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(54) AIR-CONDITIONING SYSTEM FOR A PASSENGER SHIP, AND A PASSENGER SHIP

(57) A passenger ship and an air-conditioning system for a passenger ship, the air-conditioning system comprising: an air-handling unit (32), which is on the centreline (X) of the passenger ship (10), in an intermediate space (30) of its deck structure (20), and located on a floor (22) of the deck structure (20), and which is adapted to supply fresh air to several passenger cabins (26) of two or several floors (22) and to receive exhaust air from said several passenger cabins; and a ventilation shaft (38), which is integrated in the intermediate space (30) and included in the structure of the intermediate space (30), and which extends in a vertical direction through several superimposed floors (22), and the ventilation shaft (38) being adapted to supply fresh air to the said air handling unit and/or receive return air from the said air handling unit. In the intermediate space (30) of the passenger ship (10) there is the air handling unit (32) and/or ventilation shaft (38) placed on the same floor with a third group (40) of separate passenger cabins (26).

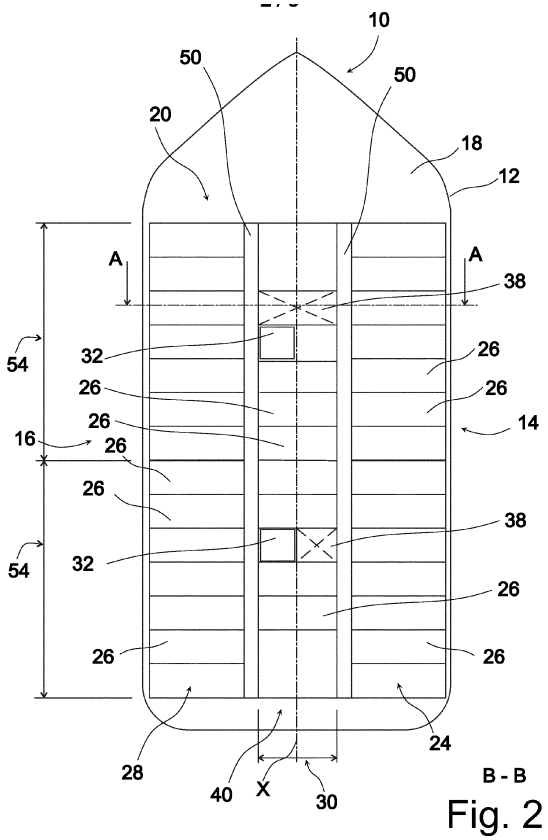

Fig. 2

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Description

Technical field of the solution

[0001] The presented solution concerns an air-conditioning system for a passenger ship.

[0002] The presented solution also concerns a passenger ship provided with the mentioned air-conditioning system.

Background of the solution

[0003] Passenger ships, especially cruise vessels, are designed typically for several hundreds or thousands of passengers. Inside air in the cruise vessel must be homogeneous in temperature and humidity irrespective of the climate zone where the cruise happens to occur. An air conditioning system for the cruise vessel is mainly intended for the air conditioning of different areas of the deck of passenger cabins, comprising, among others, passenger cabins, corridors, storage rooms and toilets.

[0004] The air-conditioning system typically comprises an air handling unit, AHU, which takes in fresh air from outside and, for example, filters it and either heats or cools it, and supplies it to the ventilated areas. Fresh air is led from a supply air duct of the air handling unit via a ductwork to passenger cabins and other areas. Air pressure, temperature and/or humidity can additionally be adjusted to desired values by using a fan coil device installed in the passenger cabin. Return air extracted from the passenger cabins is led back to the air handling unit and its return duct by means of a ductwork.

[0005] An example of a fan coil device for a passenger cabin has been presented in the document EP 3150926 A1. Another example of a fan coil device for a passenger ship cabin and an air-conditioning system for a cruise vessel, including an air handling unit, has been presented in the document EP 3591302 A1.

[0006] Air handling units become relatively large-scale and they take a lot of space, when they serve passenger cabins of three floors or more. Horizontal ducts providing fresh air to the air handling units from outside the ship and extracting return air from the ship also become large and voluminous.

[0007] A passenger ship is usually divided into successive fire compartments comprising several floors. There are own air handling units for each fire compartment so that together they take up a lot of space.

[0008] Passenger cabins are typically placed successively on both sides of the passenger ship to a multi-storey deck structure situated above the deck of the passenger ship so that the cabins can be, for example, balcony cabins with a sea view. Between the passenger cabins in the middle section of the passenger ship there is an intermediate space of the height of several floors, to which large air handling units with ductworks have been placed, as well as pipelines for fresh air and return air. This intermediate space also contains the staircases and lifts. One example of a passenger ship's deck structure provided with an intermediate space is presented in the document US 4838190 A.

[0009] The above described intermediate space in the deck structure of the passenger ship may, nevertheless, lead to disadvantageous use of space and, additionally, large air handling units in the intermediate space and associated pipelines restrict the use of the intermediate space also for other purposes.

