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[Continued on next page]

(54) Title: MOUNTING SUPPORT FOR A PHOTOVOLTAIC MODULE

(57) Abstract: A mounting support for a photovoltaic module is described. The mounting support includes a foundation having an integrated wire- way ledge portion. A photovoltaic module support mechanism is coupled with the foundation.

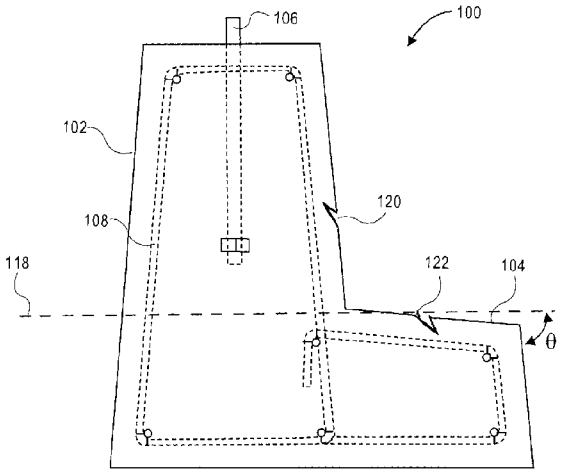


FIG. 1A

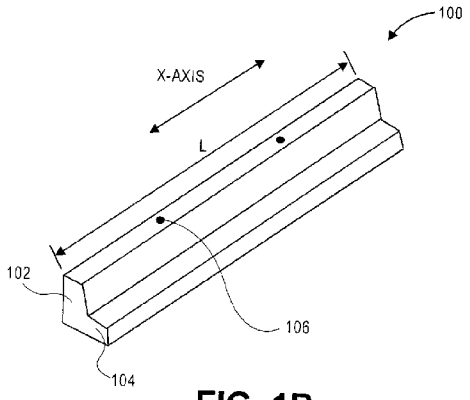


FIG. 1B

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(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, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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Mounting Support for a Photovoltaic Module

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/138,292, filed December 17, 2008, the entire contents of which are hereby incorporated by reference herein.

[0002] This invention was made with Government support under Contract No. DEFC36-07GO17043 awarded by the United States Department of Energy. The Government has certain rights in this invention.

TECHNICAL FIELD

[0003] Embodiments of the present invention are in the field of photovoltaic systems and, in particular, mounting supports for photovoltaic modules.

BACKGROUND

[0004] Photovoltaic cells, commonly known as solar cells, are well known devices for direct conversion of solar radiation into electrical energy. Generally, solar cells are fabricated on a semiconductor wafer or substrate using semiconductor processing techniques to form a p-n junction near a surface of the substrate. Solar radiation impinging on the surface of the substrate creates electron and hole pairs in the bulk of the substrate, which migrate to p-doped and n-doped regions in the substrate, thereby generating a voltage differential between the doped regions. The doped regions are coupled to metal contacts on the solar cell to direct an electrical current from the cell to an external circuit coupled thereto. Generally, solar cells are grouped into arrays or modules of interconnected cells mounted on a common or shared platform and electrically coupled to an electrical power distribution network to form a solar system.

[0005] Ground based solar systems require both significant cabling and foundation support. To meet electrical code, the cabling is usually placed in an

expensive metal wire tray. Foundations for ground based solar systems are usually discrete and can require significant labor for on-site installation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Figure 1A illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated wire-way ledge, in accordance with an embodiment of the present invention.

[0007] Figure 1B illustrates an isometric view of the mounting support for a photovoltaic module of Figure 1A, in accordance with an embodiment of the present invention.

[0008] Figure 2A illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated upward-sloping wire-way ledge, in accordance with an embodiment of the present invention.

[0009] Figure 2B illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated flat wire-way ledge, in accordance with an embodiment of the present invention.

[0010] Figure 2C illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation adaptable to receive a cover, in accordance with an embodiment of the present invention.

[0011] Figure 2D illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated wire-way ledge with a lip, in accordance with an embodiment of the present invention.

[0012] Figure 3 illustrates an isometric view of a photo-voltaic system, including a foundation having an integrated wire-way ledge, in accordance with an embodiment of the present invention.

[0013] Figure 4 depicts a Flowchart representing a series of operations in a method for fabricating a mounting support for a photovoltaic module, including a foundation having an integrated wire-way ledge, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

[0014] A mounting support for a photovoltaic module is described herein. In the following description, numerous specific details are set forth, such as specific measurements, in order to provide a thorough understanding of the present invention. It will be apparent to one skilled in the art that embodiments of the present invention may be practiced without these specific details. In other instances, well-known fabrication operations, such as cement mixing operations, are not described in detail in order to not unnecessarily obscure embodiments of the present invention. Furthermore, it is to be understood that the various embodiments shown in the Figures are illustrative representations and are not necessarily drawn to scale.

