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(71) Applicant: **Etec Inc.**
Gyeongsangnam-do 656-925 (KR)

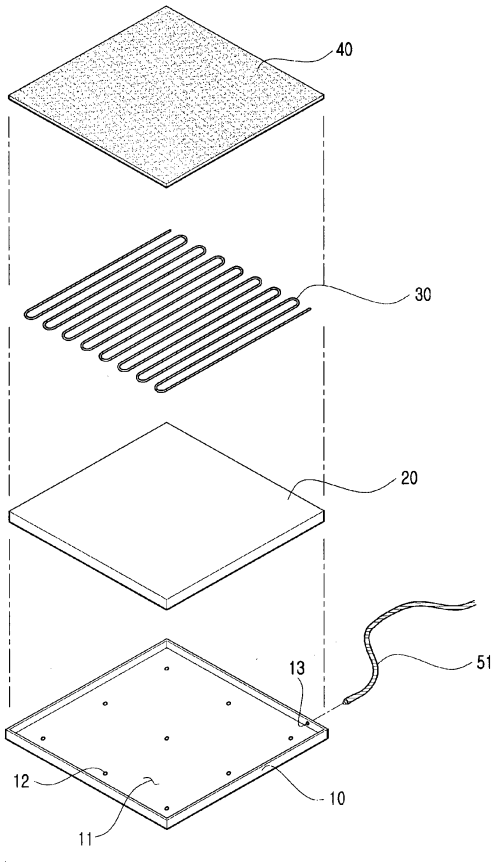
(72) Inventor: **BAEK, Cheol-Jin**
Geoje-si
Gyeongsangnam-do 656-930 (KR)

(74) Representative: **Munk, Ludwig**
Patentanwälte Munk
Prinzregentenstraße 3
86150 Augsburg (DE)

(54) **HEATING DEVICE FOR USE BELOW SHIP DECKS**

(57) Disclosed is a lower heat-generating device for a deck in a ship according to the present invention including: an enclosure member having a filling space defined therein and a plurality of fastening holes formed on a bottom surface thereof, the enclosure member being opened at a top thereof; a heat-insulating member configured to be filled in the filling space of the enclosure member; a heating cable exothermically arranged on the heat-insulating member and configured to transfer heat to the ship deck positioned above the heating cable; a fixing member disposed on the heating cable and configured to securely fix the heating cable on the heat-insulating member so that the heating cable is held in position; and a controller mounted at the outside of the enclosure member and electrically connected to the heating cable, the controller being configured to control the generation of heat from the heating cable and the supply of electric power.

[Fig. 1]



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Description

[Field of the Invention]

[0001] The present invention relates to a lower heat-generating device for a deck in a ship. More particularly, the present invention relates to a lower heat-generating device for a deck in a ship, which is exothermically mounted below the ship deck so that safety accidents due to freezing from the bitterly cold weather are prevented from occurring, which can be additionally installed at an existing structure so that an economic efficiency is ensured, which is installed independently so that maintenance, repair and management are facilitated, and which is installed below, but not above a structure so that inconvenience is not caused to a walker and a worker during the walk and work.

[Background of the Invention]

[0002] In general, a structure such as a stairway or a corridor installed on a ship or a marine structure is made of a ferrous material. However, in case of an iron stairway installed on a ship or a marine structure that is exposed to the same cold weather as the polar region for a long period of time, there is caused a problem in that a footplate of the stairway is prone to be frozen so that a walker and a worker are exposed to safety accidents.

[0003] In order to address and solve this problem, heat-generating devices are disclosed which prevent the footplate of the stairway from being frozen. However, such conventional heat-generating devices entail a problem in that since maintenance and repair of the entire heat-generating device is required when its erroneous operation or breakage occurs, the stairway may be frozen during the maintenance and repair period, thereby making it difficult to use the stairway and increasing the maintenance and repair cost. Furthermore, in the case where the heat-generating device is installed at an existing structure, a user suffers from an inconvenience having to reconstructing to install the heat-generating device after dismantling a stairway or a corridor, as well as the conventional heat-generating device has a disadvantage in that it is installed above, but not below the structure so that inconvenience is caused to a walker and a worker during the walk and work.

