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(54) IMPROVED NOISE DAMPER, IN PARTICULAR FOR AN AIR CONDITIONING SYSTEM OF A RAILWAY VEHICLE

(57) The noise damper (10) comprises a casing (16) delimiting an air passage, the casing (16) having walls (18) each comprising an acoustic insulation layer. The noise damper (10) comprises:
- at least one baffle (20) arranged in the air passage to separate the air passage in several channels, each channel extending substantially parallel to a longitudinal direction (X) and
- a helical deflector (24) arranged in each channel, extending parallel to the longitudinal direction (X).

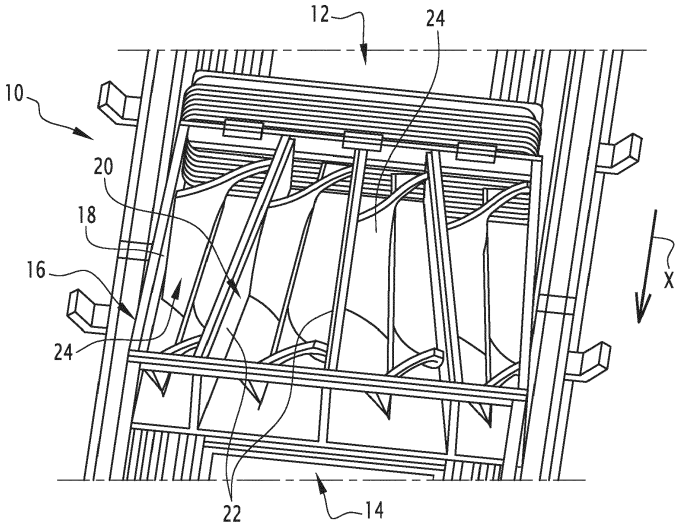

FIG.1

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Description

[0001] The present invention concerns a noise damper, in particular for an air conditioning system, preferentially in a railway vehicle.

[0002] The main noise source equipment inside a railway vehicle passenger area is generally the air conditioning system HVAC (Heating Ventilation Air Conditioning Unit), and especially the fans which blow the air inside air ducts and towards the passenger area.

[0003] A noise damper is already known from prior art. Such a noise damper is intended to equip the air conditioning system, and is arranged between a front air blower of the air conditioning system and the beginning of an air duct. The main function of the noise damper is to absorb the noise coming from the HVAC, and also to share the air in different directions.

[0004] A known noise damper usually comprises a casing, for example made of aluminum, delimiting an air passage, the casing having walls each comprising an acoustic insulation layer. The acoustic insulation layers are for example made of several self-adhesive panels arranged on said walls of the casing.

[0005] However, such a noise damper may be insufficient in the context of air conditioning systems comprising more and more powerful blowers.

[0006] The invention aims proposing a more efficient noise damper.

[0007] To this end, the invention relates to a noise damper, comprising a casing delimiting an air passage, the casing having walls each comprising an acoustic insulation layer, characterized in that the noise damper comprises:

- at least one baffle arranged in the air passage to separate the air passage in several channels, each channel extending substantially parallel to a longitudinal direction and
- a helical deflector arranged in each channel, extending parallel to the longitudinal direction.

[0008] The baffles are intended to guide the air in order to avoid turbulences and to absorb the noise with more surface of insulation in contact with the air.

[0009] Besides, the helical deflector gives acoustic advantage to make longer the circuit in the noise damper and create more reflection to the insulation. Besides, a helix does not slow the airflow, so a helix is a good compromise between aerodynamics and acoustics.

[0010] A noise damper according to the invention may comprise any of the following features, taken alone or in any possible combination.

- The casing is metallic, preferentially made of aluminum.
- The noise damper has a length, in the longitudinal direction, substantially equal to 1 meter.
- At least one of the baffles is inclined in regard to the longitudinal direction, so that the channels have not a constant cross section along the longitudinal direction.
- Each baffle comprises an acoustic insulation layer on its faces.
- Each helical deflector has a helical surface extending around a central axis and extending radially from the central axis to an inner surface delimiting the corresponding channel.

[0011] The invention relates to an air conditioning system, in particular for a railway vehicle, characterized in that it comprises a noise damper as disclosed above.

[0012] The invention relates to a railway vehicle, in particular an underground train, characterized in that it comprises an air conditioning system as disclosed above.

[0013] Several aspects and advantages of the invention will be enlightened in the following disclosure, given only as an example and made in reference to the attached figure, in which:

- Figure 1 is an open view from above of a noise damper according to an example of embodiment of the invention.

