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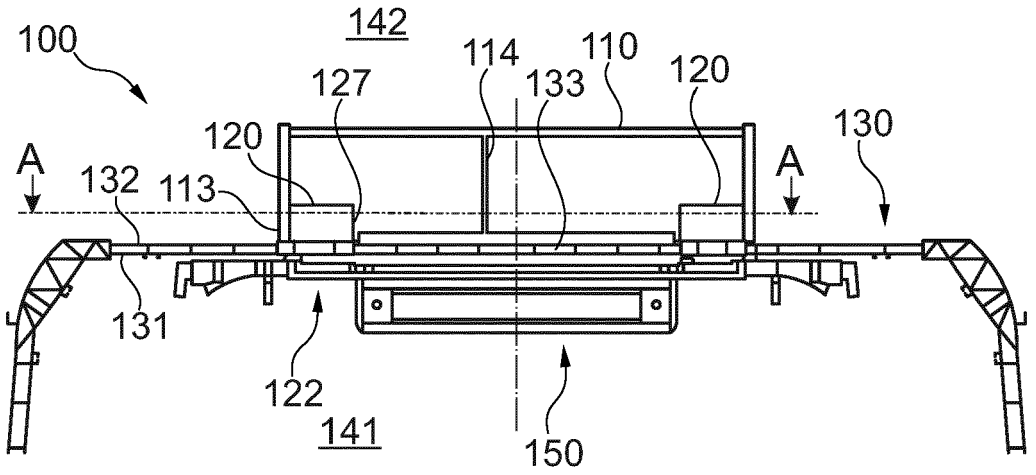
(71) Applicant: **Bombardier Transportation GmbH**
10785 Berlin (DE)

(72) Inventor: **Waroquier, Louis**
10439 Berlin (DE)

(74) Representative: **Zimmermann & Partner Patentanwälte mbB**
Postfach 330 920
80069 München (DE)

(54) AIR DUCT SYSTEM INTERGRATED INTO THE CAR BODY ROOF PROFILES

(57) A car body arrangement (100) for a vehicle, in particular a rail vehicle is described. The car body arrangement includes a car body roof (130) having an inner side (131) and an outer side (132), the car body roof separating an interior space (141) of the vehicle from an exterior surrounding (142) of the vehicle; a main air duct (110) arranged at the outer side (132) of the car body roof (130); at least two secondary air ducts (120), which are spaced apart from each other and form structural parts of the car body roof (130), wherein a part of the car body roof (130) extends between and connects the two secondary air ducts (120). Each of the two secondary air ducts (120) provides air channels between the main air duct (110) and the interior space (141) of the vehicle. Further, a method for mounting an air duct system is described.



A-A

Fig. 1a

EP 3 127 774 A1

Description

Technical field

[0001] The invention refers to a car body arrangement with an air duct system of a vehicle, in particular a rail vehicle.

Background

[0002] Air ducts are used for heating, ventilation, and air conditioning (HVAC) to deliver and remove air to and from a vehicle. Air duct systems in vehicles, and in particular in rail vehicles, often serve to deliver and exchange the air in the passenger compartment in order to provide an agreeable and healthy environment during travelling. HVAC is therefore an aspect not to be neglected for the passenger's acceptance of travelling in a vehicle.

[0003] The air ducts used for delivering the air to a desired position in the vehicle are normally located in the ceiling area for providing fresh air from above down to the passengers. In known systems, the air duct systems are often mounted between the car body roof and the interior ceiling and are independent from the car body or ceiling. For instance, the air duct system and secondary chambers of the air duct system are supported and connected by multiple brackets to the extrude profiles of the car body roof. The same concept of fixation applies for the ceiling, the lighting and sometimes the roof wire duct(s).

[0004] The patent application EP 2 335 954 A1 describes an arrangement to be fixed to a roof of a vehicle. The arrangement includes supporting structures fastened to a vehicle body- roof, and a ceiling lining suspended on the supporting structures. The ceiling lining includes a channel module, which forms an air supply channel for supplying air into the interior of a vehicle body. A plate-like ceiling element downwardly covers the air supply channel and forms a surface of the ceiling lining on a lower side. The surface of the ceiling lining is viewed from a passenger compartment.

[0005] The document CN 202295004U describes an air duct system similar to the air duct system of EP 2 335 954 A1. The Chinese document refers to a vehicle roof assembly and a passenger vehicle including the roof assembly. The vehicle roof assembly includes a bearing device and a ceiling lining plate. The ceiling lining plate includes a channel module forming an air supplying channel. The bearing device is provided with a fixing component suitable for mounting a display or a monitoring device.

[0006] The document KR 100765270 B1 refers to a diagonal-type air conditioner duct module including a primary duct supplying cooled air in the longitudinal direction of a passenger room of a train. A secondary duct is formed at two sides of the primary duct to allow the cooled air supplied from the primary duct to pass through a plate having primary exhaust holes such that the cooled air has uniform pressure. A tertiary duct is formed below the secondary duct to allow the cooled air supplied from the secondary duct to pass through a plate having secondary exhaust holes such that the cooled air has uniform pressure. A cooled air exhaust port is formed on the lower portion of the tertiary duct to allow the cooled air to be uniformly supplied to the passenger room.