[0010] One example of a passenger ship's multi-storey deck structure is also presented in the document JP HO4224497, in which the intermediate space is not in use. This may, nevertheless, lead to difficulties in placing the large air handling units in an optimal manner and, further, the associated pipelines must be placed between the passenger cabins located on the sides of the passenger ship. A consequence of this is that the number of passenger cabins especially with balconies or sea view cannot be maximised.

Summary of the solution

[0011] The objective of the presented solution is to solve the above described problems or drawbacks.

[0012] The air-conditioning system for a passenger ship in accordance with the presented solution is specified in claim 1.

[0013] The passenger ship according to the presented solution is specified in claim 15.

[0014] It is an advantage of the presented solution that the air handling units of the air-conditioning system can be placed into the intermediate space so that they only take up a little space.

[0015] A further advantage is that the air handling units are located in the intermediate space so that they do not take up space from passenger cabins on the sides of the ship, which may be provided with balconies and/or which have a sea view.

[0016] A further advantage is that the air handling units are adapted to restrictedly serve, for example, only the passenger cabins of two decks or at most three decks so that it is possible to choose into use air handling units, which are smaller than before. This also provides the advantage of shorter ductworks for fresh air and exhaust air, because the air handling units are located closer to the passenger cabins than big state-of-the-art air handling units. This also has the advantage that pressure losses in ductworks are smaller and needed components can be smaller or components with lower power.

[0017] A further advantage is that compact air handling units are utilised, requiring only a small floor area for installation. The compact size is also achieved by connecting different ducts, such as supply duct and/or return duct, for example, on top of the air handling unit, in which case the air handling unit is of a vertical structure and, with its ducts, takes up space mainly in the vertical direction. This saves space compared to state-of-the-art apparatuses, the structure of which with ducts is long in the horizontal

direction and which require a lot of floor area and space, for example, for purposes of service.

[0018] It is a further advantage that fresh air and return air can be led along ventilation shafts in the vertical direction so that they take up only a little space on each floor of the intermediate space. Ventilation shafts, when they are constructed large enough for the planed quantity of air, cause as little pressure losses as possible. Advantages are further achieved by placing the air handling unit immediately next to the ventilation shaft or in its proximity so that the ducts connecting the air handling unit and the ventilation shaft, such as the said supply duct and/or return duct can be kept short and the pressure losses caused in the ducts can be kept as small as possible.

[0019] An advantage is that by means of one vertical ventilation shaft two or more air handling units on different floors can be brought close to the ventilation shaft commonly serving these air handling units.

[0020] A further advantage is that the ventilation shaft can be designed as an integrated part of the ship's steel structure, thus freeing space for other structures to be placed into the intermediate space.

[0021] A special advantage is now achieved by freeing space in the intermediate space, to which new passenger cabins can be placed. In the known technology the intermediate space was reserved for large air handling units, staircases and lifts, and other technical devices.

[0022] Principles known per se, for example, from the above-mentioned documents EP 3150926 A1 and EP 3591302 A1, can be applied in the presented air-conditioning system for a passenger ship and its air handling unit and fan coil device for a passenger cabin.

[0023] Devices with a vertical structure known per se from above-ground buildings can be applied in the presented air-conditioning system for a passenger ship, especially in its air handling unit. The structure and materials of these devices need only be adapted to meet the requirements of maritime conditions, for example, by using stainless materials.

Short description of the drawings

[0024]

Figure 1 illustrates a front view of a passenger ship, in which the air-conditioning system of the presented solution is applied.

Figure 2 illustrates a top view of the passenger ship of Figure 1.

Figure 3 illustrates as a schematic diagram an air handling unit and associated ductworks and ducts to serve passenger cabins.

Detailed description of the presented solution

[0025] The solution presented next will be explained in more detail by simultaneously referring to some examples and using reference numbering.

[0026] The same reference number is used to refer to same or similar components, parts or embodiments.

[0027] In Figures 1 and 2 there is illustrated an example of a passenger ship 10, in which the air-conditioning system of the solution can be applied.

[0028] In Figure 1 there is illustrated a cross-section of the passenger ship 10 along the line A - A of Figure 2. Figure 2 illustrates a cross-section of the passenger ship 10 along the line B - B of Figure 1.

[0029] The object is especially a cruise vessel designed for several hundreds or thousands of passengers.

[0030] The said passenger ship 10 comprises ahull 12, a deck 18 and a deck structure 20.

[0031] The hull 12 forms a waterproof, floating and load-bearing steel structure, inside which there may be located, for example, a power unit for the passenger ship, technical premises, crew cabins, car decks or premises common to the passengers. The hull 12 defines a horizontal centreline X of the passenger ship, which joins with or is parallel to the longitudinal direction and the direction of travel of the passenger ship 10. The hull 12 also defines a first side 14 and a second side 16 on both sides of the centreline X, on opposite sides of the centreline.