[0014] Figure 1 shows a noise damper 10, according to an example of embodiment of the invention. The noise damper 10 is intended to equip an air conditioning system, in particular in a railway vehicle. The railway vehicle is for example an underground train.

[0015] In an underground train, the air conditioning system is generally formed by an HVAC (Heat Ventilation Air Conditioning) unit arranged on a roof structure and one air duct system on the top of a ceiling. The air is blown from outlets placed on each side of the ceiling.

[0016] The main noise source inside the railway vehicle is fans of the HVAC unit. The critical point in term of noise level is the area just below diffuser closest to HVAC Unit. Thus, the noise damper 10 is arranged between an upstream duct 12 coming from the air conditioning system and a downstream duct 14 intended to distribute conditioned air towards a passenger area of the railway vehicle. The downstream duct 14 usually comprises outlets leading to the passenger area.

[0017] The function of this noise damper 10 is to reduce the noise coming from the fans of the HVAC unit.

[0018] The noise damper 10 comprises a casing 16 comprising walls 18 delimiting an air passage extending in a longitudinal direction X between the upstream duct 12 and the downstream duct 14. The casing 16 is preferentially metallic, advantageously made of aluminum.

[0019] Preferentially, the noise damper 10 has a length of about 1 meter in the longitudinal direction X. A longer noise damper (2 or 3m) would be better for the acoustic but not acceptable for the passenger in term of temperature comfort. On contrary, with a smaller noise damper or without any noise damper, the aeraulic comfort would be

better but it would be noisier for the passenger. Thus, a length of about 1 meter is optimal.

[0020] Each wall 18 comprises at least one acoustic insulation layer, intended to absorb noise of the airflow circulating in contact of this acoustic insulation layer, in a manner known.

[0021] The noise damper 10 according to the invention also comprises at least one baffle 20 arranged in the air passage to separate the air passage in several channels. Each channel extends substantially parallel to the longitudinal direction X. In the example shown, the noise damper 10 comprises three baffles 20, separating the air passage into four channels.

[0022] Preferentially, at least one of the baffles 20 is inclined in regard to the longitudinal direction X, so that the channels have not a constant cross section along the longitudinal direction X. On the example shown, the two central channels are narrow on the side of the upstream duct 12, and wide on the side of the downstream duct 14, whereas the lateral channels are wide on the side of the upstream duct 12, and narrow on the side of the downstream duct 14.

[0023] Preferentially, each baffle 20 comprises an acoustic insulation layer 22 on its faces, so that each channel is transversally delimited between two acoustic insulation layers 22.

[0024] Each acoustic insulation layer 22 preferentially has a thickness of 20 mm.

[0025] Each channel also comprises acoustic insulation layers on its bottom wall and on its upper wall.

[0026] The noise damping depends on the surface of acoustic insulation in contact with the air. The global surface of insulation in contact with the air is increased by adding baffles inside the noise damper, thus the baffles 20 allow reducing noise.

[0027] Besides, the baffles 20 improve the air guiding, avoiding turbulences.

[0028] The noise damper 10 also comprises, in each channel, a helical deflector 24, extending substantially parallel to the longitudinal direction, i.e. in the direction of the airflow.

[0029] Each helical deflector 24 has a helical surface extending around a central axis. The helical surface extends radially from the central axis to an inner surface of the acoustic insulation layers delimiting the channel. Consequently, the air necessarily flows between the helical surface and the acoustic insulation layers 22, along the helical surface.

[0030] In other words, because of the helical deflector 24, the airflow necessarily encounters the acoustic insulation layers 22 delimiting the channel, and the helical deflector blocks the direct acoustic waves coming from the upstream duct 12.

Claims

1. A noise damper (10), comprising a casing (16) delimiting an air passage, the casing (16) having walls (18) each comprising an acoustic insulation layer, **characterized in that** the noise damper (10) comprises:

- at least one baffle (20) arranged in the air passage to separate the air passage in several channels, each channel extending substantially parallel to a longitudinal direction (X) and
- a helical deflector (24) arranged in each channel, extending parallel to the longitudinal direction (X).

2. A noise damper (10) according to claim 1, wherein the casing (16) is metallic, preferentially made of aluminum.

3. A noise damper (10) according to claim 1 or 2, having a length, in the longitudinal direction (X), substantially equal to 1 meter.

4. A noise damper (10) according to any of preceding claims, wherein at least one of the baffles (20) is inclined in regard to the longitudinal direction (X), so that the channels have not a constant cross section along the longitudinal direction (X).

5. A noise damper (10) according to any of preceding claims, wherein each baffle (20) comprises an acoustic insulation layer (22) on its faces.