[0015] Disclosed herein is a mounting support for a photovoltaic module. The mounting support may include a foundation. In one embodiment, the foundation includes an integrated wire-way ledge portion. A photovoltaic module support mechanism is coupled with the foundation. A photovoltaic system may include a mounting support for a photovoltaic module having a foundation including an integrated wire-way ledge portion. In one embodiment, a photovoltaic module support mechanism is coupled with the foundation. A photovoltaic module may be coupled with the module support mechanism. In one embodiment, a set of wires or cables is coupled with the photovoltaic module and is supported by the integrated wire-way ledge portion of the foundation. A method for fabricating a mounting support for a photovoltaic module may include forming a foundation including an integrated wire-way ledge portion. In one embodiment, a photovoltaic module support mechanism is formed coupled with the foundation.

[0016] Fabrication of a mounting support for a photovoltaic module including a foundation having an integrated wire-way ledge portion may eliminate the need for a separate tray equipped to hold and route cabling for a solar system. In accordance with an embodiment of the present invention, a photovoltaic module includes a grade beam having an integrated wire-way ledge portion to provide a continuous, or nearly continuous, foundation that

also serves as a wire-routing support for both DC and AC cabling. By incorporating the wire-support functionality of a tray into the foundation itself, large-scale solar system implementation costs, including field labor, may be reduced. Furthermore, in accordance with another embodiment of the present invention, the foundation and the integrated wire-way ledge portion are molded together, at the same time, during the fabrication thereof.

[0017] In an aspect of the present invention, a mounting support for a photovoltaic module is provided. Figure 1A illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated wire-way ledge, in accordance with an embodiment of the present invention.

[0018] Referring to Figure 1A, a mounting support 100 for a photovoltaic module includes a foundation 102 having an integrated wire-way ledge portion 104. A photovoltaic module support mechanism 106 is coupled with foundation 102. In accordance with an embodiment of the present invention, foundation 102 includes a grade beam portion, as depicted in Figure 1A. In one embodiment, foundation 102 has a horizontal axis 118, and integrated wire-way ledge portion 104 of foundation 102 is sloped downward and an angle θ, away from horizontal axis 118, as is also depicted in Figure 1A. In a specific embodiment, the downward slope for integrated wire-way ledge portion 104 aids with drainage of rain or other moisture that collects on mounting support 100. In another embodiment, foundation 102, including integrated wire-way ledge portion 104, is adaptable to receive a cover that at least partially covers integrated wire-way ledge portion 104. In a specific embodiment, foundation 102, including integrated wire-way ledge portion 104, is adaptable at a pair of inset features 120 and 122 to receive the cover. A cover inserted into inset features 120 and 122 may be used to protect, from outside weather conditions, a set of wires or cables supported by the region of integrated wire-way ledge portion 104 covered by such a cover. Another possible configuration for receiving a cover is described in association with Figure 2C, below. In one embodiment, foundation 102, including integrated wire-way ledge portion 104, is composed of concrete. In another embodiment,

photovoltaic module support mechanism 106 includes a J-bolt. In an embodiment, foundation 102, including integrated wire-way ledge portion 104, is reinforced by an internal rebar system 108, as depicted in Figure 1A. It is to be understood that, in certain embodiments, the specific design of internal rebar system 108 is performed on a case-by-case basis to conform to soil conditions at the specific location of implementation of mounting support 100.

[0019] Figure 1B illustrates an isometric view of the mounting support of Figure 1A, in accordance with an embodiment of the present invention. Referring to Figure 1B, mounting support 100 for a photovoltaic module includes foundation 102 having integrated wire-way ledge portion 104. Photovoltaic module support mechanism 106 is coupled with foundation 102. In one embodiment, foundation 102 has a length, L, running parallel with integrated wire-way ledge portion 104, e.g. along the X-axis. In a specific embodiment, the length, L, is continuous (e.g., without the presence of a break or termination edge) for approximately 30 meters. In an embodiment, the foundation, including the integrated wire-way ledge portion, is continuous or discrete and has a length running parallel with the integrated wire-way ledge portion, the length approximately in the range of 2 – 200 meters.

[0020] It should be understood that a mounting support for a photovoltaic module need not be limited to a foundation including a downward-sloping integrated wire-way ledge portion, as described in association with Figure 1A. Figures 2A-2D illustrate cross-sectional views of a variety of possibilities of arrangements for a mounting support for a photovoltaic module.

