality of blades connected to the hub. Each blade of the plurality of blades

includes a layer and a plurality of electro-thermal heating panels disposed on the layer. Two or more electro-thermal heating panels of the plurality of electro-thermal heating panels overlap.

5 The term ETH panels disposed on the layer is intended to encompass the ETH elements being disposed on an outer surface of the layer, on an inner surface of the layer and/or embedded within the layer. The layer may be any layer of the structure of the wind turbine blade, e.g. glass, carbon, core material and so on. The ETH panel may be any suitable ETH panel for the purpose of heating the blades of a wind turbine. The ETH panel may be solid or flexible and may be comprised of a veil
10 of conductive fibres, carbon, metal, a mesh, a substrate coated with a conductive material such as carbon, and so on.

BRIEF DESCRIPTION OF THE DRAWINGS

So that the manner in which the above recited features of the present
15 disclosure can be understood in detail, a more particular description of the disclosure, briefly summarized above, may be had by reference to examples, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical examples of this disclosure and are therefore not to be considered limiting of its scope, for the disclosure may admit to other equally effective
20 examples.

Figure 1 illustrates a diagrammatic view of a horizontal-axis wind turbine generator (WTG), according to one example.

Figure 2 illustrates a diagrammatic view of typical components internal to the nacelle 104 and tower of the WTG of Figure 1, according to one example.

25 Figure 3 is a schematic view of a control system for one or more electro-thermal heating (ETH) panels inside the WTG of Figure 1, according to one example.

Figures 4A – 4B are perspective views of the blade of Figure 1, showing a portion of the embedded ETH panel, according to one example.

Figures 5A – 5C are schematic section views of a portion of one or more ETH panels, according to one example.

To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures. It is contemplated that elements disclosed in one example may be beneficially utilized on other examples without specific recitation.

DESCRIPTION OF EXAMPLE EMBODIMENTS

Examples of the present disclosure generally relate to wind turbine blades configured to minimize or eliminate buildup of ice on the blades. In order to maintain an ice free surface on a wind turbine blade, a plurality of ETH panels are embedded in the wind turbine blade to heat the wind turbine blade. Two or more ETH panels of the plurality of ETH panels are overlapping in order to provide a predetermined heat flux over a region covered by the two or more ETH panels.

Figure 1 illustrates a diagrammatic view of a horizontal-axis wind turbine generator (WTG) 100. The WTG 100 typically includes a tower 102 and a nacelle 104 located at the top of the tower 102. A wind turbine rotor 106 may be connected with the nacelle 104 through a low speed shaft extending out of the nacelle 104. As shown, the wind turbine rotor 106 includes three rotor blades 108 mounted on a common hub 110, but may include any suitable number of blades, such as two, four, five, or more blades. The blade 108 typically has an aerodynamic shape with a leading edge 112 for facing into the wind, a trailing edge 114 at the opposite end of a chord for the blade 108, a tip 116, and a root 118 for attaching to the hub 110 in any suitable manner. For some examples, the blades 108 may be connected to the hub 110 using pitch bearings 120 such that each blade 108 may be rotated around its longitudinal axis to adjust the blade's pitch.

Figure 2 illustrates a diagrammatic view of typical components internal to the nacelle 104 and tower 102 of the WTG 100. When the wind 200 impacts on the blades 108, the rotor 106 spins and rotates a low-speed shaft 202. Gears in a

gearbox 204 mechanically convert the low rotational speed of the low-speed shaft 202 into a relatively high rotational speed of a high-speed shaft 208 suitable for generating electricity using a generator 206. The WTG 100 may also include a braking system 212 for emergency shutdown situations and/or to lock the rotor in a required position.

A controller 210 may sense the rotational speed of one or both of the shafts 202, 208. The controller 210 may receive inputs from an anemometer 214 (providing wind speed) and/or a wind vane 216 (providing wind direction). Based on information received, the controller 210 may send a control signal to one or more of the blades 108 in an effort to adjust the pitch 218 of the blades. By adjusting the pitch 218 of the blades with respect to the wind direction, the rotational speed of the rotor (and therefore, the shafts 202, 208) may be increased or decreased. Based on the wind direction, for example, the controller 210 may send a control signal to an assembly comprising a yaw motor 220 and a yaw drive 222 to rotate the nacelle 104 with respect to the tower 102, such that the rotor 106 may be positioned to face more (or, in certain circumstances, less) upwind.