[0007] The document JP 09-136648 describes a railway rolling stock. An air duct for fresh air is formed in a car body structure. An air duct forming member is extended in the back and forth directions of the car while its both side end parts are fixed to the vehicle car structure and a vehicle car floor.

Drawbacks of the prior art

[0008] The above described solutions for providing air ducts in a vehicle have considerable space requirements and/or require considerable material and assembling time efforts.

Problem

[0009] Therefore, it is an object of the present invention, to provide a cost efficient and space-saving solution for an air duct system in a car body arrangement. At the same time, it is an object of the present invention to provide a roof and air duct construction for a vehicle having a low weight and good structural properties.

Solution according to the invention

[0010] The problem is solved by a car body arrangement according to claim 1 and a method for mounting an air duct system according to claim 14. Further aspects, advantages, and features of the present invention are apparent from the dependent claims, the description, and the accompanying drawings.

[0011] According to embodiments described herein, a car body arrangement for a vehicle, in particular a rail vehicle is described. The car body arrangement includes a car body roof having an inner side and an outer side. Typically, the car body roof separates an interior of the vehicle from an exterior of the vehicle. The car body arrangement further includes a main air duct arranged at least partially on the outer side of the car body roof; and at least two secondary air ducts, which are spaced apart from each other and form structural parts of the car body roof. A part of the car body roof extends between the two secondary air ducts and connects them. Both of the two secondary air ducts provide air channels between the main air duct and the interior of the vehicle.

[0012] The design of the car body arrangement including the car body roof allows for integrating at least a part of the air duct system in the car body roof. Therefore, the car body arrangement according to embodiments described herein allows for reducing the weight of the air duct system, and, thus, the whole car body arrangement.

Also, the car body arrangement according to embodiments described herein reduces the space required for the air duct system, especially in the interior of the vehicle. The car body arrangement according to embodiments described herein therefore offers more space in the interior of the vehicle or allows for designing the roof construction to be lower than in known vehicles. A further advantage of the car body arrangement according to embodiments described herein is the reduction of material used for forming the car body arrangement with the car body roof and the air duct system according to embodiments described herein. The installation time may also be reduced due to the reduction of single parts to be assembled when mounting the car body arrangement.

[0013] Additionally, by forming the secondary air ducts as integral parts of the car body roof according to embodiments described herein, the car body roof is positioned between the main air duct (at the outside) and the interior passenger ceiling. This arrangement facilitates the integration and connection of additional systems (such as lighting devices, stanchions, LEDD, wire ducts and the like) to the car body. Integrating the secondary air duct chamber into the car body roof (which is e.g. made of aluminum extrude profile) and making it a structural part of the car body roof, may allow for removing (at least some of) the brackets holding the air duct system and, thereby, further save installation time and costs as well as material and weight.

[0014] According to one embodiment of the invention, the secondary air ducts are separated from the main air duct by respective partition walls. The partition walls may include first openings to provide a fluid connection between the main air duct and the secondary air ducts. Further, the secondary air ducts are connected with the interior of the vehicle by respective second openings. The air flow is thus properly directed from the main air duct via the secondary air ducts to the interior of the vehicle. Further, this arrangement allows for guiding the air flow in a simple way.

[0015] In one embodiment, the secondary air ducts extend at least partially to the exterior with regard to the car body roof. This arrangement may help to further reduce the space for the air duct system required in the interior of the vehicle. With less space occupied by the air duct system in the interior of the vehicle, the gained space may for instance either be used otherwise, the optical appearance in the interior of the vehicle may be improved, or the height of the train may be reduced and the height of the ceiling may be increased.

[0016] Typically, the part of the car body roof, which extends between the two secondary air ducts, forms together with the secondary air ducts a continuous internal surface of the car body roof, especially a planar surface. The continuous surface in the interior of the vehicle is useful for providing and/or fixing additional components for the vehicle to the continuous surface. Also, the continuous surface may facilitate and reduce the design of the fixation elements used for fixing additional components to the continuous surface in the interior of the vehicle.

[0017] The main air duct may cover the secondary air ducts and may extend over the secondary air ducts. Such a design saves space and allows for guiding the air flow in a proper way to the interior of the vehicle.

[0018] In one embodiment, the car body arrangement may further include a cover for the main air duct for improving the aerodynamic conditions of the car body arrangement. For instance, the main air duct being located and fixed to the outer side of the car body roof may be covered so as to improve the aerodynamic characteristics of the car body arrangement. In one example, one cover may be used for covering the whole main air duct. In another example, covers for the left and right side of the main air duct may be provided for improving the aerodynamic conditions. In some embodiments, the geometry of the main air duct may be adapted to fit the aerodynamic and aesthetic requirement (e.g. by making the left and right corners of the main air duct "rounded").