[0021] Figure 2A illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated upward-sloping wire-way ledge, in accordance with an embodiment of the present invention. Referring to Figure 2A, a mounting support 200A for a photovoltaic module includes a foundation 202A having an integrated wire-way ledge portion 204A. A set of wires or cables 214A is supported by integrated wire-way ledge portion 204A. In an embodiment, foundation 202A has a horizontal axis 218A, and integrated wire-way ledge portion 204A of

foundation 202A is sloped upward and an angle θ, away from horizontal axis 218A.

[0022] Figure 2B illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated flat wire-way ledge, in accordance with an embodiment of the present invention. Referring to Figure 2B, a mounting support 200B for a photovoltaic module includes a foundation 202B having an integrated wire-way ledge portion 204B. A set of wires or cables 214B is supported by integrated wire-way ledge portion 204B. In an embodiment, foundation 202B has a horizontal axis 218B, and integrated wire-way ledge portion 204B of foundation 202B is approximately parallel, e.g. $\theta = 0$ degrees, with horizontal axis 218B.

[0023] Figure 2C illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation adaptable to receive a cover, in accordance with an embodiment of the present invention. Referring to Figure 2C, a mounting support 200C for a photovoltaic module includes a foundation 202C having an integrated wire-way ledge portion 204C. A set of wires or cables 214C is supported by the region of integrated wire-way ledge portion 204C that is covered by a cover 224. In an embodiment, foundation 202C, including integrated wire-way ledge portion 204C, is adaptable at a pair of protruding, as opposed to inset, features 220 and 222 to receive cover 224. In a particular embodiment, cover 224 is composed of a material such as, but not limited to, sheet metal or a plastic. In a specific embodiment, integrated wire-way ledge portion 204C of foundation 202C is sloped downward, as depicted in Figure 2C. In an embodiment, the configuration of both a downward-sloping cover 224 and a downward sloping integrated wire-way ledge portion 204C enhances the effective drainage of rain or other moisture that collects on mounting support 200C.

[0024] Figure 2D illustrates a cross-sectional view of a mounting support for a photovoltaic module, including a foundation having an integrated wire-way ledge with a lip, in accordance with an embodiment of the present invention. Referring to Figure 2D, a mounting support 200D for a photovoltaic module includes a foundation 202D having an integrated wire-way ledge

portion 204D. In an embodiment, integrated wire-way ledge portion 204D includes a lip 230. In one embodiment, lip 230 confines, to foundation 202D, a set of wires or cables 214D supported by integrated wire-way ledge portion 204D. In another embodiment, a drainage hole 232 is disposed in lip 230. Drainage hole 232 may aid with drainage of rain or other moisture that collects on mounting support 200D. In a specific embodiment, integrated wire-way ledge portion 204D of foundation 202D is sloped downward, as depicted in Figure 2D.

[0025] In another aspect of the present invention, a photo-voltaic system is provided. Figure 3 illustrates an isometric view of a photo-voltaic system, including a foundation having an integrated wire-way ledge, in accordance with an embodiment of the present invention.

[0026] Referring to Figure 3, a photovoltaic system 300 includes a foundation 302 having an integrated wire-way ledge portion 304. A photovoltaic module support mechanism 306 is coupled with foundation 302. A photovoltaic module 312 is coupled with photo-voltaic module support mechanism 306. In accordance with an embodiment of the present invention, a set of wires or cables 314 is further coupled with photovoltaic module 312 and supported by integrated wire-way ledge portion 304 of foundation 302, as depicted in Figure 3.

[0027] In one embodiment, photovoltaic module 312 is coupled with photo-voltaic module support mechanism 306 by a photovoltaic tracker mechanism 316, as depicted in Figure 3. In a specific embodiment, photovoltaic module support mechanism 306 includes a J-bolt. In another embodiment, foundation 302, including integrated wire-way ledge portion 304, is adaptable to receive a cover that at least partially covers the integrated wire-way ledge portion and that protects the set of wires or cables 314. In one embodiment, foundation 302 has a horizontal axis, integrated wire-way ledge portion 304 is sloped downward and away from the horizontal axis, and the set of wires or cables 314 is further supported by a lip of integrated wire-way ledge portion 304. In another embodiment, a strap fastened with a powder actuated pin to secure the set of wires or cables 314. In a specific embodiment, such a

strap is implemented approximately every 1.5 meters along wire-way ledge portion 304. In yet another embodiment, foundation 302 has a length running parallel with integrated wire-way ledge portion, e.g. along the X-axis. In a specific embodiment, the length is continuous for approximately 30 meters. In one embodiment, foundation 302, including integrated wire-way ledge portion 304, is composed of concrete. In an embodiment, the foundation, including the integrated wire-way ledge portion, is continuous or discrete and has a length running parallel with the integrated wire-way ledge portion, the length approximately in the range of 2 – 200 meters.

