



(11) **EP 2 853 478 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
28.03.2018 Bulletin 2018/13

(51) Int Cl.:
B63B 17/00 ^(2006.01) **H05B 3/20** ^(2006.01)
B63J 2/12 ^(2006.01) **B63B 3/48** ^(2006.01)

(21) Application number: **13750616.8**

(86) International application number:
PCT/KR2013/004173

(22) Date of filing: **10.05.2013**

(87) International publication number:
WO 2013/187604 (19.12.2013 Gazette 2013/51)

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

ERWÄRMUNGSVORRICHTUNG ZUR VERWENDUNG UNTER SCHIFFSDECKS

DISPOSITIF DE CHAUFFAGE À DES FINS D'UTILISATION SOUS DES PONTS DE NAVIRE

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **13.06.2012 KR 20120063215**

(43) Date of publication of application:
01.04.2015 Bulletin 2015/14

(73) Proprietor: **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)

(56) References cited:
JP-A- 2005 315 063 KR-A- 20100 038 517
KR-A- 20120 018 067 KR-B1- 101 074 720
KR-B1- 101 107 093 SI-A- 22 764

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[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.

[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 foot-plate 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 foot-plate 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.

[0004] Such conventional heat-generating devices are shown in KR 10-2010-0038517A, KR 101107093B1 and KR 10-1074720B1. SI22764A shows a heating-element with a heater below a walkable surface.

[0005] Starting therefrom, 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 adapt the heat-generating device for a deck in a ship, to be exothermically mounted below the ship deck and providing a good heat transfer, 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.

[0006] 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.

[0007] Further the lower heat-generating device includes 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.

[0008] 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.

[0009] 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.

[0010] 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.

[0011] 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;
Fig. 2 is a cross-sectional view showing a lower heat-generating device for a deck in a ship;
Fig. 3 is a schematic diagrammatic view showing a

use state in which a lower heat-generating device for a deck in a ship;

Fig. 4 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. 5 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.

[0012] 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.

[0013] Fig. 1 is an exploded perspective view showing a lower heat-generating device for a deck in a ship, Fig. 2 is a cross-sectional view showing a lower heat-generating device for a deck in a ship, 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.

[0014] The lower heat-generating device for a deck in a ship 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.

[0015] Hereinafter, constituent elements and their connection relationship of the lower heat-generating device for a deck in a ship will be described in detail with reference to Figs. 1 and 2.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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

[0024] 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.

[0025] 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.

[0026] 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.

[0027] 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 an 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 another embodiment of the present invention.

[0028] 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.

[0029] 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 scope of the present claimed invention.

[0030] 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.

[0031] 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 (10) having a filling space (11) defined therein and a plurality of fastening holes (12) formed on a bottom surface thereof, the enclosure member (10) being opened at a top thereof;

a heat-insulating member (20) configured to be filled in the filling space (11) of the enclosure member (10);

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 (50) being configured to control the generation of heat from the heating cable (30) and the supply of electric power, **characterized in that** the lower heat-generating device further comprises a heat diffusion member (80) configured to be filled in an air layer (60) formed between the underside of the ship deck and the top surface of

the fixing member (40) to exhibit a heat-insulating effect, the heat diffusion member (80) having a shape corresponding to that of the air layer (60).

2. The lower heat-generating device according to claim 1, wherein the heat-insulating member (20) comprises one or more concave depressions (70) formed at a region of the air layer (60) where the heating cable (30) is not arranged so as to increase the volume of the air layer (60), the heat diffusion member (20) being formed and filled to have a shape corresponding to that of the air layer (60).