[0019] The car body arrangement described herein may include an interior ceiling system. In particular, the interior ceiling system may include at least one component being directly connected to the inner side of the car body roof. The component being directly connected to the inner side may be a ceiling cover for the inner side, a lighting system and/or a roof wire duct. The interior ceiling system allows for easily including and mounting additional vehicle components in the vehicle. Due to the construction of the car body arrangement according to embodiments described herein, the interior ceiling system can directly be attached to the inner side of the car body roof, which facilitates the assembly of the interior ceiling system.

[0020] In some embodiments, the interior ceiling system or single components of the interior ceiling system are connected to the inner side of the car body roof by a C-profile. For instance, a ceiling cover, a lighting system and a roof wire duct may be directly connected to the inner side of the car body roof by C-profiles. Mounting the components by a C-profile to the car body roof presents an easy way to mount these components in a vehicle, while, at the same time, the fixation is a low cost solution.

[0021] According to some embodiments, which may be combined with other embodiments described herein, the main air duct comprises two units, each being connected to a fan. In particular, each unit of the main air duct has a cross-section decreasing in size with increasing distance from the fan. The partition of the main air duct enables a uniform air distribution at each side of the vehicle, such as a uniform air distribution for each passenger compartment in a car. Further, the two units of the main air duct provide a separated and reliable solution. With each unit being connected to a fan, the air flow can be reliably and flexibly guided to the interior of the vehicle. Two smaller fans may be used instead of one large fan. Also, if one of the units fails, the other unit may

still operate and supply air to the interior of the vehicle.

[0022] In some embodiments, the secondary air ducts include substantially vertical fins for directing the air from the main air duct to the interior of the vehicle. A reliable and flexible air flow distribution may be achieved by using substantially vertical fins in the secondary air ducts.

[0023] According to some embodiments, which may be combined with other embodiments described herein, the secondary air ducts are formed from extruded profiles, especially square or rectangular profiles. Forming the secondary air ducts from extruded profiles allows for producing the secondary air duct in a cost-efficient and easy way. In one example, the secondary air ducts may be made from extruded aluminum profiles.

[0024] In some embodiments, the secondary air ducts are welded to the car body roof. In this way, the secondary air ducts become structural parts of the car body roof, while using an easy and cost-efficient fixation process.

[0025] According to some embodiments, the main air duct is fixed to the car body roof. The main air duct may thereby be placed on the car body roof and can directly be fixed on to the car body roof, which avoids the need for additional brackets for holding and supporting the main air duct. This construction also allows for raising the interior ceiling of the vehicle and providing more space in the interior than known systems.

[0026] According to further embodiments described herein, a method for mounting an air duct system with a main air duct and two secondary air ducts in a car body arrangement is described. The car body arrangement may include a car body roof having an inner side and an outer side, wherein the car body roof separates an interior of the vehicle from an exterior of the vehicle. The method includes providing the secondary air duct as a structural part of the car body roof; and fixing the main air duct on the car body roof. Thereby, the interior is in fluid connection with the main air duct through the secondary air duct.

[0027] According to some embodiments, the method further includes mounting an interior ceiling system to the inner side of the car body roof. In particular, the interior ceiling system is mounted to the inner side by C-profiles. As explained above, the interior ceiling system allows for easy mounting of further components in the vehicle. The C-profiles allow for mounting the interior ceiling system in a cost-efficient way.

Figures

[0028] For understanding in detail the manner in which the above recited features of the present invention may be embodied, a more particular description of the principles of the invention, summarized above, may be given by reference to embodiments. The elements in the drawing are shown in relation to each other and are not necessarily to scale. Same reference numbers refer to same parts. The accompanying drawings relate to embodiments of the invention and are described as follows:

Figure 1a shows a schematic view of a car body arrangement according to one embodiment described herein.

Figure 1b shows a schematic view of a bottom of an air duct in a car body arrangement as described herein.

Figure 1c shows a schematic view of a car body arrangement according to a further embodiment described herein.

Figure 1d shows a schematic view of a bottom of an air duct in the car body arrangement as shown in Figure 1c.

Figure 2 shows a schematic perspective view of an air duct system as used in the embodiment exemplarily described herein.

Figure 3 shows a schematic partial view of a main air duct and the interior of a secondary air duct according to the embodiment described as an example herein.

Embodiment

[0029] Figures 1a to 1d show embodiments of a car body arrangement 100 for a vehicle, especially a rail vehicle. A car body roof 130 separates an interior space 141 of the vehicle from an exterior surrounding 142 of the vehicle. The car body arrangement 100 includes subdivided main air ducts 110 provided on the car body roof 130. The main air duct 110 is subdivided by partition wall 114. Air flows through the main air duct 110 perpendicular and also parallel to the cutting plane. In the main air duct 110, two secondary air ducts 120 are provided. Each of the secondary air ducts 120 may have first openings 121 (only shown in Figure 1c by dashed lines), through which air is supplied from the respective part of the main air duct 110 to the secondary air ducts 120. The secondary air ducts 120 also have second openings 122, through which the air in the secondary air ducts 120 is supplied to the interior space 141 of the vehicle. In this way, the secondary air ducts 120 may provide air channels between the two parts of the main air duct 110 and the interior 141 of the vehicle. An arrow 123 in Figure 1c indicates an exemplary air flow from the main air duct 110 to the interior 141 of the vehicle.