In cold climate regions, ice may form on the blades 108, which can reduce the speed of the rotation of the blades 108. In order to maintain an ice free surface on the blades 108, one or more Electro Thermal Heating (ETH) panels may be utilized. Figure 3 is a schematic view of a control system 300 for one or more ETH panels 302 inside the WTG 100. The control system 300 may include a plurality of blade control and power distribution boxes 304, hub control and power distribution box 306, a slip ring 314, a power source 316, and a system controller 308. The one or more ETH panels 302 may be embedded in each blade 108 and may be controlled by blade control and power distribution boxes 304 located in the root 118 of each blade 108. There may be one blade control and power distribution boxes 304 for each blade 108. In one example, there are up to 32 ETH panels 302 embedded in each blade 108, such as 16 ETH panels 302 covering a windward blade surface and 16 ETH panels 302 covering a leeward blade surface. In one example, the one or more ETH panels 302 cover the entire blade 108 except for the root 118. Electrical power may

be supplied to the one or more ETH panels 302 from blade power and distribution box 304 located in the blade root. The blade power and distribution box 304 may include relays for switching on and off the one or more ETH panels 302 in each blade 108. The blade power and distribution box 304 may also include lightning protection components. From the blade power and distribution box 304, power cables are routed to each ETH panel 302. In one example, the WTG 100 includes three blades and three power cables 307, and each power cable 307 connects the hub power and distribution box 306 to a corresponding blade power and distribution box 304 located in a corresponding blade 108.

The hub control and power distribution box 306 may be electrically connected a slip ring 314 located inside the nacelle 104. The slip ring 314 may be electrically connected to a power source 316 located inside the nacelle 104. The power source 316 may include a circuit breaker switch to allow the system to be de-energized. Electrical power may be supplied from the power source 316 through the hub interface of the nacelle 104 via the slip ring 314 and may be supplied to the one or more ETH panels 302 in each blade 108 via the slip ring 314, the hub control and power distribution box 306, and the blade control and power distribution box 304. The control and operation of the control system 300 may be achieved by remote connection via the system controller 308 and communication through the slip ring 314. The system controller 308 may be connected to the slip ring 314 to allow communication to the hub control and power distribution box 306. Each blade control and power distribution box 304 may be electrically connected to a communication link through the slip ring 314. Control signals provided to the blade control and power distribution box 304 from the system controller 308 are communicated through the slip ring 314. In one example this may be through a wireless link. In another example this may be through an electrical or optical fibre link.

The control system 300 may utilize duty cycling (*i.e.*, switching on and off relays over a period of time) to achieve power distribution across the one or more ETH panels 302 in each blade 108. During severe icing conditions ideally all of the ETH panels 302 embedded in the blades 108 should be switched on continuously.

The slip ring 314 may have a power or current constraint which will restrict the energy drawn from the power source 316 to the ETH Panels 302. To maximize the potential power available to the ETH panels 302, the control system 300 will focus on a fixed and predetermined set of zones having combined energy consumption less than the capabilities of the slip ring 314.

Figure 4A is a perspective view of the blade 108 showing a portion of the embedded ETH panel 302. As shown, the ETH panel 302 may be embedded in the blade 108, such as between a first layer 402 and a second layer 404 of the blade 108. The ETH panel 302 may be any suitable resistive heating element. In one example, each ETH panel 302 is a carbon mesh. One or more busbars 408 are disposed across the ETH panel 302 for supplying power to the ETH panel 302, as shown in Figure 4B.

Figures 5A – 5C are schematic section views of the one or more ETH panels 302, according to one example. As shown in Figure 5A, the ETH panel 302 and one or more, such as two, busbars 408 coupled to the ETH panel 302 are embedded in the blade 108 (Figure 4A). The areal weight of the ETH panel 302 may range from about 2 g/m² to about 200 g/m². The ETH panel 302 is capable of providing a predetermined heat flux, which is determined by one or more of the electrical resistance of the material used, the length of the ETH panel, and the width of the ETH panel for the ETH panel 302. The heat flux provided by the ETH panel 302 may range from about 0.25 kW/m² to about 20 kW/m². The ETH panel 302 may be rectangular or other suitable shape. One or more busbars 408 may be electrically connected to the ETH panel 302 for conducting electrical power to the ETH panel 302. In one embodiment, two busbars 408 are electrically connected to opposite edge portions of the ETH panel 302. The busbars 408 may extend along a width of the ETH panel 302 or extend along a length of the ETH panel 302. The busbar 408 may be made of a thin strip of conductive metal, such as copper.

In order to increase the heat flux, multiple ETH panels may be stacked. As shown in Figure 5B, a second ETH panel 502 may be disposed between the ETH

panel 302 and the first layer 402 (Figure 4A). The first ETH panel 302 and the second ETH panel 502 may have the same dimensions (e.g., length and width). The second ETH panel 502 may be the same as the ETH panel 302, and may be electrically connected to one or more busbars 504. The one or more busbars 504 may be electrically connected to the ETH panel 302, and each busbar 504 may be aligned with a corresponding busbar 408. The busbars 504 may be the same as the busbar 408. An insulation layer 505 may be disposed between the ETH panel 302 and the ETH panel 502, between the busbars. The insulation layer 505 may be made of any suitable electrically insulative material, such as glass fibre. In some embodiments, ETH panels 302, 502 may be capable of providing the same heat flux. In other embodiments, ETH panels 302, 502 may be capable of providing different heat fluxes. In one embodiment, each ETH panel 302, 502 is capable of providing a heat flux of 5 kW/m^2 , and the total heat flux provided by the two stacked, or completely overlapping, ETH panels 302, 502 is 10 kW/m^2 . In some embodiments, the ETH panels may be completely overlapping in order to provide a uniform heat flux over an area covered by the ETH panels. In other embodiments, the ETH panels may be partially overlapping in order to provide different heat fluxes within the area covered by the ETH panels.