[Detailed Description of the Invention]

[Technical Problems]

[0004] Accordingly, the present invention was made to solve the aforementioned problem occurring in the prior art, and it is an object of the present invention to provide a lower heat-generating device for a deck in a ship, which is exothermically mounted below the ship deck so that safety accidents due to freezing from the bitterly cold weather are prevented from occurring, which can be additionally installed at an existing structure so that an economic efficiency is ensured, which is installed independently so that maintenance, repair and management are facilitated, and which is installed below, but not above a structure so that inconvenience is not caused to a walker and a worker during the walk and work.

[Technical Solution]

[0005] To accomplish the above object, in accordance with an embodiment of the present invention, there is provided a lower heat-generating device for a deck in a ship, including: an enclosure member having a filling space defined therein and a plurality of fastening holes formed on a bottom surface thereof, the enclosure member being opened at a top thereof; a heat-insulating member configured to be filled in the filling space of enclosure member; a heating cable exothermically arranged on the heat-insulating member and configured to transfer heat to the ship deck positioned above the heating cable; a fixing member disposed on the heating cable and configured to securely fix the heating cable on the heat-insulating member so that the heating cable is held in position; and a controller mounted at the outside of the enclosure member and electrically connected to the heating cable, the controller being configured to control the generation of heat from the heating cable and the supply of electric power.

[0006] In accordance with a preferable embodiment, the lower heat-generating device may further include a heat diffusion member configured to be filled in an air layer formed between the underside of the ship deck and the top surface of the fixing member to exhibit a heat-insulating effect, the heat diffusion member having a shape corresponding to that of the air layer.

[0007] In accordance with a preferable embodiment, the heat-insulating member includes one or more concave depressions formed at a region of the air layer where the heating cable is not arranged so as to increase the volume of the air layer, the heat diffusion member being formed and filled to have a shape corresponding to that of the air layer.

[Advantageous Effect]

[0008] The lower heat-generating device for a deck in a ship in accordance with a preferred embodiment of the present invention as constructed above has the following advantageous effects.

[0009] The lower heat-generating device is exothermically mounted below the ship deck so that safety accidents due to freezing from the bitterly cold weather can be prevented from occurring. In addition, the lower heat-generating device can be additionally installed at an existing structure so that an economic efficiency is ensured, and can be installed independently so that maintenance, repair and management are facilitated. Further, the lower heat-generating device is installed below, but not above

a structure so that inconvenience is not caused to a walker and a worker during the walk and work.

[Brief Description of the Invention]

[0010] The above objects, other features and advantages of the present invention will become more apparent by describing the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is an exploded perspective view showing a lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention;

Fig. 2 is a cross-sectional view showing a lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention;

Fig. 3 is a schematic diagrammatic view showing a use state in which a lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention;

Fig. 4 is a cross-sectional view showing a lower heat-generating device for a deck in a ship in accordance with another embodiment of the present invention; and

Fig. 5 is a cross-sectional view showing a lower heat-generating device for a deck in a ship in accordance with still another embodiment of the present invention.

[Preferred Embodiments of the Invention]

[0011] Now, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. The matters defined in the description, such as the detailed construction and elements, are nothing but specific details provided to assist those of ordinary skill in the art in a comprehensive understanding of the invention, and the present invention is not limited to the embodiments disclosed hereinafter.

[0012] Fig. 1 is an exploded perspective view showing a lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention, Fig. 2 is a cross-sectional view showing a lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention, and Fig. 3 is a schematic diagrammatic view showing a use state in which a lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention.

[0013] The lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention includes: a enclosure member 10 having a filling space 11 defined therein and a plurality of fastening holes 12 formed on a bottom surface thereof, the enclosure member being opened at a top thereof; a heat-insulating member 20 configured to be filled in the filling space 11 of the enclosure member; a heating cable 30 exothermically arranged on the heat-insulating member 20 and configured to transfer heat to the ship deck positioned above the heating cable; a fixing member 40 disposed on the heating cable 30 and configured to securely fix the heating cable 30 on the heat-insulating member 20 so that the heating cable is held in position; and a controller 50 mounted at the outside of the enclosure member 10 and electrically connected to the heating cable 30, the controller being configured to control the generation of heat from the heating cable 30 and the supply of electric power.

[0014] Hereinafter, constituent elements and their connection relationship of the lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention will be described in detail with reference to Figs. 1 and 2.