Patentansprüche

1. Untere Vorrichtung zur Wärmeerzeugung für ein Deck auf einem Schiff, umfassend:

ein Gehäuseelement (10) mit einem darin angeordneten Füllraum (11) und einer Vielzahl von Befestigungslöchern (12), die an einer Bodenfläche davon gebildet sind, wobei das Gehäuseelement (10) an seinem oberen Ende geöffnet ist;

ein wärmeisolierendes Element (20), das ausgebildet ist, um in den Füllraum (11) des Gehäuseelementes (10) gefüllt zu werden;

ein Heizkabel (30), das exotherm an dem wärmeisolierenden Element (20) angeordnet ist, und so ausgebildet ist, dass es die Wärme auf das Schiffsdeck überträgt, das über dem Heizkabel angeordnet ist;

ein Befestigungselement (40), das an dem Heizkabel (30) angeordnet ist und so ausgebildet ist, dass es das Heizkabel (30) an dem wärmeisolierenden Element (20) sicher befestigt, so dass das Heizkabel in Position gehalten wird; und einen Controller (50), der an der Außenseite des Gehäuseelementes (10) montiert ist und mit dem Heizkabel (30) elektrisch verbunden ist, wobei der Controller (50) so ausgebildet ist, dass er die Erzeugung von Wärme aus dem Heizkabel (30) und die Zufuhr von elektrischer Energie steuert, **dadurch gekennzeichnet, dass** die untere Vorrichtung zur Wärmeerzeugung weiterhin ein Wärmediffusionselement (80) umfasst, das so ausgebildet ist, dass es in eine Luftschicht (60) gefüllt wird, die zwischen der Unterseite des Schiffsdecks und der Oberseite des Befestigungselementes (40) gebildet ist, um eine wärmeisolierende Wirkung zu zeigen, wobei das Wärmediffusionselement (80) eine Form hat, die der der Luftschicht (60) entspricht.

2. Untere Vorrichtung zur Wärmeerzeugung nach An-

spruch 1, wobei das wärmeisolierende Element (20) eine oder mehrere konkave Vertiefungen (70) umfasst, die an einem Bereich der Luftschicht (60) gebildet sind, an dem das Heizkabel (30) nicht angeordnet ist, um das Volumen der Luftschicht (60) zu erhöhen, wobei das Wärmediffusionselement (20) so geformt und gefüllt ist, dass es eine Form hat, die der der Luftschicht (60) entspricht.

Revendications

1. Dispositif inférieur de génération de chaleur pour un pont dans un navire comportant:

un élément d'enceinte (10) ayant un espace de remplissage (11) y défini et une pluralité des trous de fixation (12) formés sur une surface inférieure de celle-ci, l'élément d'enceinte (10) étant ouvert à une partie supérieure de celui-ci; un élément d'isolation thermique (20) configuré pour être rempli dans l'espace de remplissage (11) de l'élément d'enceinte (10);

un câble chauffant (30) disposé exothermiquement sur l'élément d'isolation thermique (20) et configuré pour transférer la chaleur au pont de navire positionné au-dessus du câble chauffant (30);