Figure 5C illustrates three partially overlapping ETH panels according to one example. As shown in Figure 5C, three partially overlapping ETH panels 302, 506, 508 may be disposed between the first layer 402 and the second layer 404 (Figure 4A). The ETH panel 506 may be disposed over the ETH panel 508, and the ETH panel 302 may be disposed over the ETH panel 506. The first ETH panel 302 may include a first edge portion 510 and a second edge portion 512 opposite the first edge portion 510. The first and second edge portions 510, 512 each may be electrically connected to a busbar 408. The second ETH panel 506 may be longer than the first ETH panel 302 and may be partially overlapping with the first ETH panel 302 (*i.e.*, a portion of the second ETH panel 506 does not overlap with the first ETH panel 302). The second ETH panel 506 may include a first edge portion 514 and a second edge portion 516 opposite the first edge portion 514. The first and second edge portions 514, 516 each may be electrically connected to a busbar 518. The first

edge portion 510 of the first ETH panel 302 may be aligned with the first edge portion 514 of the second ETH panel 506, and the busbar 408 disposed on the first edge portion 510 of the first ETH panel 302 may be aligned with the busbar 518 disposed on the first edge portion 514 of the second ETH panel 506. Because the second
5 ETH panel 506 is longer than the first ETH panel 302, the second edge portion 516 of the second ETH panel 506 does not align with the second edge portion 512 of the first ETH panel 302, and the busbar 518 disposed on the second edge portion 516 of the second ETH panel 506 does not align with the busbar 408 disposed on the second edge portion 512 of the first ETH panel 302. An insulation layer 520 may be
10 disposed between the first ETH panel 302 and the second ETH panel 506. The insulation layer 520 may not extend the entire length of the second ETH panel 506. The insulation layer 520 may extend further than the second edge portion 512 of the first ETH panel 302 by a predetermined distance in order to prevent an electrical connection between the busbar 408 positioned on the second edge portion 512 of
15 the first ETH panel 302 and the second ETH panel 506. The insulation layer 520 may be made of the same material as the insulation layer 505.

The third ETH panel 508 may be longer than the second ETH panel 506 and may be partially overlapping with the second ETH panel 506 (*i.e.*, a portion of the third ETH panel 508 does not overlap with the second ETH panel 506). The third
20 ETH panel 508 may include a first edge portion 522 and a second edge portion 524 opposite the first edge portion 522. The first and second edge portions 522, 524 each may be electrically connected to one busbar 526. The first edge portion 514 of the second ETH panel 506 may be aligned with the first edge portion 522 of the third ETH panel 508, and the busbar 518 disposed on the first edge portion 514 of the
25 second ETH panel 506 may be aligned with the busbar 526 disposed on the first edge portion 522 of the third ETH panel 508. Because the third ETH panel 508 is longer than the second ETH panel 506, the second edge portion 524 of the third ETH panel 508 does not align with the second edge portion 516 of the second ETH panel 506, and the busbar 526 disposed on the second edge portion 524 of the third ETH
30 panel 508 does not align with the busbar 518 disposed on the second edge portion 516 of the second ETH panel 506. An insulation layer 527 may be disposed between

the second ETH panel 506 and the third ETH panel 508. The insulation layer 527 may not extend the entire length of the third ETH panel 508. The insulation layer 527 may extend further than the second edge portion 516 of the second ETH panel 506 by a predetermined distance in order to prevent an electrical connection between the busbar 518 positioned on the second edge portion 516 of the second ETH panel 506 and the third ETH panel 508. The insulation layer 527 may be made of the same material as the insulation layer 505.

The partially overlapping ETH panels 302, 506, 508 may provide different heat fluxes within the region 534 covered by the partially overlapping ETH panels 302, 506, 508. In some embodiments, each individual ETH panel 302, 506, 508 may be capable of providing the same heat flux, but the heat flux within the region 534 may be different due to the partially overlapping design (overlapped ETH panels provide cumulative heat flux). For example, each ETH panel 302, 506, 508 is capable of providing a heat flux of about 5 kW/m^2 . A first region 528 within the region 534 may be capable of providing a heat flux of about three times 5 kW/m^2 , which is 15 kW/m^2 , since three ETH panels 302, 506, 508 are present in the first region 528 of the region 534. A second region 530 within the region 534 may be capable of providing a heat flux of about two times 5 kW/m^2 , which is 10 kW/m^2 , since two ETH panels 506, 508 are present in the second region 530 of the region 534. A third region 532 within the region 534 may be capable of providing a heat flux of about 5 kW/m^2 , since one ETH panel 508 is present in the third region 532 of the region 534. In other embodiments, each individual ETH panel 302, 506, 508 may be capable of providing different heat fluxes. For example, the first ETH panel 302 is capable of providing a heat flux of about 2.5 kW/m^2 , and the second and third ETH panels 506, 508 each is capable of providing a heat flux of about 5 kW/m^2 . The first region 528 within the region 534 may be capable of providing a heat flux of about 12.5 kW/m^2 , since three ETH panels 302, 506, 508 are present in the first region 528 of the region 534. The second region 530 within the region 534 may be capable of providing a heat flux of about 10 kW/m^2 , since two ETH panels 506, 508 are present in the second region 530 of the region 534. The third region 532 within the region 534 may be capable of providing a

heat flux of about 5 kW/m², since one ETH panel 508 is present in the third region 532 of the region 534.