[0028] In yet another aspect of the present invention, a method for fabricating a mounting support for a photovoltaic module is provided. Figure 4 depicts a Flowchart 400 representing a series of operations in a method for fabricating a mounting support for a photovoltaic module, including a foundation having an integrated wire-way ledge, in accordance with an embodiment of the present invention.

[0029] Referring to operation 402 of Flowchart 400, a method for fabricating a mounting support for a photovoltaic module includes forming a foundation having an integrated wire-way ledge portion. In one embodiment, forming the foundation, including the integrated wire-way ledge portion, includes using a cast-in-place technique. In a specific embodiment, the cast-in-place technique is virtually continuous and is performed on-site versus, e.g., a discrete pre-casting technique where individual foundation units are fabricated off-site and transported to the desired location. However, in an alternative embodiment, a discrete pre-casting technique is used and the discrete units are shipped to the specific site for eventual use. In another embodiment, forming the foundation includes forming the foundation and the integrated wire-way ledge portion to be adaptable to receive a cover that at least partially covers the integrated wire-way ledge portion. In one embodiment, forming the foundation, including the integrated wire-way ledge portion, includes forming the foundation to have a horizontal axis and forming the integrated wire-way ledge portion to be sloped downward, away from the horizontal axis. In another embodiment, forming the foundation, including the integrated wire-

way ledge portion, includes forming the foundation to have a length running parallel with the integrated wire-way ledge portion. In a specific embodiment, the length is continuous (e.g., without the presence of a break or termination edge) for approximately 30 meters. In an embodiment, forming the foundation, including the integrated wire-way ledge portion, includes using wet cement. The specific mixture and composition of the wet cement may be changed or optimized on a site to site, as-needed basis. In an embodiment, the foundation, including the integrated wire-way ledge portion, is formed to be continuous or discrete and to have a length running parallel with the integrated wire-way ledge portion, the length approximately in the range of 2 – 200 meters.

[0030] Referring to operation 404 of Flowchart 400, in accordance with an embodiment of the present invention, the method for fabricating a mounting support for a photovoltaic module further includes forming a photovoltaic module support mechanism coupled with the foundation. In one embodiment, forming the foundation, including the integrated wire-way ledge portion, includes using wet cement. In that embodiment, forming the photovoltaic module support mechanism includes incorporating the photovoltaic module support mechanism into the wet cement prior to drying to form concrete. In an alternative embodiment, forming the photovoltaic module support mechanism includes incorporating, by an epoxy process, the photovoltaic module support mechanism onto dried cement. In a specific embodiment, forming the photovoltaic module support mechanism includes incorporating a J-bolt into the foundation.

[0031] Thus, a mounting support for a photovoltaic module has been disclosed. In accordance with an embodiment of the present invention, the mounting support includes a foundation having an integrated wire-way ledge portion. A photovoltaic module support mechanism is coupled with the foundation. In one embodiment, the foundation, including the integrated wire-way ledge portion, is adaptable to receive a cover that at least partially covers the integrated wire-way ledge portion. In another embodiment, the foundation has a horizontal axis and the integrated wire-way ledge portion is sloped downward, away from the horizontal axis.

CLAIMS

What is claimed is:

1. A mounting support for a photovoltaic module, comprising:
a foundation having an integrated wire-way ledge portion; and
a photovoltaic module support mechanism coupled with the foundation.

2. The mounting support of claim 1, wherein the foundation, including the integrated wire-way ledge portion, is adaptable to receive a cover that at least partially covers the integrated wire-way ledge portion.

3. The mounting support of claim 1, wherein the foundation has a horizontal axis, and wherein the integrated wire-way ledge portion of the foundation is sloped downward, away from the horizontal axis.

4. The mounting support of claim 1, wherein the foundation, either continuous or discrete, has a length running parallel with the integrated wire-way ledge portion, and wherein the length is approximately in the range of 2 – 200 meters.

5. The mounting support of claim 1, wherein the foundation, including the integrated wire-way ledge portion, comprises concrete.

6. The mounting support of claim 1, wherein the foundation, including the integrated wire-way ledge portion, is fabricated by a technique selected from the group consisting of a pre-cast technique or a cast-in-place technique.

7. The mounting support of claim 1, wherein the photovoltaic module support mechanism comprises a J-bolt.

8. A photovoltaic system, comprising:
a foundation having an integrated wire-way ledge portion;
a photovoltaic module support mechanism coupled with the foundation;

a photovoltaic module coupled with the photo-voltaic module support mechanism; and

a set of wires or cables coupled with the photovoltaic module and supported by the integrated wire-way ledge portion of the foundation.

9. The photovoltaic system of claim 8, wherein the photovoltaic module is coupled with the photo-voltaic module support mechanism by a photovoltaic tracker mechanism.