[0032] The hull 12 is principally covered by the horizontal deck 18, on top of which the overlying deck structure 20 of the passenger ship 10 is located.

[0033] The deck structure 20 consists of several superimposed floors 22, of which there may be, for example, at least 4 or 10 - 12. The deck structure 20 may have several superimposed floors 22 with a similar structure and intended for passenger cabins 26. The said similar floors 22 are especially described in this specification.

[0034] The hull 12, the deck 18 and the deck structure 20 typically have a steel structure.

[0035] Each said floor 22 has a first group 24 of separate passenger cabins 26, which are located successively in the longitudinal direction of the passenger ship 10. There are, for example, at least 10 or 15 - 20 successive passenger cabins 26. These are located on the first side 14 of the hull 12.

[0036] Each said floor 22 further has a second group 28 of separate passenger cabins 26, which are located successively in the longitudinal direction of the passenger ship 10. There are, for example, at least 10 or 15 - 20 successive passenger cabins 26, or dozens of these. These are located on the second side 16 of the hull 12.

[0037] The said passenger cabins 26 are cabins that, for example, have a balcony and/or sea view.

[0038] The passenger cabins 26 are, for example, prefurnished modules, which are installed into the deck structure 20 and connected to different systems of the passenger ship 10, such as electricity, water or ventila-

tion systems.

[0039] The deck structure 20 further has an intermediate space 30, which is in a horizontal direction located on each floor 22 between the first and second passenger cabin groups 24, 28; for example, on the centreline X. In addition, the intermediate space 30 extends in a vertical direction through several superimposed floors 22; for example, at least through four floors 22 or 10 - 12 floors 22. According to one example, the intermediate space 30 extends through all the floors 22 of the deck structure 20.

[0040] In addition to this, the intermediate space 30 extends in the longitudinal direction of the passenger ship 10 past several successive passenger cabins 26; for example, past at least 10 or 15 - 20 passenger cabins, or past all of them. According to one example, the intermediate space 30 extends to the whole length of the first and second passenger cabin groups 24, 28.

[0041] Thus, the intermediate space 30 is formed between the first and second passenger cabin groups 24, 28 on different floors 22. The intermediate space 30 extends in the longitudinal direction of the passenger ship 10.

[0042] According to one example and Figures 1, 2, on each floor 22, between the intermediate space 30 and the first passenger cabin group 24 and also between the intermediate space 30 and the second passenger cabin group 28, there is located a corridor 50, which extends past the passenger cabins 26 in the longitudinal direction of the passenger ship 10 .

[0043] According to one example, a steel bulkhead of the passenger ship 10 separates the intermediate space 30 and each corridor 50 on each floor, simultaneously limiting the intermediate space 30.

[0044] The intermediate space 30 may additionally include one or several stairways and lifts, which travel through several floors 22.

[0045] In its longitudinal direction, the passenger ship 10 may be divided into several, for example two or more fire compartments 54. Each fire compartment 54 covers a part of the first and second passenger cabin groups 24, 28 and their passenger cabins 26.

[0046] The air-conditioning system of the presented solution is contemplated next, with the help of some examples.

[0047] The air-conditioning system of the presented solution comprises at least one air handling unit 32 and at least one ventilation shaft 38.

[0048] According to an example of Figures 1 and 2, the air handling unit 32 is in the intermediate space 30 and located on a floor 22 of the deck structure 20.

[0049] The air handling unit 32 is adapted to serve several passenger cabins 26 of two or several different floors 22. According to an example, the said air handling unit 32 is adapted to serve several passenger cabins 26 of two or at most three different floors 22.

[0050] The said passenger cabins 26 to be served belong to the first and second passenger cabin groups 24, 28 of each floor 22.

[0051] According to an example, the said passenger cabins 26 to be served further belong to the same fire compartment 54. The air handling unit 32 is adapted to serve the passenger cabins 26 of only one fire compartment 54. Two or several air handling units 32 may be located in the same fire compartment 54.

[0052] According to an example according to Figure 3, the air handling unit 32 comprises a first ductwork 34, via which the air handling unit 32 is adapted to supply fresh air to several passenger cabins 26 of two or several floors 22. The air handling unit further comprises a second ductwork 36, via which the air handling unit 32 is adapted to receive exhaust air from said passenger cabins 26 of two or several floors. The air handling unit 32 may be adapted to heat or cool said supplied air.

[0053] According to one example, the first ductwork 34 comprises a duct 56 leaving from the air handling unit 32, which divides into several ducts 46, leading to different passenger cabins 26. According to one example, the second ductwork 36 comprises ducts 48 coming from several different passenger cabins 26, which combine to form a duct 58 leading to the air handling unit 32.