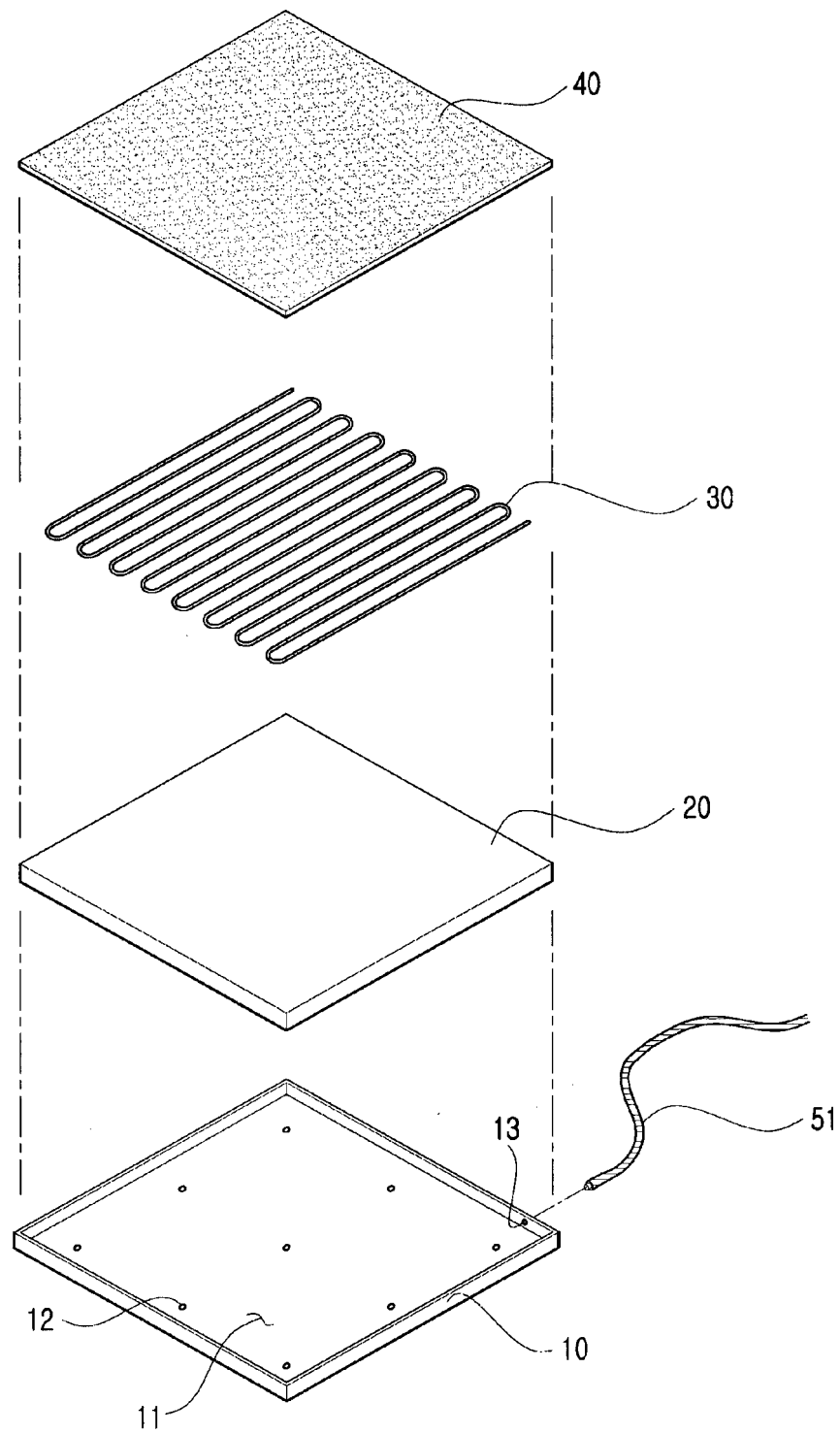
un élément de fixation (40) disposé au câble chauffant (30) et configuré pour fixer fermement le câble chauffant (30) à l'élément d'isolation thermique (20) de sorte que le câble chauffant (30) est maintenu en position; et

un contrôleur (50) monté à l'extérieur de l'élément d'enceinte (10) et relié électriquement au câble chauffant (30), le contrôleur (50) étant configuré pour contrôler la production de chaleur à partir du câble chauffant (30) et l'alimentation d'énergie électrique, **caractérisé en ce que**

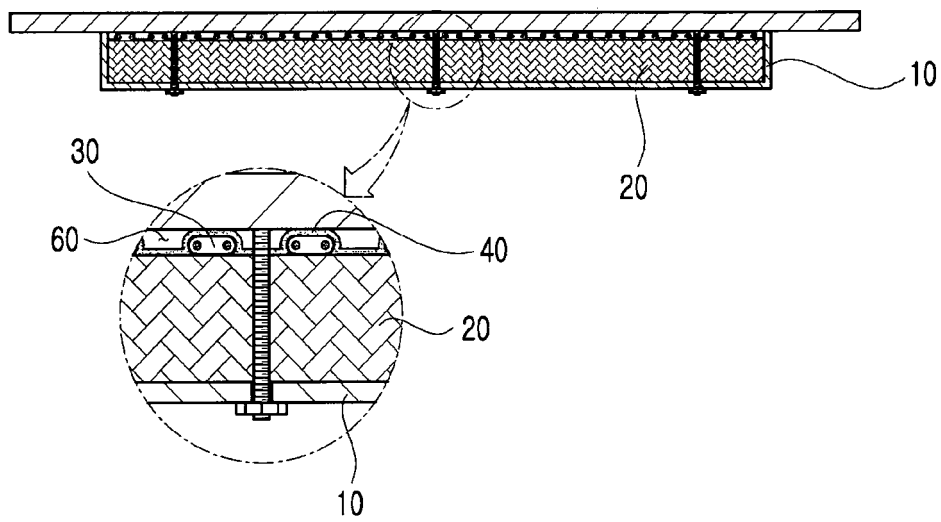
le dispositif inférieur de génération de chaleur comporte en outre un élément de la diffusion thermique (80) configuré pour être rempli dans une couche d'air (60) formée entre la partie inférieure du pont de navire et la surface supérieure de l'élément de fixation (40) pour montrer un effet d'isolation thermique, l'élément de la diffusion thermique (80) ayant une forme correspondant à celle de la couche d'air (60).