10. The photovoltaic system of claim 8, wherein the foundation, including the integrated wire-way ledge portion, is adaptable to receive a cover that at least partially covers the integrated wire-way ledge portion and that protects the set of wires or cables.

11. The photovoltaic system of claim 8, wherein the foundation has a horizontal axis, wherein the integrated wire-way ledge portion is sloped downward, away from the horizontal axis, and wherein the set of wires or cables is further supported by a lip of the integrated wire-way ledge portion.

12. The photovoltaic system of claim 8, wherein the foundation, either continuous or discrete, has a length running parallel with the integrated wire-way ledge portion, and wherein the length is approximately in the range of 2 – 200 meters.

13. The photovoltaic system of claim 8, wherein the foundation, including the integrated wire-way ledge portion, comprises concrete.

14. The photovoltaic system of claim 8, wherein the foundation, including the integrated wire-way ledge portion, is fabricated by a technique selected from the group consisting of a pre-cast technique or a cast-in-place technique.

15. The photovoltaic system of claim 8, wherein the photovoltaic module support mechanism comprises a J-bolt.

16. A method for fabricating a mounting support for a photovoltaic module, comprising:

forming a foundation having an integrated wire-way ledge portion; and

forming a photovoltaic module support mechanism coupled with the foundation.

17. The method of claim 16, wherein forming the foundation, including the integrated wire-way ledge portion, comprises using a technique selected from the group consisting of a pre-cast technique or a cast-in-place technique.

18. The method of claim 16, wherein forming the foundation comprises forming the foundation, including the integrated wire-way ledge portion, to be adaptable to receive a cover that at least partially covers the integrated wire-way ledge portion.

19. The method of claim 16, wherein forming the foundation, including the integrated wire-way ledge portion, comprises forming the foundation to have a horizontal axis and forming the integrated wire-way ledge portion to be sloped downward, away from the horizontal axis.

20. The method of claim 16, wherein forming the foundation, including the integrated wire-way ledge portion, comprises forming the foundation to be continuous or discrete and to have a length running parallel with the integrated wire-way ledge portion, wherein the length is approximately in the range of 2 – 200 meters.

21. The method of claim 16, wherein forming the foundation, including the integrated wire-way ledge portion, comprises using wet cement, and wherein forming the photovoltaic module support mechanism comprises incorporating

the photovoltaic module support mechanism into the wet cement prior to drying to form concrete.

22. The method of claim 21, wherein forming the photovoltaic module support mechanism comprises incorporating a J-bolt into the foundation.