[0054] In each passenger cabin 26, to which the duct 46 and the duct 48 are connected, there may be a fan coil device 52, by means of which the air pressure, temperature and/or humidity of the passenger cabin 26 is adjusted to the desired value. For example, the fresh air duct 46 is connected to the passenger cabin 26 by means of the fan coil device 52.

[0055] According to one example, the air handling unit 32 is compact and requires only a small floor area for installation. Most preferably the structure and material of the air handling unit 32 is adapted to meet the requirements of maritime conditions.

[0056] According to one example, the air handling unit 32 is located in a space, which fits into one floor 22 in a vertical direction. In addition to this or alternatively, the air handling unit 32 is located, for example, in a space, which in the longitudinal direction of the passenger ship 10 corresponds to the length of one or two passenger cabins 26 in the longitudinal direction of the passenger ship 10.

[0057] The ventilation shaft 38 is integrated in the intermediate space 30 and included in the structure of the intermediate space 30. According to one example, the ventilation shaft 38 is a space limited by steel plate structures, which is an integral part of the deck structure 20. The ventilation shaft 38 is most preferably constructed into the passenger ship 10 simultaneously with the deck structure 20.

[0058] The ventilation shaft 38 has a horizontal cross-section in the form of, for example, a rectangle or a square. The ventilation shaft 38 is used as such for transferring air without installed pipes or similar.

[0059] The ventilation shaft 38 extends in a vertical direction through several successive floors 22. According to one example, the ventilation shaft 38 extends at the same time to the floor 22 or past the floor 22, in which

the air handling unit 32 is located.

[0060] According to one example, the ventilation shaft 38 extends in the vertical direction in the same way as the intermediate space 30, which is presented above, or the length of the ventilation shaft 38 in the vertical direction is shorter than the intermediate space 30. According to one example, the ventilation shaft 38 extends through all floors 22 of the deck structure 20.

[0061] The ventilation shaft 38 is adapted to supply fresh air to the air handling unit 32, to which the ventilation shaft 38 is connected via a first duct 42 (see Figure 3). Additionally, or alternatively, the ventilation shaft 38 is adapted to receive return air from the said air handling unit 32, to which the ventilation shaft 38 is connected via a second duct 44 (see Figure 3).

[0062] According to one example, the ventilation shaft 38 is located in a space, which in the longitudinal direction of the passenger ship 10 corresponds to the length of one or two passenger cabins 26 in the longitudinal direction of the passenger ship 10. Additionally, or alternatively, the ventilation shaft 38 is located in a space, the width of which corresponds to the width of the intermediate space 30 in a lateral direction of the passenger ship 10, which is essentially perpendicular to the longitudinal direction of the passenger ship 10.

[0063] According to one example, the ventilation shaft 38 is adapted to receive fresh air from the level of the deck 18 of the passenger ship 10 and/or the floor 22, on which the rescue boats are located. According to one example, the ventilation shaft 38 is adapted to remove return air from the level of the upper part of the deck structure 20. The ventilation shaft 38 may be communicated with outside of the passenger ship 10 via different ducts and/or closing devices.

[0064] According to one example, the ventilation shaft 38 is intended to both supply fresh air and remove return air so that the said ventilation shaft 38 is divided into at least two separate, vertical ducts, the first one of which is for fresh air and the second one for return air. Fresh air is obtained from outside the passenger ship 10 and return air is removed to outside the passenger ship 10.

[0065] According to one example, fresh air is adapted to flow downwards or upwards in the ventilation shaft 38 or its first duct. According to another example, return air is adapted to flow upwards in the ventilation shaft 38 or its second duct.

[0066] According to one example, the said ventilation shaft 38 is only intended to either supply above-mentioned fresh air or remove above-mentioned return air. Thus, the air-conditioning system additionally comprises a second respective ventilation shaft 38 for the said same air handling unit 32. In this case, the one ventilation shaft 38 is only meant for the supply of above-described fresh air and the other ventilation shaft 38 for the removal of above-described return air.

[0067] According to one example, the air handling unit 32 is located adjacent to or in the proximity of one or several ventilation shafts 38 so that the first duct 42 and/or the second duct 44 can be constructed as short as possible.

[0068] When utilising the air-conditioning system of the presented solution, the passenger ship 10 may be executed so that a third group 40 of separate passenger cabins 26 may be placed on several floors 22 of the intermediate space 30, the passenger cabins 26 being arranged successively in the intermediate space 30 in the longitudinal direction of the passenger ship 10. The air handling unit 32 is adapted to serve also the passenger cabins 26 of the third passenger cabin group 40 in a way that corresponds to what has been disclosed above. These passenger cabins 26 belong to one above-mentioned fire compartment 54.

[0069] Thus, the air-conditioning system of the presented solution has been executed so that the intermediate space 30 of the passenger ship 10 contains the air handling unit 32 or the ventilation shaft 38, or both, placed on the same floor 22 with the third passenger cabin group 40.