The examples given hereinabove are not exhaustive or limiting in terms of the arrangement of overlapping or partially overlapping ETH panels.

- 5 For example, in terms of overlapping ETH panels, a second ETH panel with smaller dimensions than a first ETH panel may be positioned in the centre of the first ETH panel, towards an edge of the first ETH panel, or any other position on the first ETH panel to be fully overlapping.

- 10 In relation to partially overlapping ETH panels, the partial overlap may be in either or both of the length and width dimensions or directions and may include an overlap of any area percentage. For example, a second ETH panel may partially overlap a first ETH panel by 50% of the area of the second ETH panel and the point of overlap may be in the width direction, the length direction or in both the width and length directions.

- 15 Accordingly, the embodiments advantageously provides or enables different heating levels across the blade 108 by overlapping and/or partially overlapping two or more of the ETH panels in or on the blade 108. The embodiments further advantageously provide a heat flux generated in the area of overlap being substantially equivalent or equal to an accumulation of individual heat flux generated
20 by each of the overlapping ETH panels.

- In the preceding, reference is made to examples presented in this disclosure. However, the scope of the present disclosure is not limited to specific described examples. Instead, any combination of the preceding features and elements, whether related to different examples or not, is contemplated to implement and
25 practice contemplated examples. Furthermore, although examples disclosed herein may achieve advantages over other possible solutions or over the prior art, whether or not a particular advantage is achieved by a given example is not limiting of the scope of the present disclosure. Thus, the preceding aspects, features, examples,

and advantages are merely illustrative and are not considered elements or limitations of the appended claims except where explicitly recited in a claim(s). Likewise, reference to “the invention” shall not be construed as a generalization of any inventive subject matter disclosed herein and shall not be considered to be an
5 element or limitation of the appended claims except where explicitly recited in a claim(s).

In view of the foregoing, the scope of the present disclosure is determined by the claims that follow.

Claims:

1. A wind turbine blade, comprising:
a layer; and
a plurality of electro-thermal heating panels disposed on the layer, wherein two
5 or more electro-thermal heating panels of the plurality of electro-thermal heating
panels overlap.
2. The wind turbine blade according to claim 1, wherein the two or more electro-
thermal heating panels have one or more different lengths, different widths and
10 different resistances.
3. The wind turbine according to claim 1, wherein the two or more electro-thermal
heating panels have the same lengths, widths and resistances.
- 15 4. The wind turbine blade according to any one of the preceding claims, wherein
the two or more electro-thermal heating panels partially overlap in one or more
directions.
5. The wind turbine blade according to any one of the preceding claims, wherein
20 two or more electro-thermal heating panels of the plurality of electro-thermal heating
panels completely overlap.
6. The wind turbine blade according to any one of the preceding claims, wherein
each electro-thermal heating panel of the plurality of electro-thermal heating panels
25 comprises a first edge portion and a second edge portion opposite the first edge
portion; and a first busbar electrically connected to the first edge portion of each
electro-thermal heating panel and a second busbar electrically connected to the
second edge portion of each electro-thermal heating panel.

7. The wind turbine blade according to any one of the preceding claims, further comprising an insulation layer disposed between the overlapping electro-thermal heating panels.

5 8. The wind turbine blade according to claim 7, wherein the insulation layer covers an area of overlap between the overlapping electro-thermal panels.

9. The wind turbine blade according to claim 7 or 8, wherein the insulation layer disposed between the overlapping electro-thermal heating panels extends further
10 than a first edge portion and/or a second edge portion of at least one electro-thermal heating panel.

10. The wind turbine blade according to any one of the preceding claims, in which a heat flux generated in an area of overlap of two or more electro-thermal panels is
15 substantially equivalent to an accumulation of individual heat flux generated by each of the overlapping electro-thermal panels.

11. A wind turbine generator, comprising:
a tower;
20 a nacelle connected to the tower;
a hub connected to the nacelle; and
a plurality of blades connected to the hub, wherein each blade of the plurality of blades comprises:
a layer; and
25 a plurality of electro-thermal heating panels disposed on the layer,
wherein two or more electro-thermal heating panels of the plurality of electro-thermal heating panels overlap.

12. The wind turbine generator of claim 11, wherein the two or more electro-thermal heating panels have one or more different lengths, different widths and
30 different resistances.

13. The wind turbine generator of claim 11, wherein the two or more electro-thermal heating panels have the same lengths, widths and resistances.

5 14. The wind turbine generator of any one of claims 11 or 12, wherein the two or more electro-thermal heating panels partially overlap in one or more directions.

15. The wind turbine generator of any one of claims 11 to 14, wherein two or more electro-thermal heating panels of the plurality of electro-thermal heating panels
10 completely overlap.