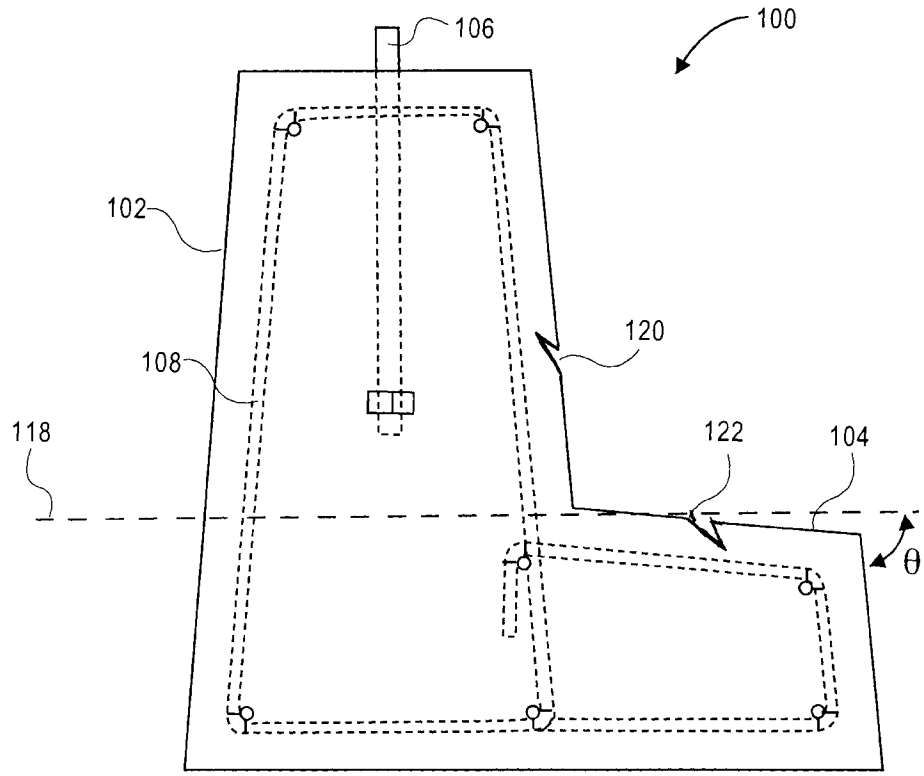


FIG. 1A

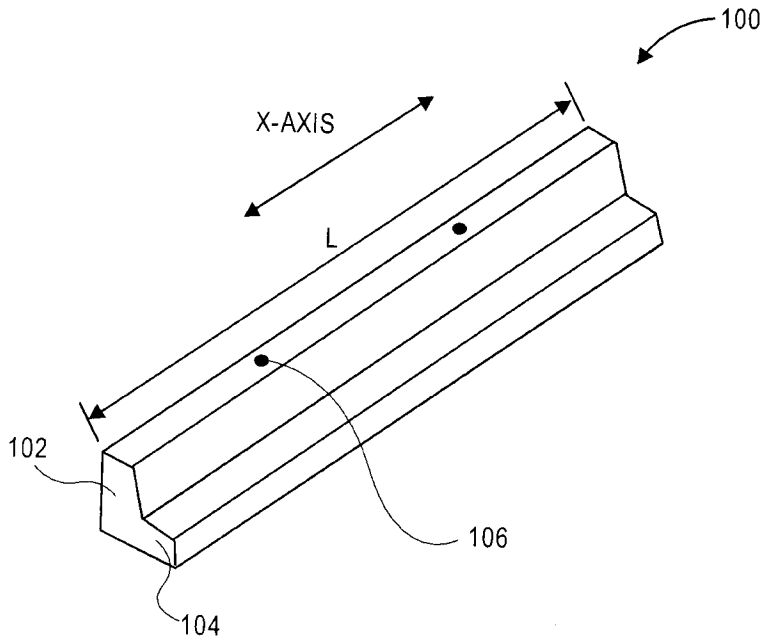


FIG. 1B

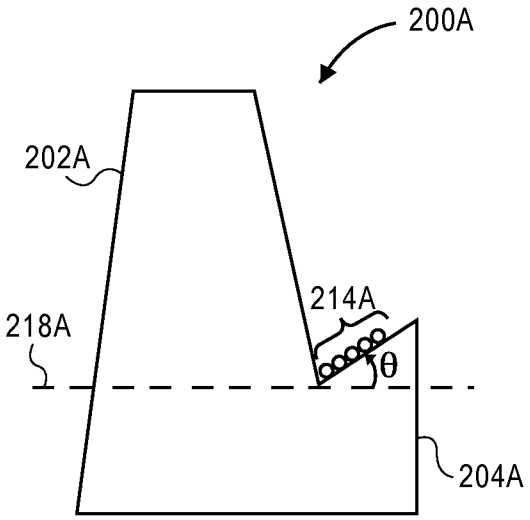


FIG. 2A

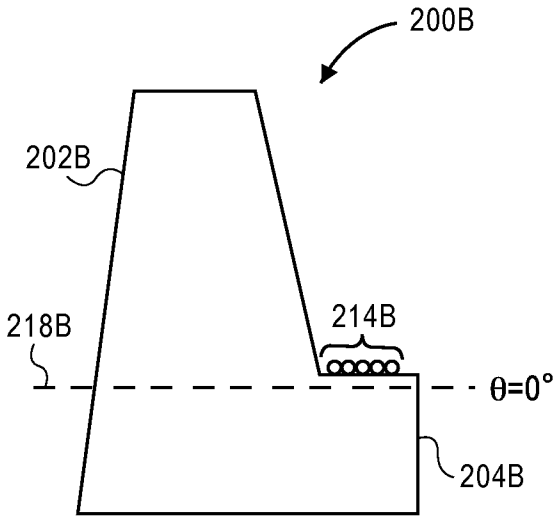


FIG. 2B

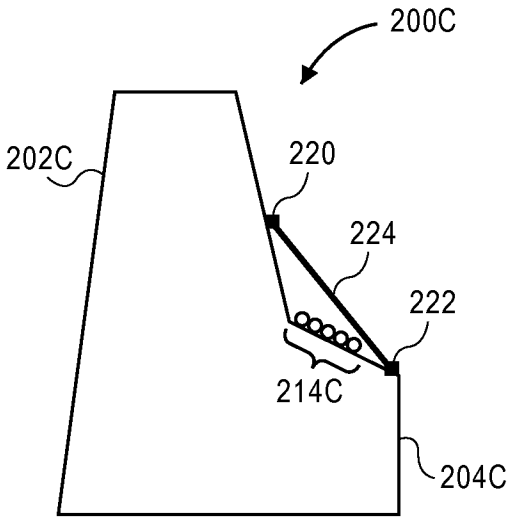


FIG. 2C

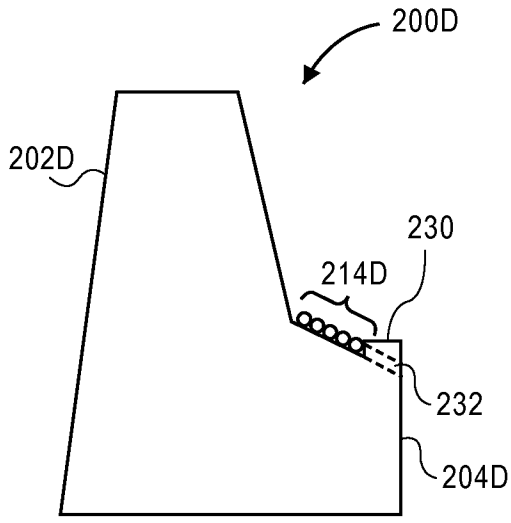


FIG. 2D

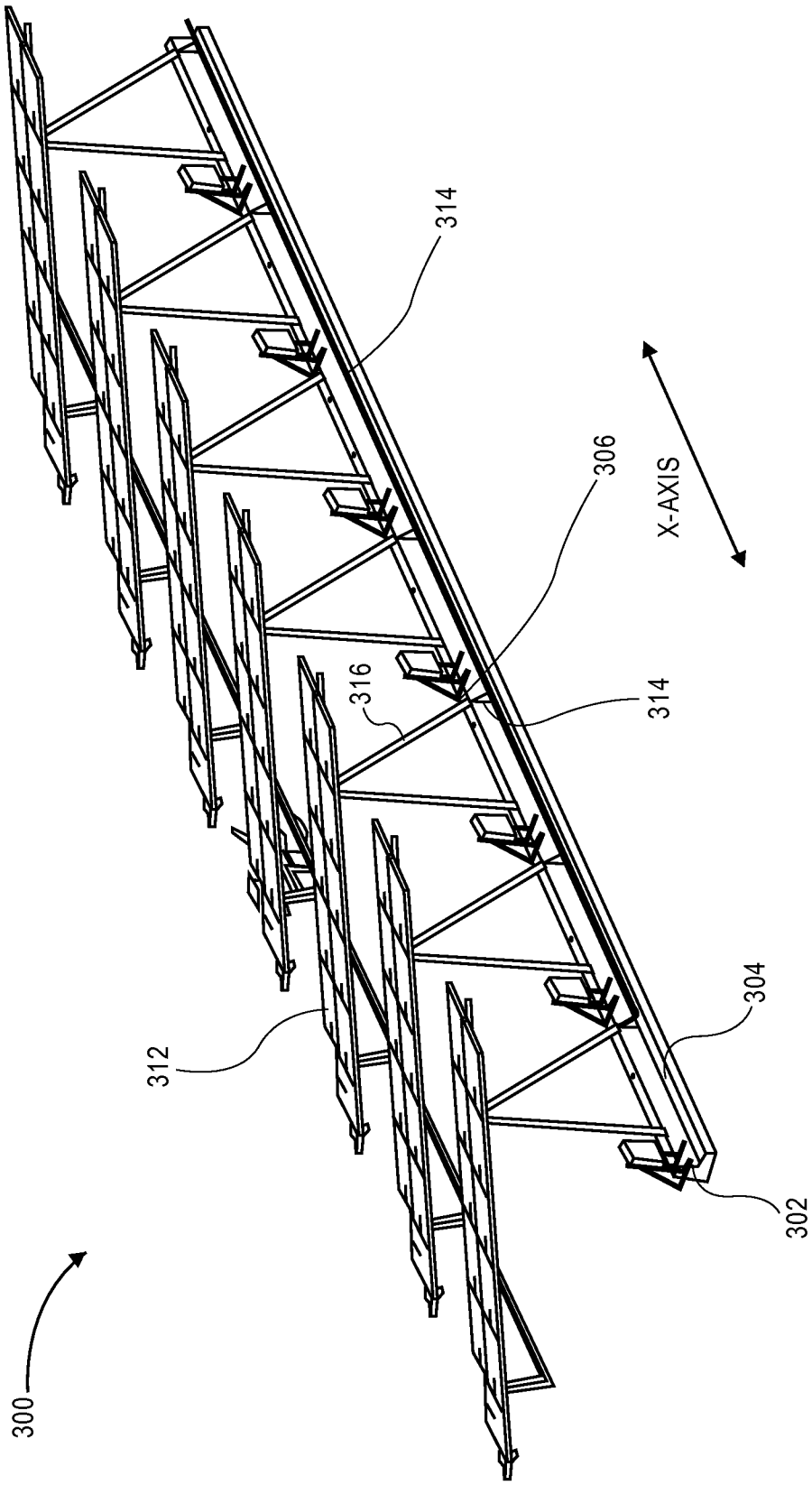


FIG. 3

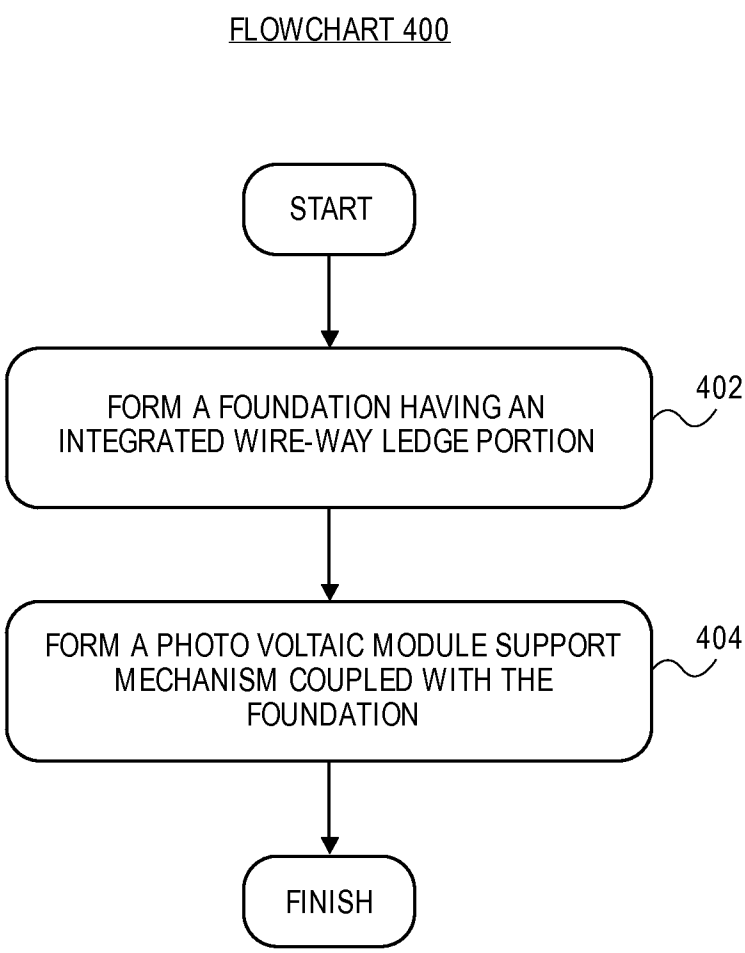

FLOWCHART 400
START
FORM A FOUNDATION HAVING AN INTEGRATED WIRE-WAY LEDGE PORTION
402
FORM A PHOTO VOLTAIC MODULE SUPPORT MECHANISM COUPLED WITH THE FOUNDATION
404
FINISH

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/066440

A. CLASSIFICATION OF SUBJECT MATTER

H01L 31/04(2006.01)i

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)

H01L 31/04; E04D 13/18; H01L 21/00; H01L 25/00; H01L 31/042