[0015] Herein, the enclosure member 10 is an element where constituent elements which will be described later are filled and installed, and that serves to form the entire outer appearance of the lower heat-generating device 1. The enclosure member 10 has a filling space 11 defined therein and a plurality of fastening holes 12 formed on a bottom surface thereof. In addition, the enclosure member 10 is opened at a top thereof.

[0016] The enclosure member 10 may be formed in a quadrangular shape having various sizes. The enclosure member 10 is formed to have the filling space 11 therein in such a manner that four sidewalls having a predetermined height protrudingly extends vertically upwardly from a bottom of the enclosure member 10. The fastening holes 12 serves to allow fixing bolts weldingly fixed to the underside of the deck to which the lower heat-generating device 1 is mounted to be fastened with fixing nuts on the underside of the enclosure member 10 therethrough. In this case, the fastening holes 12 are not formed at regions where the heating cable 30 is arranged. In addition, the aforementioned connecting hole 13 serves to allow a connecting cable 51 connected to the controller 50 which will be described later to be introduced into the enclosure member 10 therethrough.

[0017] The heat-insulating member 20 is filled within the filling space 11 of the enclosure member 10 as described above, and serves to prevent heat released from the heating cable 30 from being transferred to the bottom, but not in the direction of the ship deck. In other words, the heat-insulating member 20 prevents heat from being released to the bottom and releases the heat from the heating cable to only the upper deck so as to increase the heat efficiency of the lower heat-generating device. The heat-insulating member 20 preferably employs a conventional heat-insulating material for heat release and water proof purpose. In this case, a top surface of the heat-insulating member 20 brought into direct contact with the heating cable 30 is preferably coated with a refractory material to prevent a fire from occurring due to heat released from the heating cable 30.

[0018] Meanwhile, the heating cable 30 is exothermically arranged on the heat-insulating member 20 filled in

the filling space 11, and serves to generate heat by itself through the electric power supplied under the control of the controller 50 so that the generated heat is transferred to the ship deck to prevent the ship deck from being frozen.

[0019] The heating cable 30 employs a conventional heating cable 30, and the heat-insulating member 20 on which the heating cable 30 is seated may have a groove (not shown) formed thereon to correspond to the shape of the heating cable 30. In the case where the top surface of the heat-insulating member 20 is not coated with a refractory material, a separate refractory film may be interposed between the heat-insulating member 20 and the heating cable 30.

[0020] In addition, the fixing member 40 is provided on the heating cable 30 seated on the heat-insulating member 20. The fixing member 40 serves to securely fix the heating cable 30 on the heat-insulating member 20. The fixing member 40 employs a conventional aluminum tape, and is closely attached to the heating cable 30 without any spacing so that the shape of the heating cable 30 seated on the heat-insulating member 20 is exposed to the outside.

[0021] In the meantime, the controller 50 is mounted at the outside of the enclosure member 10 and is electrically connected to the heating cable 30 by means of the connecting cable 51 so that the controller controls the generation of heat from the heating cable 30 and the supply of electric power. The controller 50 is mounted at a rail of the ship deck by one relative to three enclosure members 10 as shown in Fig. 3. In this case, the heating cables 30 of adjacent enclosure members 10 may be designed to be connected to one another so that the generation of heat from the heating cable 30 and the supply of electric power can be controlled by a single controller 50. Alternatively, a temperature sensor may be additionally mounted at the controller 50 so that electric power can be supplied to the heating cable 30 below a predetermined temperature, and the supply of electric power can be interrupted above the predetermined temperature.

[0022] Hereinafter, the entire installation method of the lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention will be described in detail with reference to Fig. 3

[0023] First, the heat-insulating member 20 is filled in the filling space 11 of the enclosure member 10, and the heating cable 30 is arranged on the filled heat-insulating member 20. Thereafter, the fixing member 40 is attached to the heating cable 30 to securely fix the heating cable 30 on the heat-insulating member 20 so as to be held in position.

[0024] Then, the connecting cable 51 connected to the controller 50 is inserted into the connecting hole 13 formed at one sidewall of the enclosure member 10 so that the connecting cable 51 is electrically connected to the heating cable 30.