16. The wind turbine generator according to any one of claims 11 to 15, wherein each electro-thermal heating panel of the plurality of electro-thermal heating panels comprises a first edge portion and a second edge portion opposite the first edge
15 portion; and a first busbar electrically connected to the first edge portion of each electro-thermal heating panel and a second busbar electrically connected to the second edge portion of each electro-thermal heating panel.

17. The wind turbine generator according to any one of claims 11 to 16, further
20 comprising an insulation layer disposed between the overlapping electro-thermal heating panels.

18. The wind turbine generator according to claim 17, wherein the insulation layer covers an area of overlap between the overlapping electro-thermal panels.

25

19. The wind turbine generator according to claim 17 or 18, wherein the insulation layer disposed between the overlapping electro-thermal heating panels extends further than a first edge portion and/or a second edge portion of at least one electro-thermal heating panel.

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20. The wind turbine generator according to any one of claims 11 to 19, in which a heat flux generated in an area of overlap of two or more electro-thermal panels is substantially equivalent to an accumulation of individual heat flux generated by each of the overlapping electro-thermal panels.

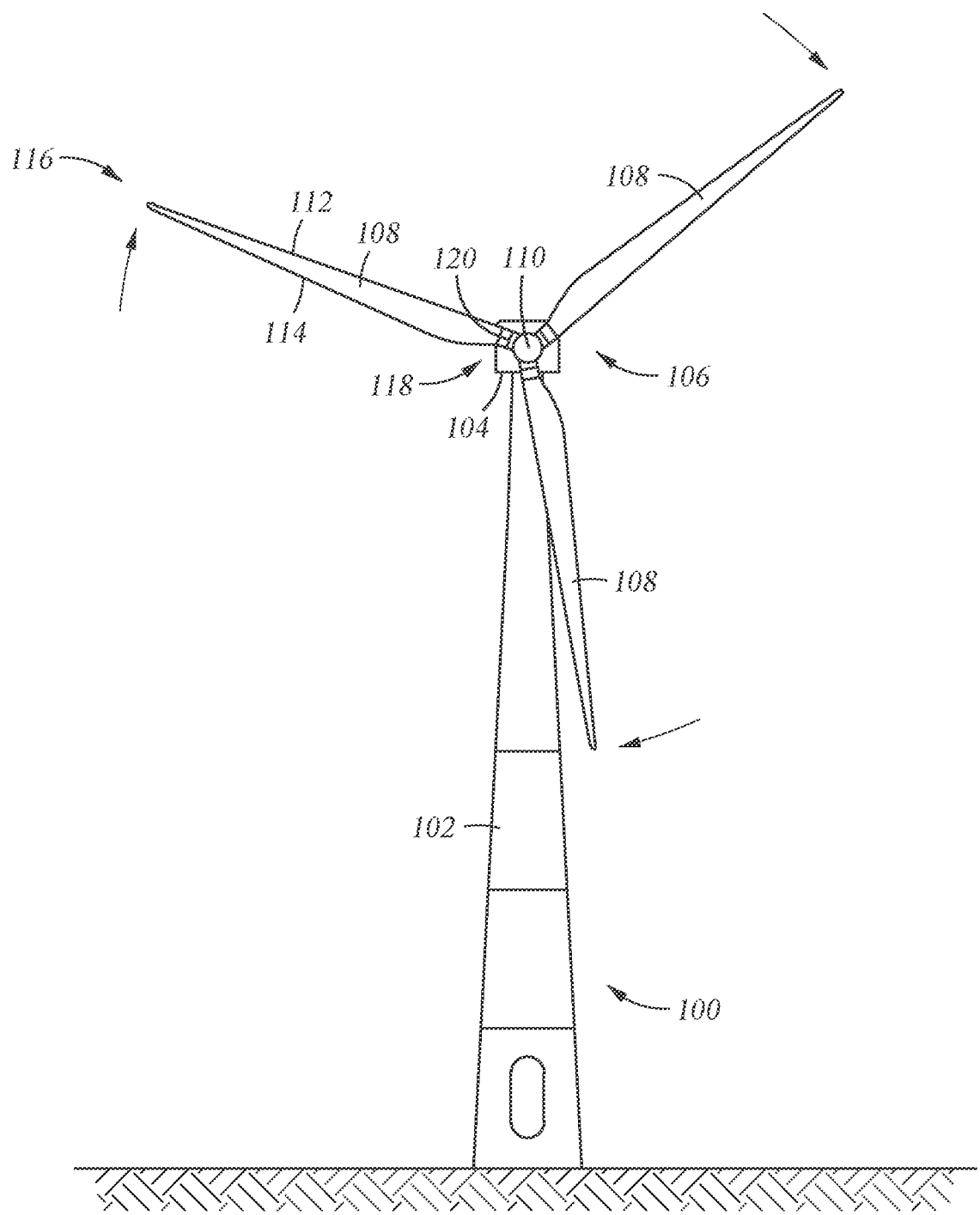
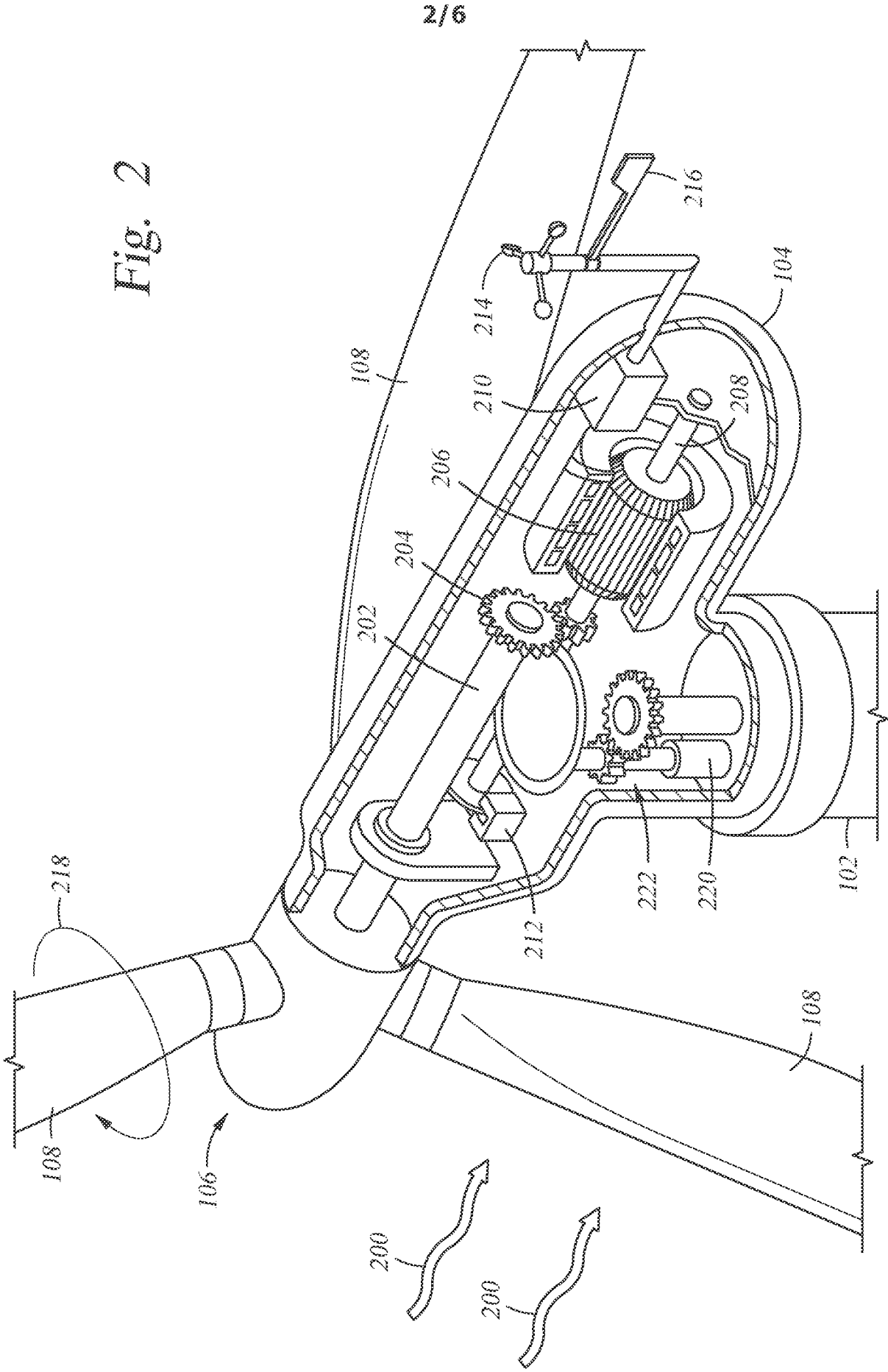