[0030] Generally, the secondary air ducts include a plurality of first openings and/or a plurality of second openings along their longitudinal axis perpendicular to the cutting plane for allowing air to flow from the main air duct to the interior of the vehicle. According to some embodiments, the secondary air ducts may omit a side wall (such as side wall 127), a top wall and/or a bottom wall for providing the respective fluid connection.

[0031] In Figure 1b, an example of the bottom 128 of

the secondary air duct 128 is shown. The bottom 128 includes the second openings 122 through which the air in the secondary air ducts 120 is supplied to the interior space 141 of the vehicle (or the saloon of the vehicle). In one example of the car body arrangement, the side wall 127 and/or the top wall of the secondary air duct 120 are not structural to simplify the first opening.

[0032] Figures 1c and 1d show a further example of a car body arrangement similar to the arrangement described with respect to Figures 1a and 1b. In the arrangement of Figures 1c and 1d, however, the secondary air duct 120 has a structural side wall and top wall, and a bottom 128 with openings 122 and connecting ribs or fins 129 between central and side roof.

[0033] According to the embodiment described herein, the main air duct is provided on the outer side 132 of the car body roof 130. In other words, the main air duct 130 extends from the car body roof 130 to the exterior 142 of the vehicle. The main air duct 110 is fixed to the car body roof 130, e.g. by screwing, riveting, or welding.

[0034] According to some embodiments, the main air duct 110 may have rounded corners for improving the aerodynamic characteristics of the main air duct on the car body roof. The main air duct 110 may be covered, e. g. by one or more covers, in order to improve the aerodynamic characteristics of the main air duct. For instance, one cover may be provided at each of the right and left side of the main air duct.

[0035] The main air duct 110 may be fixed and sealed such as to provide a constant and reliable quality of the air supplied to the interior 141 of the vehicle. The main air duct 110 may be fixed and sealed to the car body roof 130 and/or to the secondary air ducts 120. The fixation of the main air duct 110 may be provided by a screw connection with a sealing or the like. The secondary air ducts 120 can share a wall 113 with the main air duct 110.

[0036] Although the main air duct is shown as being located on the car body roof and, thereby, extending at the exterior of the vehicle in the figures, the main air duct being arranged at the outer side of the car body roof may also be lowered such that it is partly above and partly below the car body roof. The lowered main air duct s also fixed to the car body roof. This arrangement may be used if the main air duct should be a part of the car body roof, as well as the secondary air ducts. However, if a high air volume is to be supplied by the air ducts, such as in the case of a desired high cooling capacity, the main air duct may be fixed on the car body roof as shown in the figures.

[0037] In the car body shown in Figures 1a and 1c, two secondary air ducts 120 are provided within two parts of the main air duct 110 for connecting the main air duct with the interior of the vehicle. The secondary air ducts ensure an air flow from the main air duct 110 to the interior of the vehicle and provide an air channel as explained above. The secondary air ducts 120 may be part of the structure of the car body roof 130. The car body roof 130 can be an extruded profile. With the secondary air ducts 120 being a structural part of the car body roof 130, no additional parts are used for holding and/or supporting the secondary air ducts 120. The secondary air ducts 120 can be extruded profiles, too, and can be welded to the car body roof 130.

[0038] The secondary air ducts 120 can be made from aluminum, especially aluminum extruded profiles. Especially, the secondary air ducts are made of one of the aluminum extruded profiles forming the car body roof.

[0039] In one example, the secondary air ducts may be arranged so that the side walls of the secondary air ducts are substantially perpendicular to the car body roof. In some embodiments, the main air duct is attached to the car body roof so as to extend from the car body roof in a substantially perpendicular manner.

[0040] As can be seen in Figures 1a and 1c, a part of the car body roof 133 extends between the secondary air ducts 120. The secondary air ducts 120 can thus be described as being an integral part of the car body roof 130.

[0041] In Figures 1a and 1c, the secondary air ducts 120 are shown as protruding partially from the outer side 132 of the car body roof. However, it should be understood that the secondary air ducts may completely protrude from the car body roof, of which they are part of, or that the secondary air ducts may be arranged at least partially below the car body roof and protruding in the interior of the vehicle.

[0042] The secondary air ducts and the car body roof together may form a continuous internal surface at the inner side 131 of the car body roof 130. In particular, the secondary air ducts and the car body roof together may form a continuous planar interior surface.

[0043] A continuous surface (and especially a planar surface) formed by the car body roof and the secondary air ducts may be beneficial for providing an interior ceiling system in the vehicle. However, it should be understood that the interior ceiling system as described and referred to herein may also be provided in cases, in which the car body roof and the secondary air ducts do not form a continuous surface for the interior of the vehicle.

[0044] The interior ceiling system may include components for the vehicle, which are to be provided at the interior of the vehicle. For instance, the components may include lighting devices, ceiling covers, wire ducts, stanchions and the like. Stanchions may be fixed to the internal surface formed by the secondary air ducts and the car body roof. Fixing stanchions directly to the car body roof may help avoiding reinforcing the central or side ceiling of the vehicle, as often done in known systems.