[0070] According to one example, the third passenger cabin group 40 is located in the longitudinal direction of the passenger ship 10 in succession with the air handling unit 32 and/or ventilation shaft 38.

[0071] The above-described air handling unit 32 and its principles may also be applied to other air handling units 32 serving other floors 22.

[0072] According to one example, the ventilation shaft 38 is located adjacent to a boundary between the fire compartments 54 or adjacent to a bulkhead.

[0073] According to one example, the intermediate space 30 includes a second air handling unit 32 located on some other floor 22, the operation of which corresponds to the above-described air handling unit 32 and which is adapted to supply fresh air to several passenger cabins 26 on two or several floors 22 via a third ductwork 34 (see Figure 3). These passenger cabins 26 belong to the above-mentioned first and second passenger cabin groups 24, 28 of the floor 22 in question, and in one example, also to the third passenger cabin group 40. The said second air handling unit 32 is additionally adapted to receive exhaust air from said several passenger cabins 26 via a fourth ductwork 36 (see Figure 3).

[0074] According to one example, the above-described ventilation shaft 38 is connected to the said second air handling unit 32 via a third duct 42 for supplying fresh air, and/or to the said second air handling unit 32 via a fourth duct 44 for receiving return air.

[0075] The presented solution is not restricted to the examples shown above, which do not present all possible embodiments of the shown solution.

[0076] The presented solution is described and defined by the enclosed claims.

Claims

1. An air-conditioning system for a passenger ship, the

air-conditioning system being adapted to be used in the passenger ship (10), which comprises:

- a hull (12) with two opposite sides (14, 16) and defining a longitudinal direction of the ship;
- a deck (18) covering the hull;
- a deck structure (20) being located above the deck and comprising several superimposed floors (22);
- a first group (24) of separate passenger cabins (26) on each floor, arranged successively in the longitudinal direction of the passenger ship and located on the first side (14) of the hull, and a second group (28) of separate passenger cabins (26) arranged successively in the longitudinal direction of the passenger ship and located on the opposite, second side (16) of the hull;
- an intermediate space (30), which in a horizontal direction is located between the first and second passenger cabin groups (24, 28) on each floor, extends in a vertical direction through several superimposed floors (22), and extends in the longitudinal direction of the ship past several successive passenger cabins (26);

characterised in that the air-conditioning system comprises:

- an air handling unit (32), which is in the intermediate space (30) and placed on one of the floors (22) and which is adapted to supply fresh air to several passenger cabins (26) of two or several of the floors via a first ductwork (34), the passenger cabins (26) belonging to the first and second passenger cabin groups (24, 28), and to receive exhaust air from said several passenger cabins via a second ductwork (36); and
- a ventilation shaft (38), which is integrated in the intermediate space (30) and included in the structure of the intermediate space (30) and extends in a vertical direction through several superimposed floors (22), the ventilation shaft (38) being adapted to supply fresh air to the said air handling unit, to which the said ventilation shaft is connected via a first duct (42), and/or to receive return air from the said air handling unit, to which the ventilation shaft is connected via a second duct (44); and
- wherein the intermediate space (30) of the passenger ship (10) includes the air handling unit (32) and/or the ventilation shaft (38) placed on the same floor with such a third group (40) of separate passenger cabins (26), which are arranged successively in the intermediate space in the longitudinal direction of the ship.

2. The passenger ship according to claim 1, wherein each floor has a corridor placed between the intermediate space (30) and the first passenger cabin group (24), and between the intermediate space and the second passenger cabin group (28), which extends past the passenger cabins (26) in the longitudinal direction of the ship.

3. The passenger ship according to claim 2, wherein on each floor the intermediate space (30) and each corridor is separated by a steel bulkhead of the ship, which limits the intermediate space.

4. The passenger ship according to any one of claims 1 - 3, wherein the said ventilation shaft (38) is a space defined by steel plate structures, which is an integral part of the said deck structure (20).

5. The passenger ship according to any one of claims 1 - 4, wherein the said air handling unit (32) is placed adjacent to or in the proximity of one of the said ventilation shaft (38).

6. The passenger ship according to any one of claims 1 - 5, wherein the said air handling unit (32) is compact and requires only a small floor area for installation, and wherein the structure and materials of the said air handling unit are adapted to the requirements of maritime conditions.

7. The passenger ship according to any one of claims 1 - 6, wherein the said third group (40) of separate passenger cabins is located in the longitudinal direction of the ship in succession with the said air handling unit (32) and/or the said ventilation shaft (38).

8. The passenger ship according to any one of claims 1 - 7, wherein the said ventilation shat (38) is divided into at least two separate, vertical ducts, the first one of which is intended for fresh air and the second one for return air.

9. The passenger ship according to any one of claims 1 - 8, wherein the ventilation shaft (38) is via the first duct communicated with outside of the passenger ship to receive fresh air and via the second duct communicated with outside of the passenger ship to remove return air.