[0025] Thereafter, fixing bolts weldingly fixed vertically to the underside of a corridor of the ship to be heated are inserted at lower ends thereof into the fastening holes 12 and protruded to the outside through fastening holes 12. At this time, the lower ends of the fixing bolts protruded to the outside through the fastening holes 12 are firmly fastened with fixing nuts.

[0026] In the above method, the lower heat-generating device 1 is mounted on the entire underside of the corridor of the ship and the generation of heat therefrom and the supply of electric power can be controlled by the controller 50. In the meantime, Fig. 4 is a cross-sectional view showing a lower heat-generating device for a deck in a ship in accordance with another embodiment of the present invention, and Fig. 5 is a cross-sectional view showing a lower heat-generating device for a deck in a ship in accordance with still another embodiment of the present invention.

[0027] An air layer 60 is formed between the underside of the ship deck and the top surface of the lower heat-generating device. The air layer 60 serves a heat-insulating element that prevents external cold air from taking internal heat. A heat diffusion member 80 may be filled in the air layer 60 in such a manner that the shape of the heat diffusion member 80 corresponds to that of the air layer 60 as shown in Fig. 4. The heat diffusion member 80 serves to rapidly transfer heat released from the heating cable 30 to the ship deck.

[0028] In addition, the heat-insulating member 20 may further include a plurality of concave depressions 70 formed at a region of the air layer 60 where the heating cable is not arranged so as to increase the volume of the air layer 60 and thus improve the heat-insulating effect as shown in Fig. 5. In this case, the heat diffusion member 80 is formed and filled to have a shape corresponding to that of the air layer, and also serves to rapidly transfer heat released from the heating cable 30 to the ship deck. While the present invention has been described in connection with the specific embodiments illustrated in the drawings, they are merely illustrative, and the invention is not limited to these embodiments. It is to be understood that various equivalent modifications and variations of the embodiments can be made by a person having an ordinary skill in the art without departing from the spirit and scope of the present invention. Therefore, the true technical scope of the present invention should not be defined by the above-mentioned embodiments but should be defined by the appended claims and equivalents thereof.

[Industrial Applicability]

[0029] As described above, the lower heat-generating device for a deck in a ship in accordance with an embodiment of the present invention can be applied to a bottom portion of a deck of a ship or a marine structure that is exposed to the same cold weather as the polar region for a long period of time so as to prevent the deck from being frozen.