6. A noise damper (10) according to any of preceding claims, wherein each helical deflector (24) has a helical surface extending around a central axis and extending radially from the central axis to an inner surface delimiting the corresponding channel.

7. An air conditioning system, in particular for a railway vehicle, **characterized in that** it comprises a noise damper (10) according to any of preceding claims.

8. A railway vehicle, in particular an underground train, **characterized in that** it comprises an air conditioning system according to claim 7.

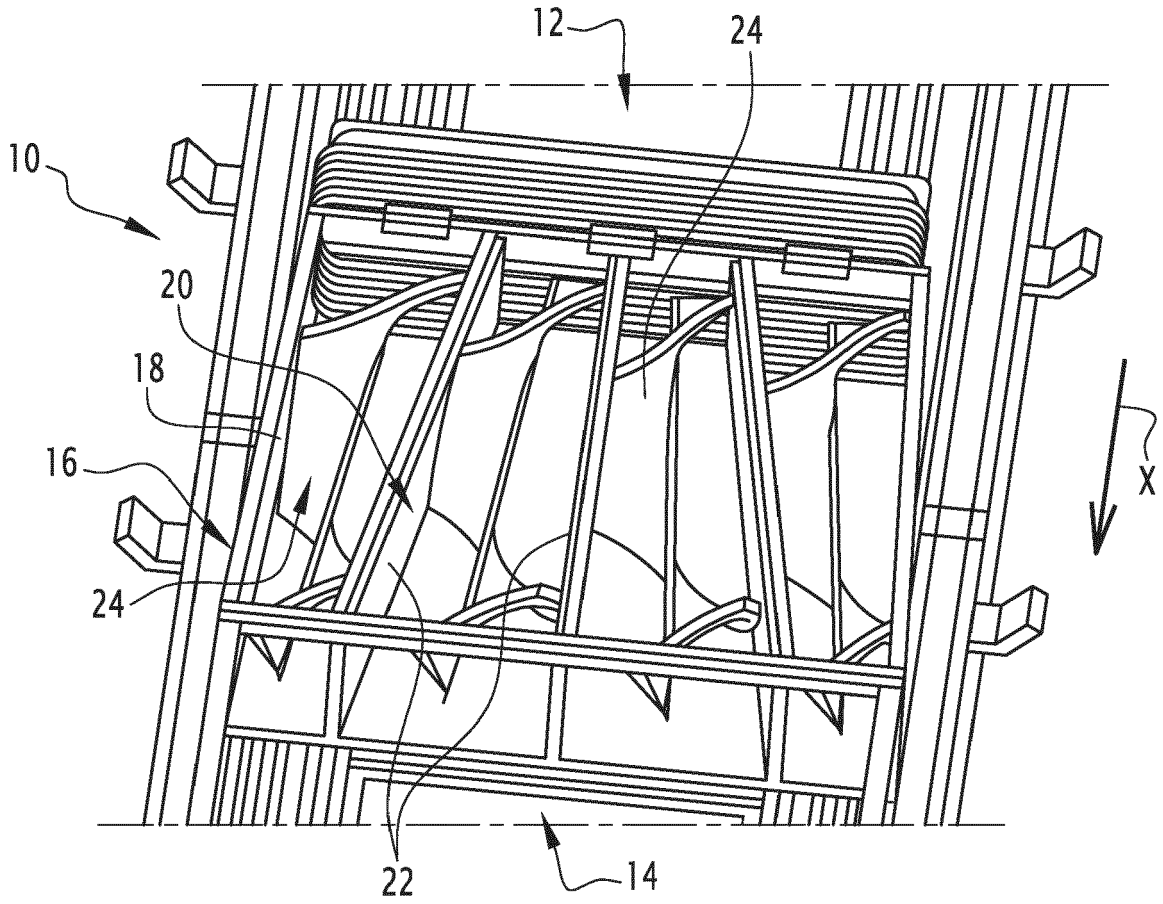

FIG.1

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EUROPEAN SEARCH REPORT

Application Number
EP 23 30 6390

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 104 859 674 A (CSR QINGDAO SIFANG CO LTD) 26 August 2015 (2015-08-26) * figures * * Description of the figures * * Paragraph technical field *	1-8	INV. B61D27/00 F24F13/24 F24F13/02 F24F13/08
A	WO 2016/187291 A1 (RITE HITE HOLDING CORP [US]) 24 November 2016 (2016-11-24) * paragraphs [0024] - [0027] * * figure 7 *	1	
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A	EP 2 426 427 A2 (EUR EX S R L [SM]) 7 March 2012 (2012-03-07) * paragraphs [0005] - [0011] * * figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)

B61D
F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 February 2024	Durrenberger, Xavier

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