[0045] The structure according to the embodiment described herein avoids the use of additional brackets since the interior ceiling system (including e.g. ceiling covers, lighting devices, wire ducts and stanchions) can directly be fixed to the car body roof. In particular, these components may directly be fixed to the car body roof via C-profiles. The structure according to this embodiment may therefore help to reduce costs, weight, and installation time of the car body arrangement, and, thus, the vehicle.

[0046] As can be seen in the example of a car body arrangement shown in Figures 1a and 1c, the car body roof 130 is formed approximately flat at the outer side. In particular, the car body roof 130 does not provide curves, or bends, but substantially corresponds to a horizontal plane. Forming the car body roof with the secondary air ducts in a flat manner at the interior side may help to save weight, material and production costs.

[0047] The secondary air ducts 120 may have a substantially rectangular or substantially square cross-section, such as a rectangular or a square extrude profile. These forms may facilitate the production process and may spare production process costs.

[0048] Figure 2 shows a schematic perspective view of an air duct system as used in the embodiment of the car body arrangement described herein. In the perspective view of Figure 2, the main air duct 110 can be seen providing a first unit 111 and a second unit 112. Each of the first unit 111 and the second unit 112 of the main air duct 110 is connected to an HVAC (heating, ventilation and air conditioning) unit at each end. The HVAC units push the air through the main air duct from both ends. If one of the HVAC units fails, the respective other unit can still operate and thereby provide and support the HVAC function for the failing side of the vehicle. The HVAC unit may be mounted to the roof of the car body arrangement too and may include several components, of which only the fans 211 and 212 are shown in Figure 2 for the sake of a better overview. The first unit 111 of the main air duct 110 is connected to fan 211, while the second unit of the main air duct 110 is connected to fan 212. In the example shown in Figure 2, the secondary air ducts 120 are also arranged below the main air duct, or can at least partially be surrounded by the main air duct.

[0049] Typically, the main air duct 110 and the secondary air ducts 120 may extend over the overall length of the car body. According to some embodiments, the fans may be located at the ends of the car body. The outside air is typically led into the air duct system through the HVAC unit (not completely presented in the figures), by means of the supply fans of the HVAC unit.

[0050] As can be seen in the embodiment shown in Figure 2, the units 111 and 112 of the main air duct 110 may have a substantially trapezoid base area. The base area of each unit of the main air duct may also have a substantially triangle shape, and a cross-section of a substantially rectangular shape, a substantially square shape and/or another shape being adapted for leaving space for the secondary air ducts, such as a shape having recesses for the secondary air ducts.

[0051] The size of the cross section of the main air duct may decrease with increasing distance from the fan. For instance, in Figure 2, the cross section size of the first unit 111 decreases with increasing distance from the fan 211. Also, the cross section size of the second unit 112 decreases with increasing distance from the fan 212.

[0052] Figure 3 shows a partial, perspective view of the main air duct 110 and the interiors of one of a secondary air duct 120. In the example shown in Figure 3, first openings 125 are provided in the sidewall of the secondary air duct 120. The first opening 125 provides a fluid connection between the first air duct 110 and the secondary air duct 120. In the bottom of the secondary air duct 120, second openings 126 are provided for allowing air to flow from the secondary air duct 120 to the interior of the vehicle, as explained in detail above with respect to Figures 1a to 1d.

[0053] In Figure 3, substantially vertical fins 160 (substantially perpendicular to the bottom of the secondary air duct) can be seen. The fins 160 in the secondary air duct 120 may be used for managing the air flow distribution, such as directing the air flow to the second openings 126, for providing a uniform air distribution within the secondary duct 120, or for providing a suitable pressure in the secondary air ducts. According to some embodiments, the fins 160 may be separately manufactured fins and may be inserted in the secondary air duct as extra parts. This may mean that the fins are not part of the car body roof such as the secondary air duct. In some embodiments, the fins 160 may be provided in the secondary air duct at regular spacings.

[0054] The car body arrangement described above allows for facilitating the production and assembly of the air duct system for the car body arrangement. By forming the secondary air ducts as integral parts of the car body roof and attaching the main air duct on the car body roof, the assembly is facilitated in that no brackets and supporting devices are required for holding and supporting the main air duct and the secondary air duct. Thus, not only the material effort may be reduced compared to known systems, but also the weight of the car body arrangement may be reduced and additional fixing elements can be avoided. The easy assembly of the air ducts further reduces the installation costs.

[0055] The car body arrangement according to embodiments described herein may be used in any car, in which a uniform air distribution is desired, especially over a certain length of the car. For instance, the car body arrangement may be used for providing a reliable air duct system for the passenger compartment of a rail vehicle.