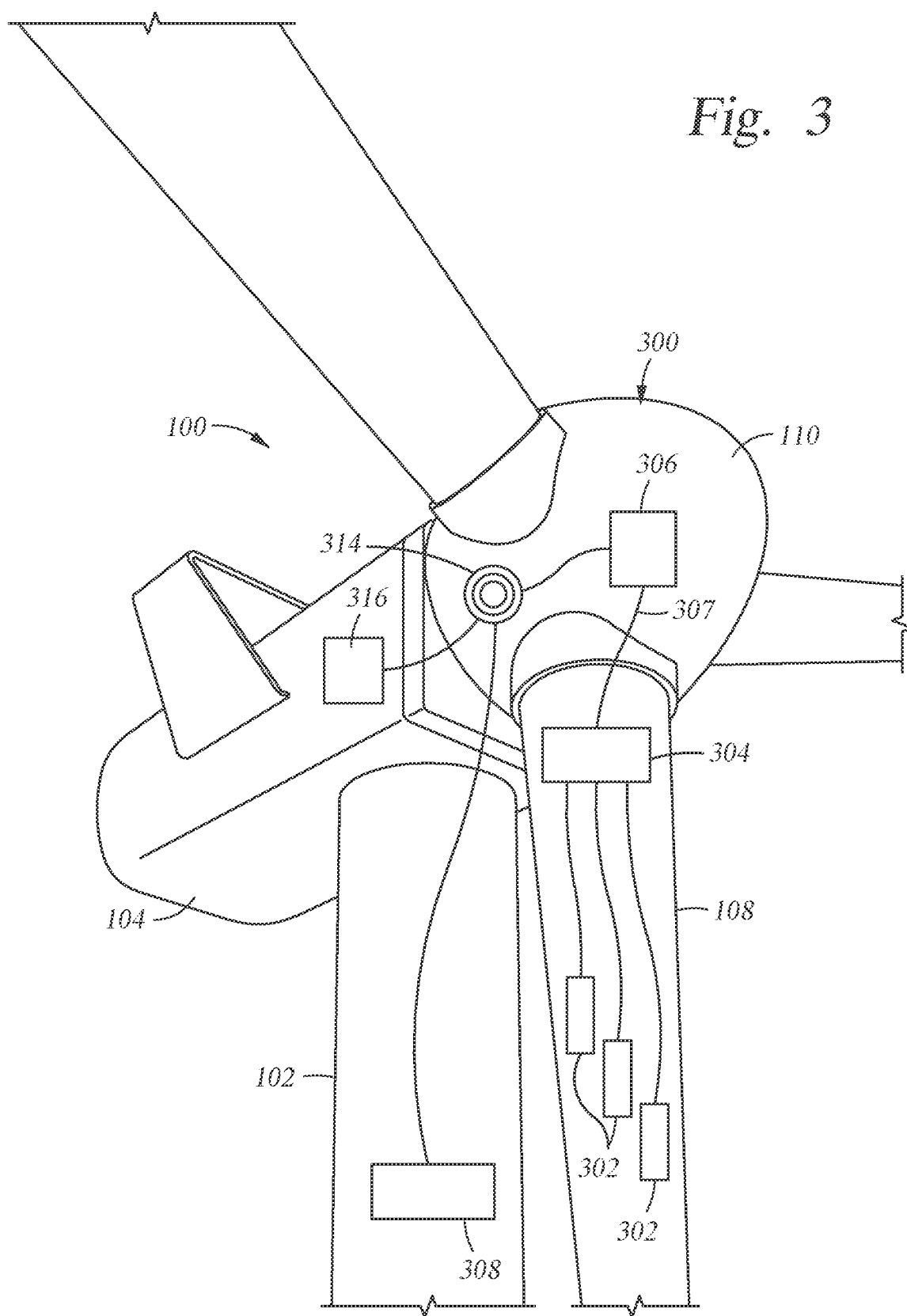
Fig. 1

Fig. 2



3/6

Fig. 3



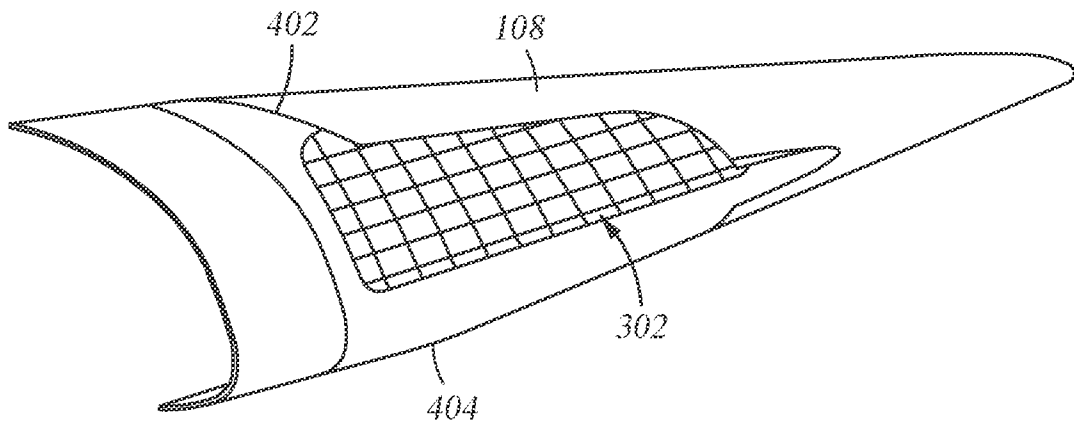


Fig. 4A

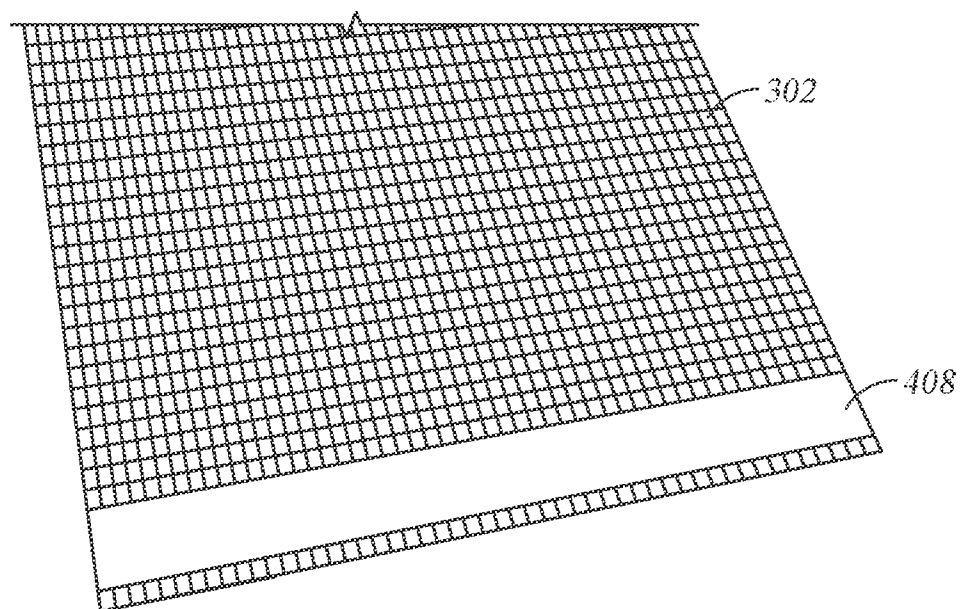


Fig. 4B



Fig. 5A

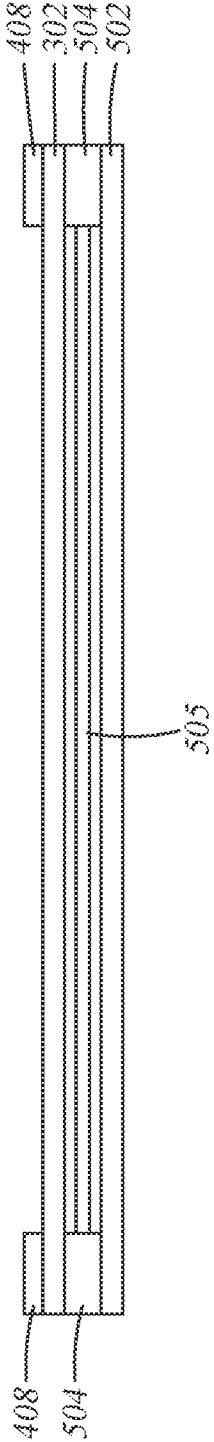


Fig. 5B

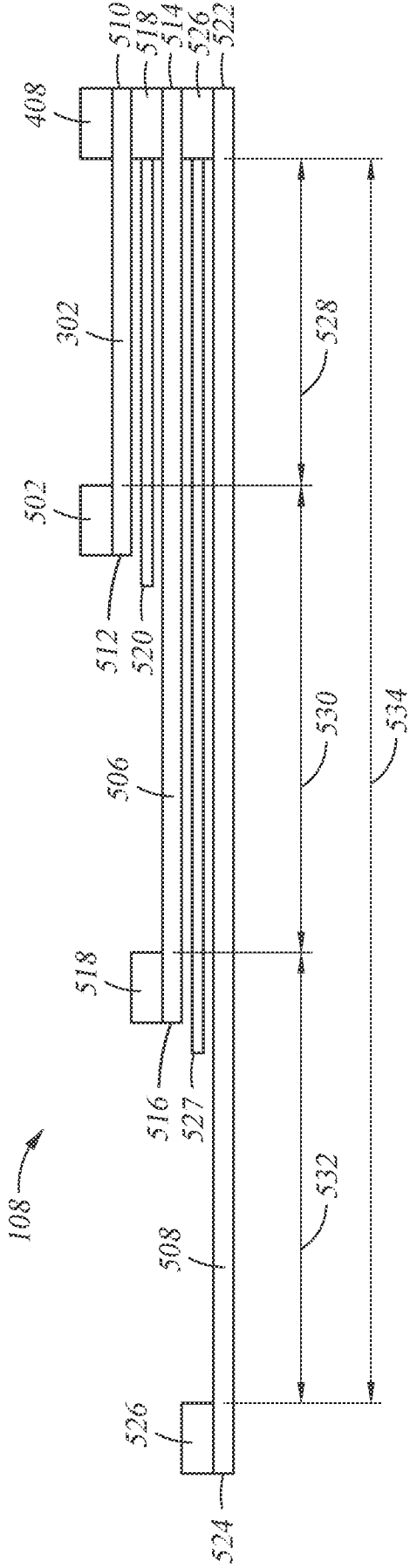


Fig. 5C

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2017/050138

A. CLASSIFICATION OF SUBJECT MATTER
INV. F03D1/06 F03D80/40
ADD.

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)
F03D

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/170992 A1 (LOEWE ASTRID [DE] ET AL) 4 July 2013 (2013-07-04) figures 2-5 paragraphs [0027], [0034], [0063] - [0071] -----	1-20
X	US 2014/086748 A1 (PELTOLA ESA [FI] ET AL) 27 March 2014 (2014-03-27) figures 1, 2 paragraphs [0053], [0054], [0058], [0071] -----	1-20
X	US 2013/022466 A1 (LAURBERG HANS [DK]) 24 January 2013 (2013-01-24) figures 8, 9 paragraphs [0034], [0035], [0071], [0072] ----- -/-	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

14 July 2017

Date of mailing of the international search report

10/08/2017

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/DK2017/050138

C(Continuation). 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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