10. The passenger ship according to any one of claims 1 - 9, wherein the said ventilation shaft (38) is adapted to supply fresh air to the said air handling unit and a separate, second air ventilation shaft (38) is adapted to receive return air from the said air handling unit.

11. The passenger ship according to any one of patent claims 1 - 10, wherein:

- in the intermediate space (30) there is a second air handling unit (38) placed on one other of the floors (22), which is adapted to supply fresh air to several passenger cabins of two or several of

the floors (22) via a third ductwork (34), the passenger cabins belonging to the said first and second passenger cabin groups (24, 28) of the floor in question, and to receive exhaust air from the said several passenger cabins via a fourth ductwork (36); and

- the said ventilation shaft (38) is via the third duct (42) communicated with the second air handling unit for supplying fresh air and/or via the fourth duct (44) communicated with the said second air handling unit for receiving return air.

12. The passenger ship according to any one of claims 1 - 11, wherein there further are one or several stairways and lifts located in the intermediate space (30), travelling through several floors.

13. The passenger ship according to any one of claims 1 - 12, wherein the first ductwork (34) comprises a duct starting from the air handling unit (32) and dividing into several ducts (46) leading to different passenger cabins, and the second ductwork (36) comprises different ducts (48) leaving from several different passenger cabins and combining into a duct leading to the air handling unit (32).

14. The passenger ship according to any one of claims 1 - 12, wherein the said air handling unit (32) is adapted to supply fresh air to several passenger cabins (26) of the two or several floors (22) via the first ductwork (34), the passenger cabins belonging to the above-mentioned third passenger cabin group (40), and to receive exhaust air from said several passenger cabins via the second ductwork (36).

15. A passenger ship, which is according to any of claims 1 - 14 and which comprises the air-conditioning system for a passenger ship according to the said claim.