2. Dispositif inférieur de génération de chaleur selon la revendication 1, l'élément d'isolation thermique (20) comportant un ou plusieurs creux concaves (70) formés à une région de la couche d'air (60) où le câble chauffant (30) n'est pas disposé afin d'augmenter le volume de la couche d'air (60), l'élément de la diffusion thermique (20) étant formé et rempli pour avoir une forme correspondant à celle de la couche d'air (60).

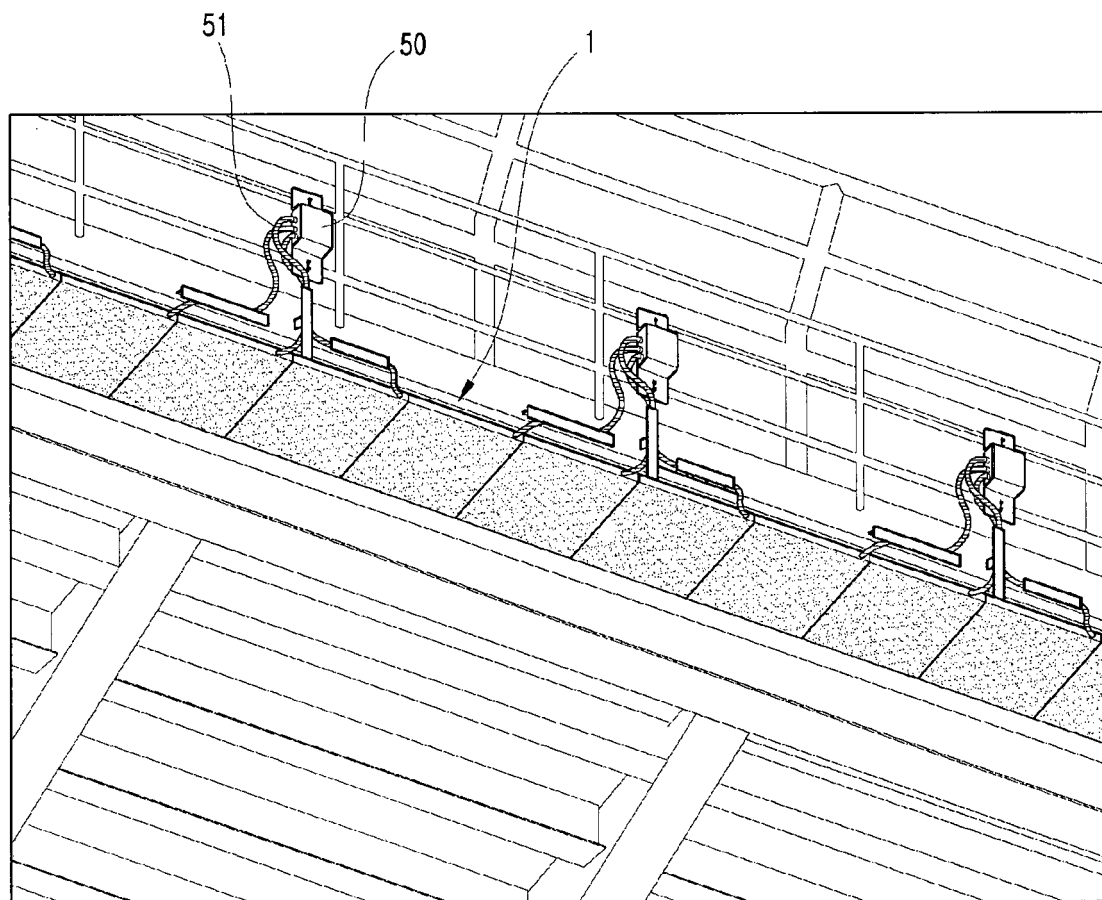
[Fig. 1]