Claims

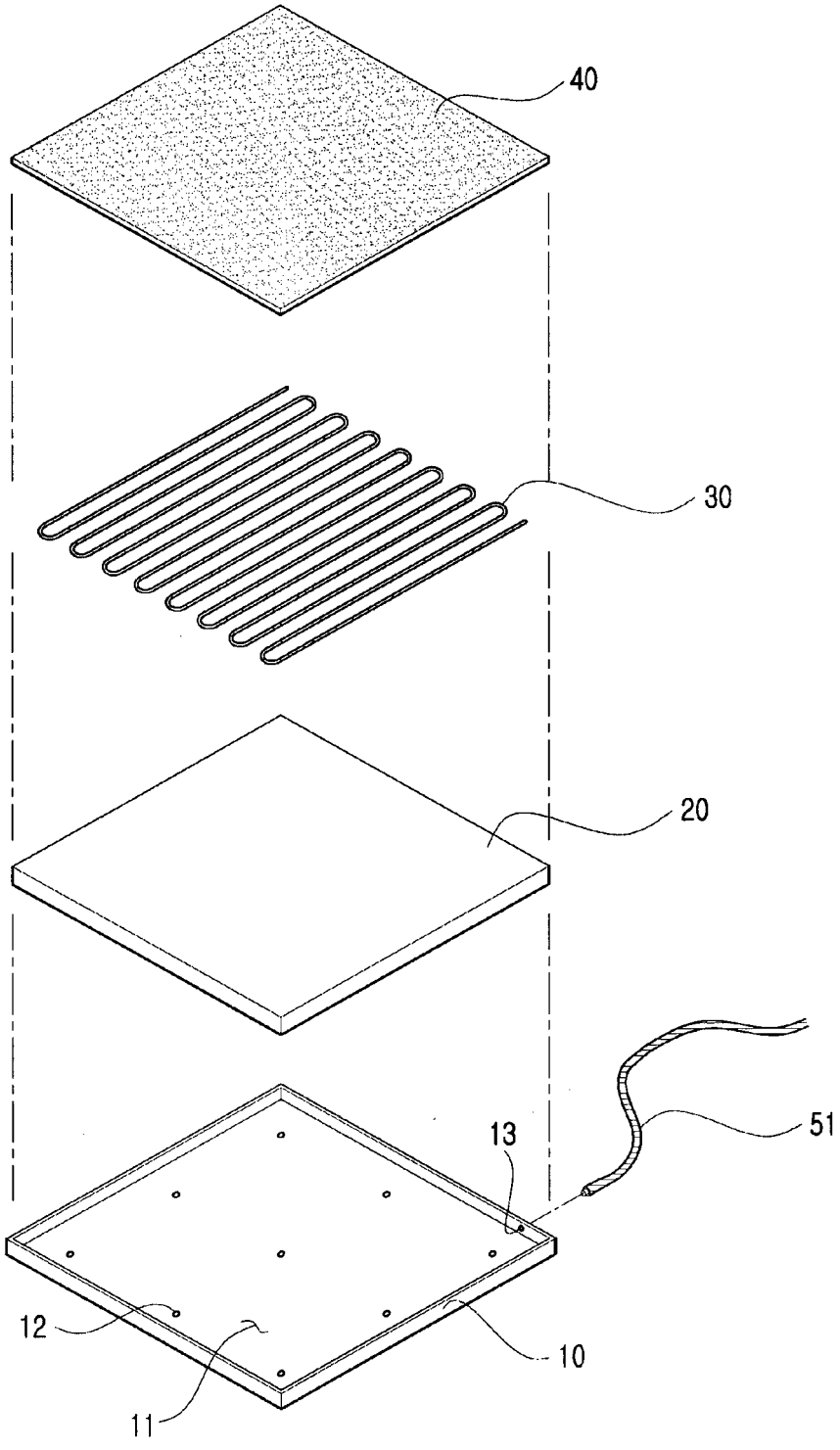
1. A lower heat-generating device for a deck in a ship, comprising:

   an enclosure member having a filling space defined therein and a plurality of fastening holes formed on a bottom surface thereof, the enclosure member being opened at a top thereof;
   a heat-insulating member configured to be filled in the filling space of the enclosure member;
   a heating cable exothermically arranged on the heat-insulating member and configured to transfer heat to the ship deck positioned above the heating cable;
   a fixing member disposed on the heating cable and configured to securely fix the heating cable on the heat-insulating member so that the heating cable is held in position; and
   a controller mounted at the outside of the enclosure member and electrically connected to the heating cable,
   the controller being configured to control the generation of heat from the heating cable and the supply of electric power.

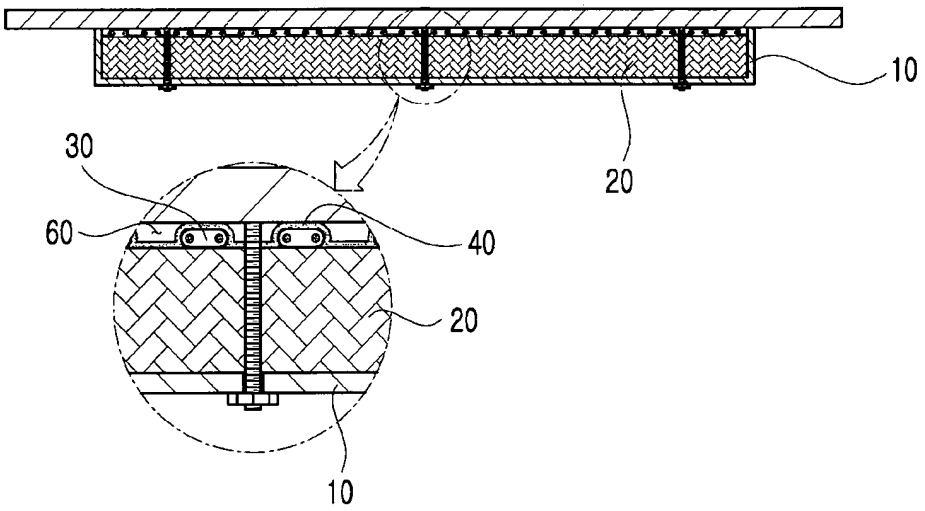
2. The lower heat-generating device according to claim 1, further comprising a heat diffusion member configured to be filled in an air layer formed between the underside of the ship deck and the top surface of the fixing member to exhibit a heat-insulating effect, the heat diffusion member having a shape corresponding to that of the air layer.