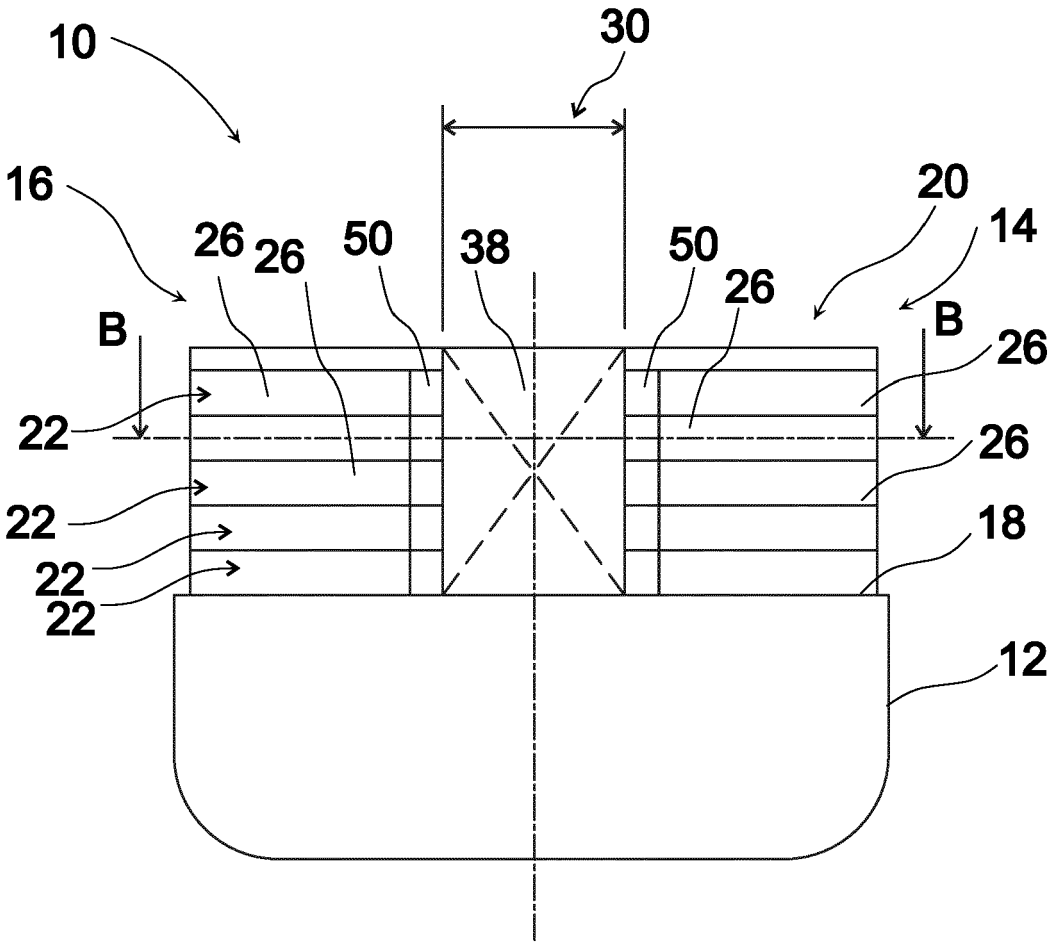

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Fig. 1

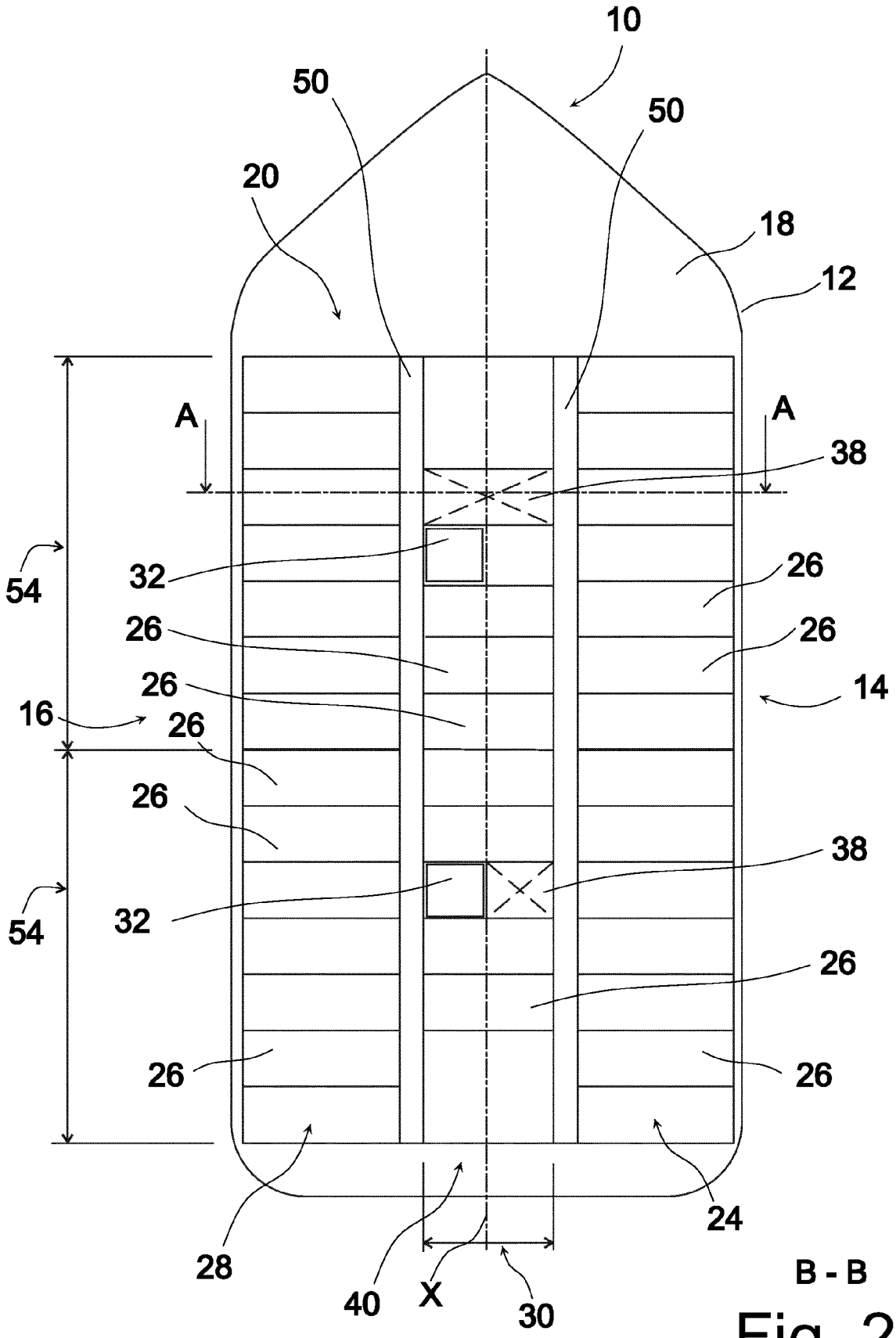
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Fig. 2