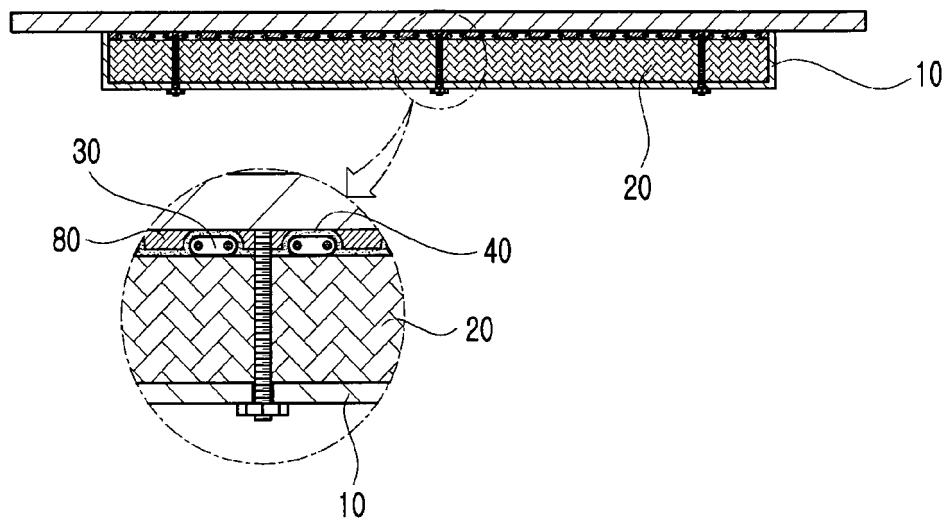
[Fig. 2]



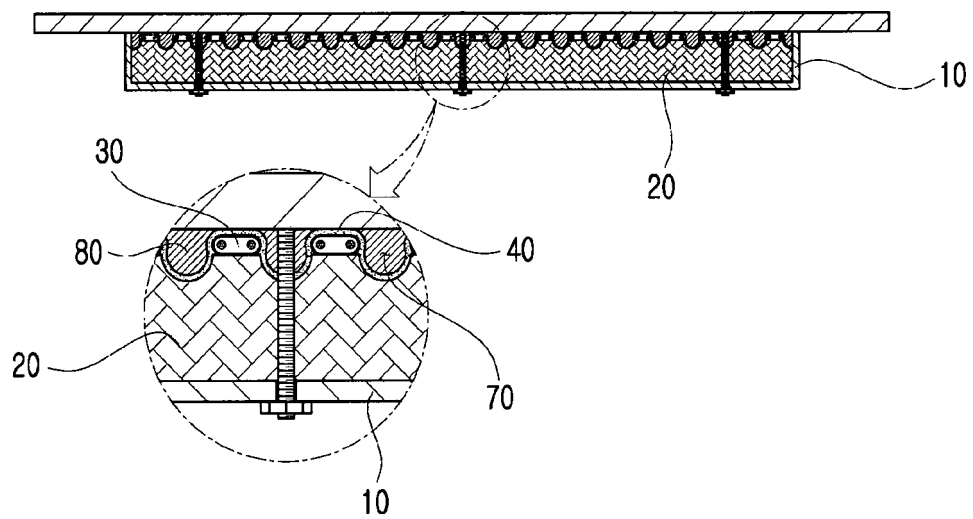
[Fig. 3]



[Fig. 4]



[Fig. 5]



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 1020100038517 A [0004]
- KR 101107093 B1 [0004]
- KR 101074720 B1 [0004]
- SI 22764 A [0004]