[0056] While the foregoing is directed to embodiments of the invention, other and further embodiments of the invention may be derived without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

Reference numbers

[0057]

100	car body arrangement
110	main air duct
111	first unit of the main air duct
112	second unit of the main air duct
113	wall of main air duct
114	partition wall of main air duct

120 secondary air duct
121 first opening of a secondary air duct
122 second openings of a secondary air duct
123 air flow
125 first opening
126 second opening
127 side wall of second air duct
128 bottom of second air duct
129 ribs
130 car body roof
131 inner side of the car body roof
132 outer side of the car body roof
141 interior of the vehicle
142 exterior of the vehicle
150 interior ceiling system
160 vertical fins in the secondary air duct
211 first fan
212 second fan

Claims

1. Car body arrangement (100) for a vehicle, in particular a rail vehicle, comprising:

a car body roof (130) having an inner side (131) and an outer side (132), the car body roof separating an interior space (141) of the vehicle from an exterior surrounding (142) of the vehicle; **characterized in that** the car body arrangement further comprises:

a main air duct (110) arranged at the outer side (132) of the car body roof (130);
at least two secondary air ducts (120), which are spaced apart from each other and form structural parts of the car body roof (130), wherein a part of the car body roof (130) extends between and connects the two secondary air ducts (120),
wherein each of the two secondary air ducts (120) provides an air channel between the main air duct (110) and the interior space (141) of the vehicle.

2. The car body arrangement according to claim 1, wherein the secondary air ducts (120) are separated from the main air duct (110) by respective partition walls which include first openings (121) to provide a fluid connection between the main air duct (110) and the secondary air ducts (120), and wherein the secondary air ducts (120) are connected with the interior space of the vehicle by respective second openings (122).

3. The car body arrangement according to any of the preceding claims, wherein the secondary air ducts (120) extend at least partially to the exterior surrounding (142) of the car body roof (130).

4. The car body arrangement according to any of the preceding claims, wherein the part of the car body roof (130), which extends between the two secondary air ducts (120), forms together with the secondary air ducts (120) a continuous internal surface of the car body roof, especially a planar surface.

5. The car body arrangement according to any of the preceding claims, wherein the main air duct covers the secondary air ducts and extends along the secondary air ducts (110).

6. The car body arrangement according to any of the preceding claims, further comprising a cover for the main air duct (110) for improving the aerodynamic conditions of the car body arrangement.

7. The car body arrangement according to any of the preceding claims, further comprising an interior ceiling system (150) and stanchions, wherein the interior ceiling system in particular comprises at least one component being directly connected to the inner side (131) of the car body roof e.g. a ceiling cover for the inner side, a lighting system and/or a roof wire duct; and/or at least one stanchion is directly connected to the inner side of the car body roof.

8. The car body arrangement according to claim 7, wherein the interior ceiling system (150) or single components of the interior ceiling system are connected to the inner side (131) of the car body roof (130) by a C-profile.

9. The car body arrangement according to any of the preceding claims, wherein the main air duct comprises two units (111; 112), each being connected to a fan (211; 212) and each having in particular a cross-section decreasing in size with increasing distance from the fan.

10. The car body arrangement according to any of the preceding claims, wherein the secondary air ducts include substantially vertical fins for directing the air from the main air duct to the interior space of the vehicle.

11. The car body arrangement according to any of the preceding claims, wherein the secondary air ducts (120) are formed from an extruded profile, especially with a square or rectangular profile.

12. The car body arrangement according to any of the preceding claims, wherein the secondary air ducts (120) are welded to the car body roof (130).

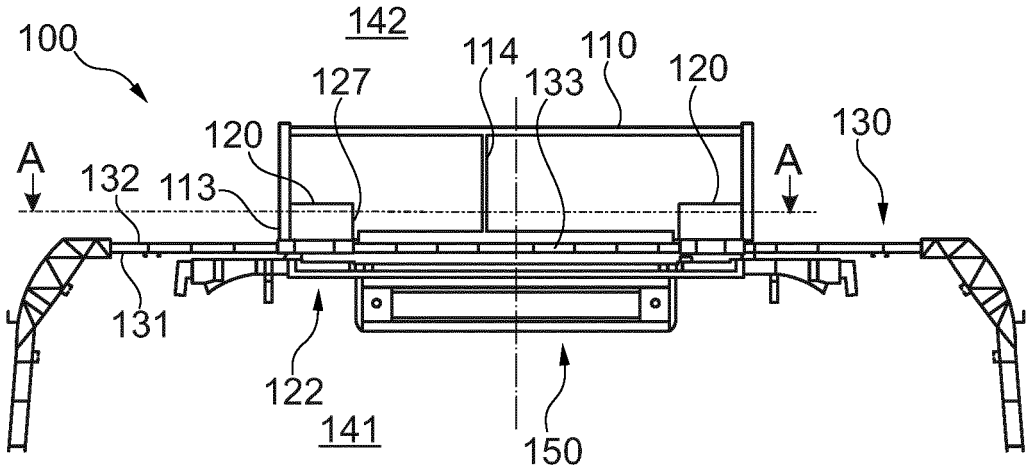
13. The car body arrangement according to any of the

preceding claims, wherein the main air duct (110) is fixed to the car body roof (130).

14. Method for mounting an air duct system with a main air duct (110) and two secondary air ducts (120) in a car body arrangement (100), the car body arrangement comprising a car body roof (130) having an inner side (131) and an outer side (132), the car body roof (130) separating an interior space (141) of the vehicle from an exterior surrounding (142) of the vehicle, the method comprising:

providing the secondary air ducts (120) as a structural parts of the car body roof (130), and
fixing the main air duct (110) on the car body roof (130), thereby creating a fluid connection between the main air duct (110), and the secondary air ducts (120), and the interior space (141).