3. The lower heat-generating device according to claim 1 or 2, wherein the heat-insulating member comprises one or more concave depressions formed at a region of the air layer where the heating cable is not arranged so as to increase the volume of the air layer, the heat diffusion member being formed and filled to have a shape corresponding to that of the air layer.

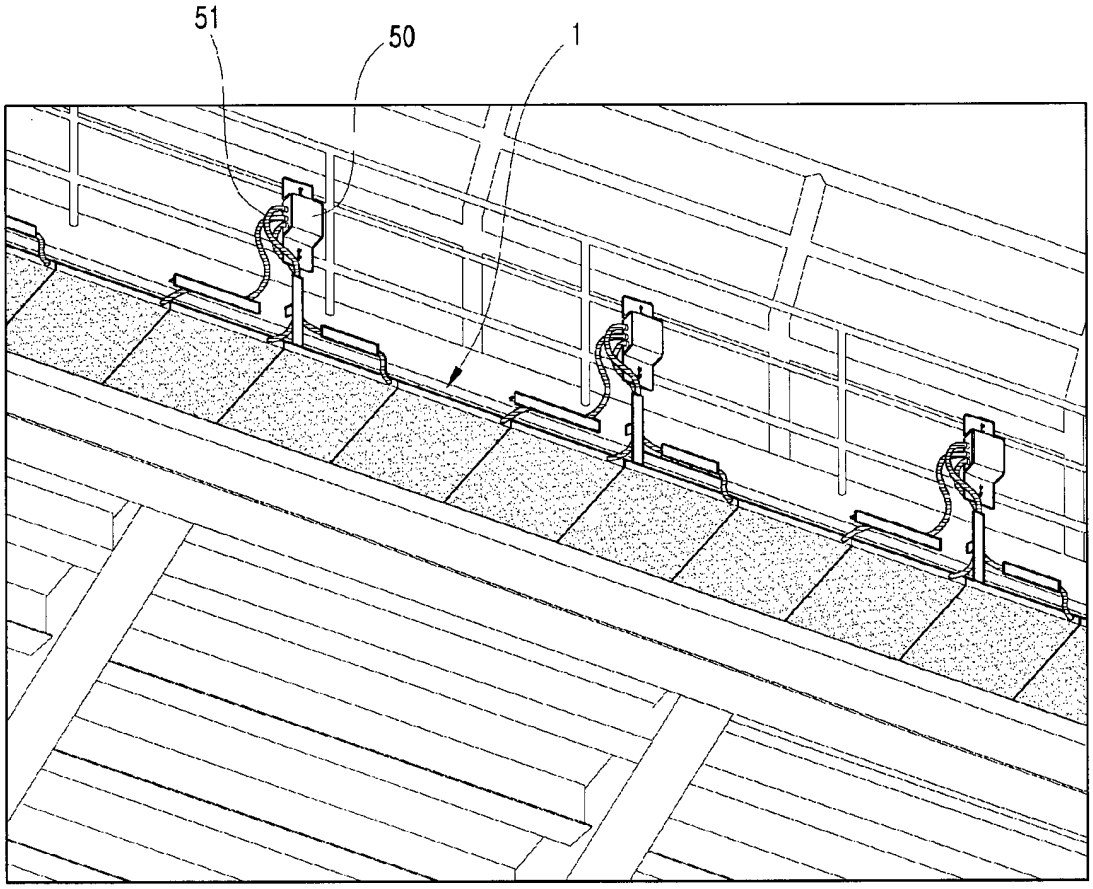
[Fig. 1]