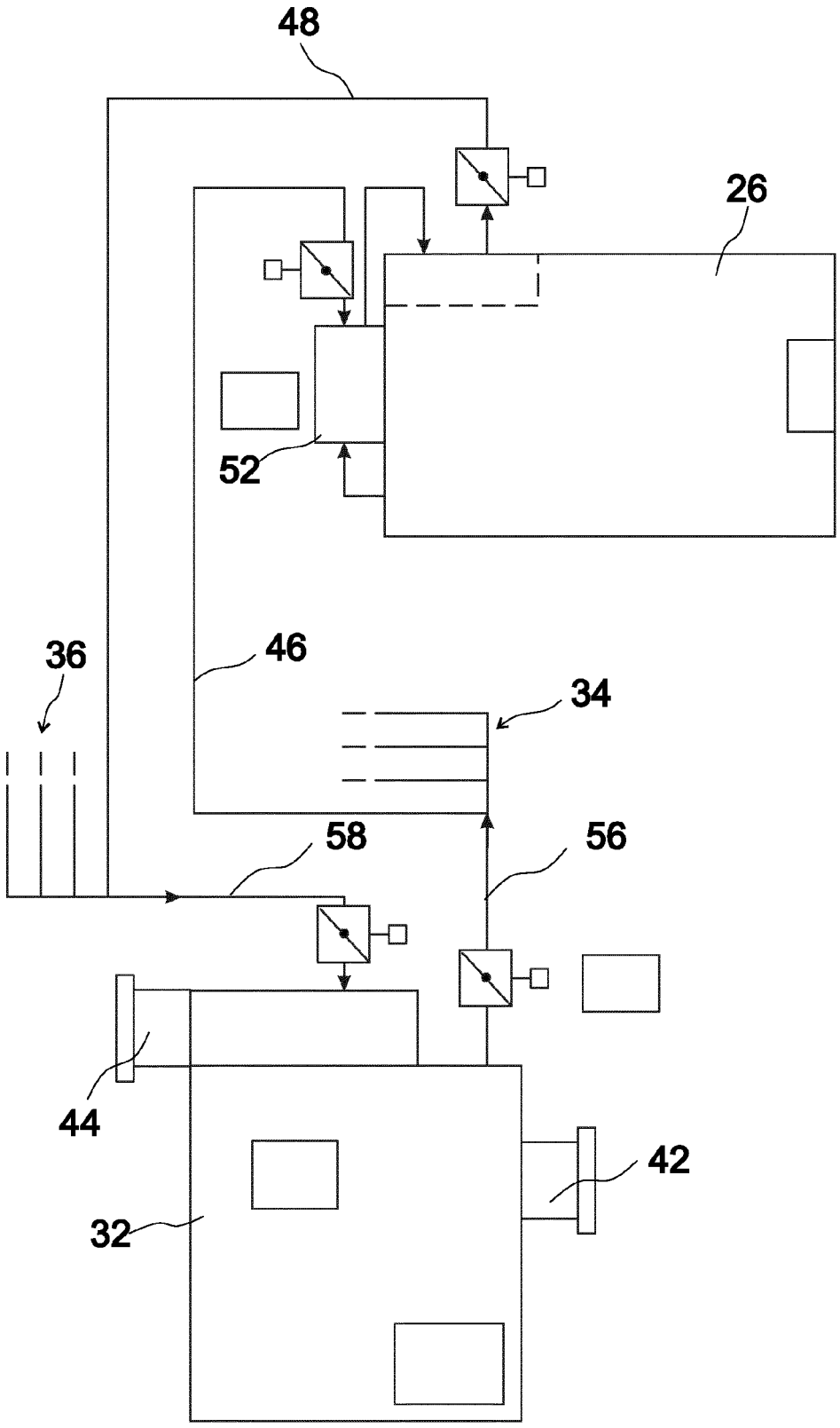

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 20 39 7503

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 176 001 A (BLOHM VOSS AG) 10 December 1986 (1986-12-10) * page 1, lines 1-15; claims; figures * * page 1, line 48 - page 2, line 5 * -----	1-15	INV. B63B29/02 B63B35/00
A	WO 2004/096633 A2 (FINCANTIERI CANTIERI NAVALI IT [IT]; BERTAGLIA GIANFRANCO [IT]) 11 November 2004 (2004-11-11) * claims; figures 1,4 * -----	1-15	
A,D	JP H04 224497 A (MITSUBISHI HEAVY IND LTD) 13 August 1992 (1992-08-13) * paragraph [0009]; claims; figures * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 September 2020	Knoflacher, Nikolaus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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08-09-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2176001 A	10-12-1986	AU 581761 B2	02-03-1989
		DE 3519394 A1	04-12-1986
		DK 256186 A	01-12-1986
		ES 8703795 A1	16-03-1987
		FR 2582613 A1	05-12-1986
		GB 2176001 A	10-12-1986
		GR 861356 B	16-09-1986
		IT 1189142 B	28-01-1988
		NL 8601230 A	16-12-1986
		NO 169882 B	11-05-1992
		PT 82576 A	01-06-1986
		TR 23609 A	30-04-1990
		US 4711193 A	08-12-1987
WO 2004096633 A2	11-11-2004	AT 378247 T	15-11-2007
		DE 602004010191 T2	02-10-2008
		EP 1773651 A2	18-04-2007
		WO 2004096633 A2	11-11-2004
JP H04224497 A	13-08-1992	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 3150926 A1 **[0005] [0022]**
- EP 3591302 A1 **[0005] [0022]**
- US 4838190 A **[0008]**
- JP HO4224497 B **[0010]**