15. The method according to claim 14, wherein the method further comprises mounting an interior ceiling system (150) to the inner side (131) of the car body roof (130), in particular by C-profiles.


100
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150

Fig. 1a

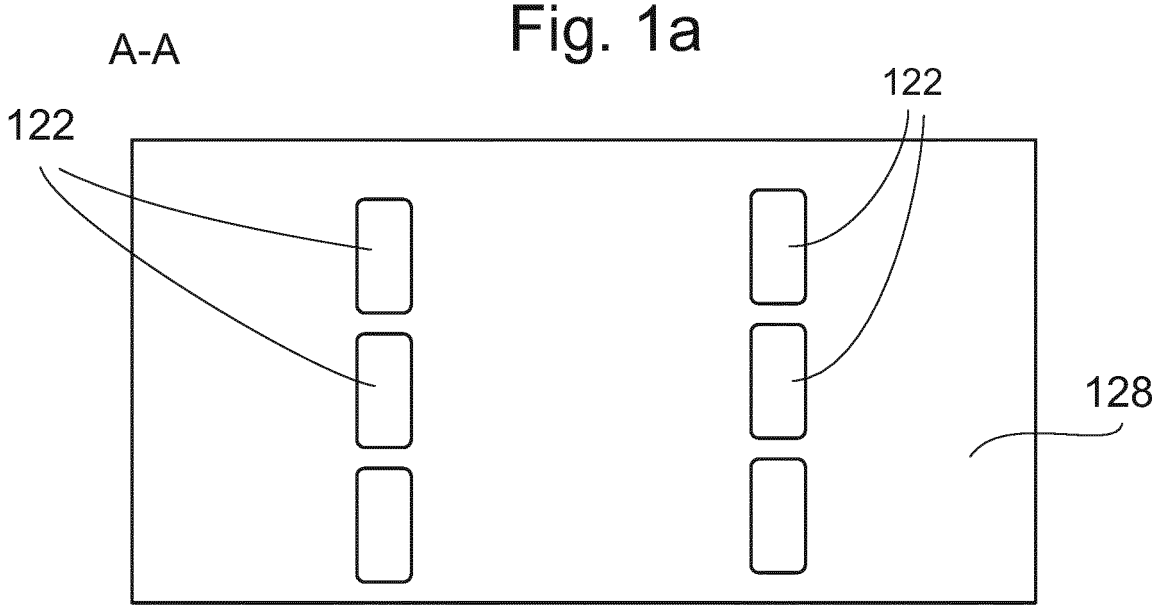
A-A
122
122
128

Fig. 1b

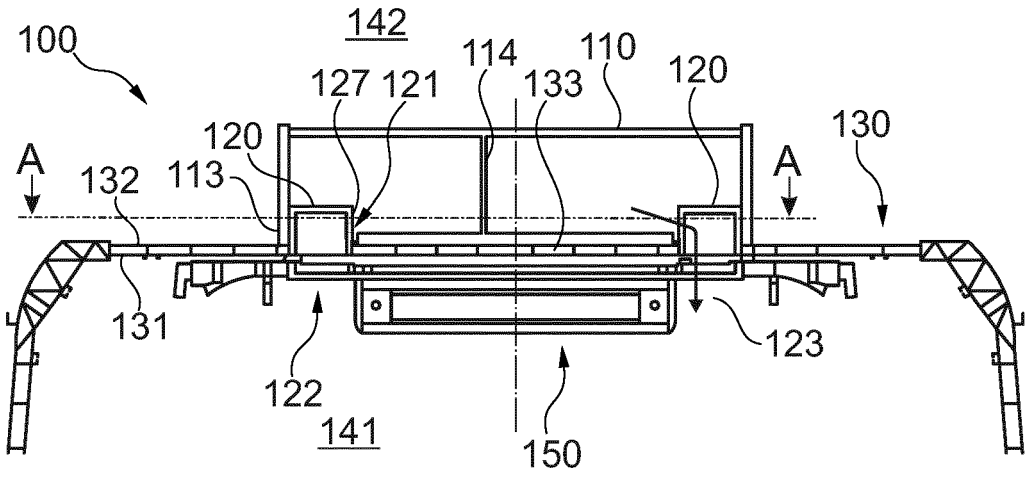
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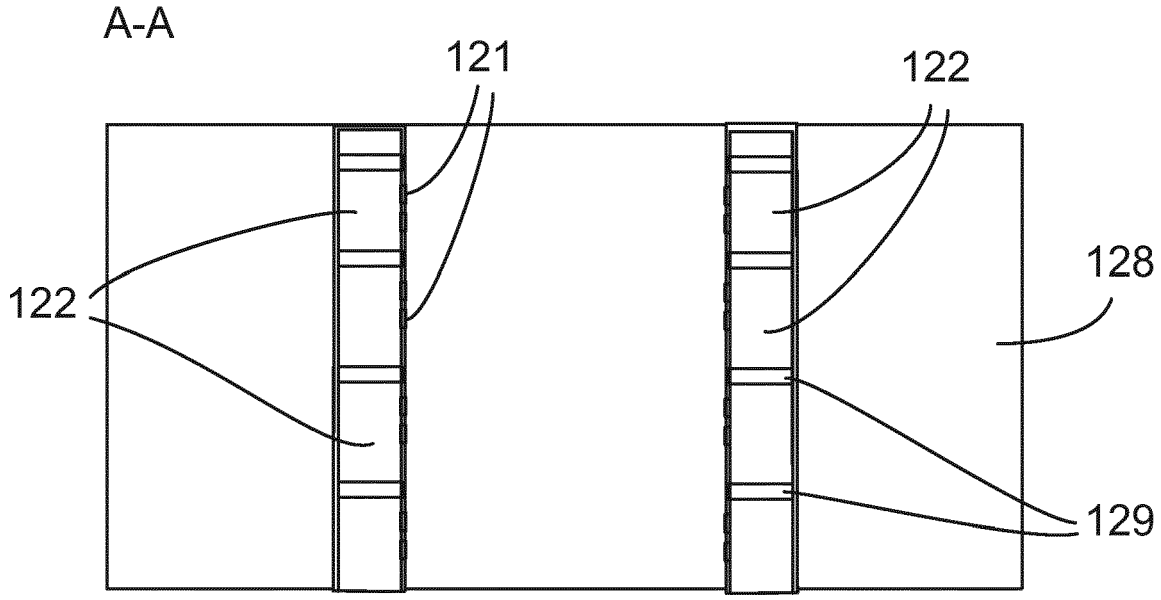
Fig. 1c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128
129