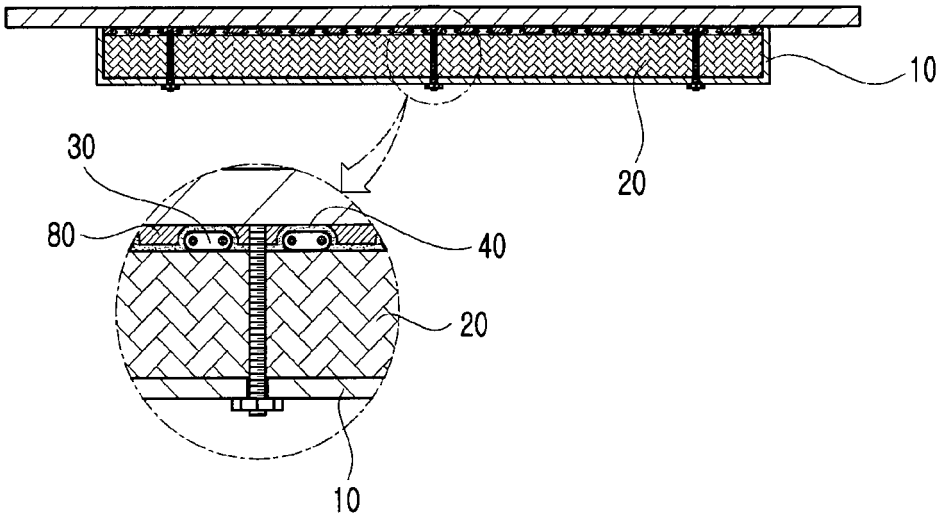
[Fig. 2]



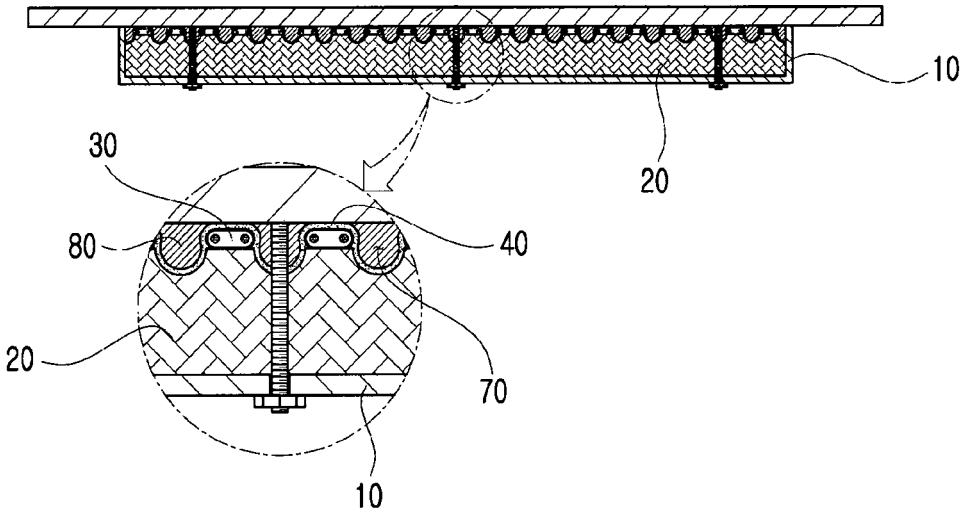
[Fig. 3]



[Fig. 4]



[Fig. 5]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2013/004173

A. CLASSIFICATION OF SUBJECT MATTER

B63B 17/00(2006.01)i, H05B 3/20(2006.01)i, B63J 2/12(2006.01)i, B63B 3/48(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)

B63B 17/00; B63B 15/00; E01C 11/24; E01C 11/26; E01H 5/10; H05B 3/20; B63J 2/12; B63B 3/48

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: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: heat, thermal, ship, ship, deck, heat-radiation, heater

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-1074720 B1 (PAEK, Cheol Jin) 19 October 2011 See claim 1 and figures 3-5.	1
A	KR 10-2012-0018067 A (SAMSUNG HEAVY IND. CO.,LTD) 29 February 2012 See claim 1 and figures 1-2.	1-3
A	JP 2005-315063 A (SHOWA CONCRETE IND CO LTD et al.) 10 November 2005 See claim 1 and figures 5-6.	1-3

☐ 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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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"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
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 AUGUST 2013 (29.08.2013)	**29 AUGUST 2013 (29.08.2013)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2013/004173

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-1074720 B1	19/10/2011	NONE	
KR 10-2012-0018067 A	29/02/2012	NONE	
JP 2005-315063 A	10/11/2005	JP 04-508923B2	21/07/2010

Form PCT/ISA/210 (patent family annex) (July 2009)