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

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: solar cell, ledge, module, foundation.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2001-0050102 A1 (SHIN MATSUMI et al.) 13 December 2001 See abstract, claims 1-10 and figures 1-7, 13 and their corresponding descriptions.	1-2,4,8,10,12,16,18,20 3,5-7,9,11,13-15,17,19,21-22
A	JP 11-177115 A (NTT POWER AND BUILDING FACILITIES INC. et al.) 02 July 1999 See abstract, claims 1-2 and figures 1-2 and their corresponding descriptions.	1,8,16
A	JP 2008-235766 A (KYOCERA CORP.) 02 October 2008 See abstract, claims 1-2, 4, 6 and figures 1-2, 7 and their corresponding descriptions.	1,8,16
A	JP 10-190035 A (GANTAN BEAUTY KOGYO KK) 21 July 1998 See abstract, claims 1-2 and figures 1-2, 4-5 and their corresponding descriptions.	1,8,16
A	JP 11-354823 A (MORINAGA ENGINEERING KK) 24 December 1999 See abstract, claims 1-5 and figures 1-2, 4, 6 and their corresponding descriptions.	1,8,16

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Information on patent family members

International application No.
PCT/US2009/066440

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2001-0050102 A1	13.12.2001	JP 03-605032 B2	08.10.2004
		JP 2002-141544 A	17.05.2002
		JP 3605032 B2	22.12.2004
		US 6753468 B2	22.06.2004
		US 6753468W D	22.06.2004
		US 6960716 B2	01.11.2005
JP 11-177115 A	02.07.1999	None	
JP 2008-235766 A	02.10.2008	JP 2008-235766 A	02.10.2008
JP 10-190035 A	21.07.1998	JP 3011667 B2	21.02.2000
JP 11-354823 A	24.12.1999	None	