Fig. 1d

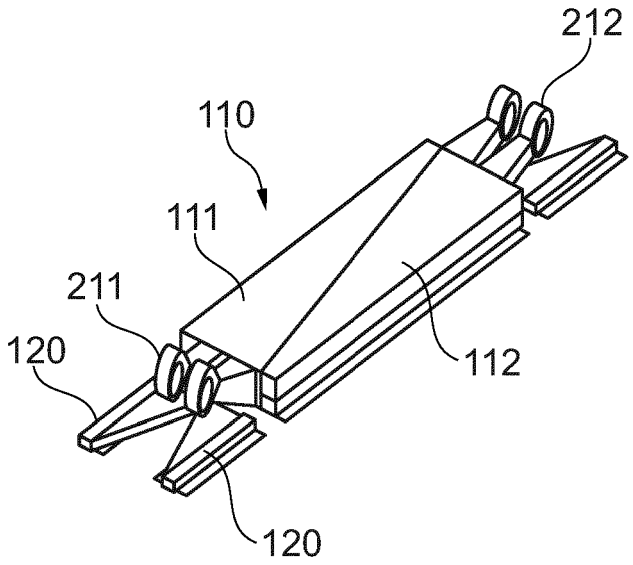

Fig. 2

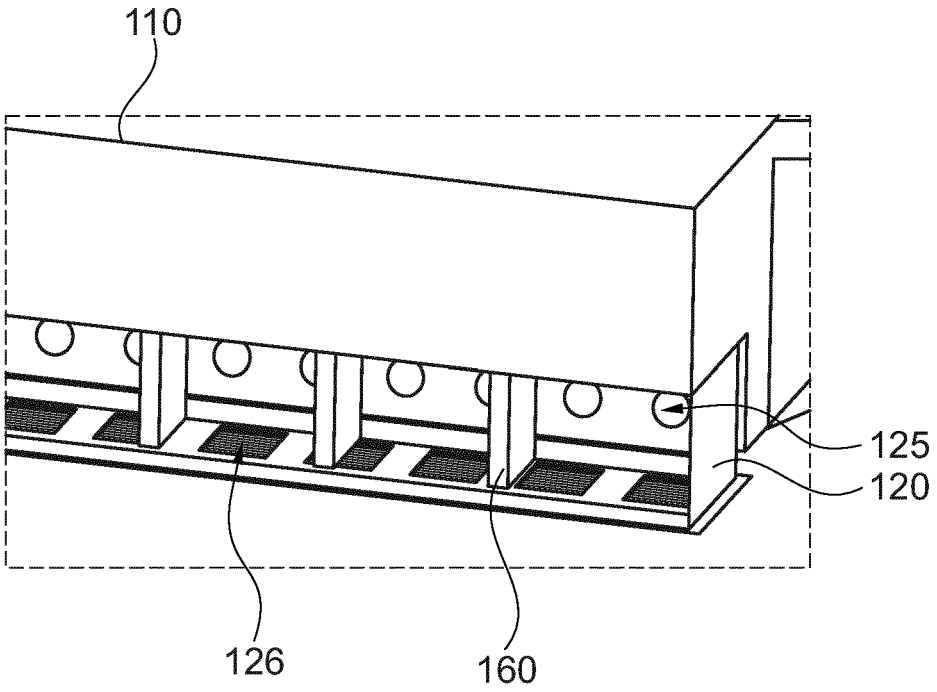

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 January 2016	Awad, Philippe

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