

Noise Barrier for Reducing Noise Transmitted to at Least One Recipient

Field

5 The present invention relates to a noise barrier for reducing noise transmitted to at least one recipient.

Background

Construction activities frequently generate community noise and vibration (which thus lead to complaints), even when it takes place over a limited time duration.
10 In recent years, public concerns about construction noise and vibration have increased significantly, due partly to lengthy periods of heavy construction on some “mega-projects” and also to the increasing prevalence of night-time construction, which is normally undertaken to avoid disrupting day-time traffic, as well as to meet tighter construction schedules. The mitigation of noise
15 generated from construction sites is therefore of particular importance to small countries (e.g. Singapore) with construction activities typically located close to residential communities.

In relation, noise barriers are commonly used for the mitigation of traffic noise.
20 The extensive networks of highways in urban areas for many major cities have resulted in the extensive use of high noise barriers to provide adequate noise screening for residential properties. The increasing height adopted for these noise barriers, necessary to screen noise generated by increasing volumes of traffic, has thus led to considerable development work into the inclusion or
25 designs of different form of barrier caps to enhance the noise screening performance, but with minimal increase in barrier height.

One object of the present invention is therefore to address at least one of the problems of the prior art and/or to provide a choice that is useful in the art.

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Summary

According to an aspect, there is provided a noise barrier for reducing noise transmitted to at least one recipient, the noise generated by at least one noise source, the barrier configured to be arranged intermediate the recipient and
35 noise source, the barrier comprising: a body; and a plurality of members

angularly arranged on at least one edge of the body, each member configured with a protruding end portion to increase insertion loss of the barrier for reducing the noise transmitted to the recipient.

5 Advantageously, by way of the members being angularly arranged at the edge of the body with the addition that each member is configured with the protruding end portion, the proposed barrier is therefore able to achieve enhanced noise mitigation performance.

10 Preferably, the edge of the body may be parallel to the horizontal axis of the body.

Preferably, the plurality of members may integrally be formed together as a single contiguous portion.

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Alternatively, the plurality of members may respectively be independently formed, and are arranged sequentially at the edge of the body.

20 Preferably, the protruding end portion may have a tapered configuration with a substantially rounded tip.

Alternatively, the protruding end portion may have has a tapered configuration with a substantially flat tip.

25 Preferably, the height of each member may be configured to be about 5% to 20% of the height of the body.

30 Preferably, the plurality of members being angularly arranged at the edge of the body may include being angularly arranged at an angle substantially between 0° to 90° with respect to the horizontal axis of the body.

Preferably, intersecting edges of any two adjacent members are arranged to define an angle, which is configurable to be between about 45° to 90°.

It should be apparent that features relating to one aspect of the invention may also be applicable to the other aspects of the invention.

These and other aspects of the invention will be apparent from and elucidated
5 with reference to the embodiments described hereinafter.

Brief Description of the Drawings

Embodiments of the invention are disclosed hereinafter with reference to the accompanying drawings, in which:

10 FIGs. 1a to 1d respectively depict different views of a noise barrier, based on a first embodiment;

FIG. 2a depicts a front perspective view of the noise barrier, while FIG. 2b is an enlarged view of the dotted region indicated as "BB" in FIG. 2a;

15 FIGs. 3a to 3f respectively depict different views of the noise barrier in line drawings format;

FIGs. 4a to 4c respectively depict different views of a member, which is angularly arranged at an edge of the body of the noise barrier;

FIGs. 5a to 5d respectively depict different configurations for the noise barrier, depending on requirements; and

20 FIG. 6a is a perspective view of a noise barrier, based on a second embodiment, and FIG. 6b shows a variant member to be angularly arranged at an edge of the body of the noise barrier.

Detailed Description of Preferred Embodiments

25 FIGs. 1a to 1d respectively depict different views of a noise barrier 100 for reducing noise transmitted (i.e. heard by) to at least one recipient (not shown), according to a first embodiment. The noise transmitted to the recipient may be interpreted as the noise heard by the recipient, and the noise is generated by at least one noise source (not shown). The barrier 100 is configured to be
30 arranged intermediate the recipient and noise source. Specifically, FIG. 1a shows a perspective view of the barrier 100, FIG. 1b shows a side view of the barrier 100, FIG. 1c shows a front elevation view of the barrier 100, and FIG. 1d is an enlarged view of the circled region indicated "AA" in FIG. 1c. Broadly, the barrier 100 comprises: a body 102, and a plurality of members 104 angularly
35 arranged on/at at least one edge of the body 102. Particularly, each member

104 is configured with a protruding end portion to increase insertion loss of the barrier 100 for reducing the noise transmitted to the recipient. The plurality of members 104 may be configured to face the noise source or recipient, depending on requirements of an intended application. It is to be appreciated that the edge of the body 102 is parallel to the horizontal axis of the body 102, and in this case, the edge is the length of the body 102 (although this is not to be construed as limiting in any manner). In connection, FIG. 2a depicts a front perspective view of the barrier 100, while FIG. 2b is an enlarged view of the dotted region indicated by "BB" in FIG. 2a. Then, FIGs. 3a to 3f depict different views of the barrier 100 in the form of line drawings, in which FIGs. 3a to 3f respectively are a front view, a side view, a top view, a bottom view, a left perspective view, and a right perspective view.

The protruding end portion (of each member 104) has a tapered configuration with a substantially rounded tip (i.e. having a jagged profile when the plurality of members 104 are viewed collectively from a front view as per FIG. 1d), as depicted in FIGs. 4a to 4c. The protruding end portion being arranged with the rounded tip, as opposed to a sharp tip, is for safety reasons (besides also being not aesthetically pleasing). To also clarify, the dimensions of the member 104, as provided in FIGs. 4a and 4b, are merely to serve as an example and are not intended to be limiting in terms of possible dimensions configurable for the member 104. Further, the plurality of members 104 being angularly arranged at the edge of the body includes the definition of being angularly arranged at an angle (i.e. also known as slant angle) substantially between 0° to 90° with respect to the horizontal axis of the body 102. More specifically, the slant angle may be between around 30° to 90° . The slant angle is denoted as " α " in FIG. 1b. It is to be appreciated that having the members 104 arranged angularly at the edge of the body 102 beneficially helps to deflect noise generated by the noise source back towards the noise source, which thus mitigates the noise propagation towards the recipient. Needless to say, a specific angle " α " to be adopted depends on requirements of an intended application the barrier 100 is to be deployed for. Separately, the height (i.e. denoted as " h " in FIG. 1b) of each member 104 is configurable to be about 5% to 20% of the height (i.e. denoted as " H " in FIG. 1b) of the body 102. Between any two immediately adjacent members 104, an angle " θ " is formed between the intersecting edges of

the two associated members 104, as depicted in FIG. 1d, and it is to be appreciated that the angle " θ " can be configured to be between 45° to 90°, depending on requirements of an intended application.

5 • ***Wind load***

By way of simulations performed to investigate performance of the barrier 100, results obtained show that there are no significant changes for forces and bending moment (about the base of the members 104) due to wind load acting on the barrier 100. In fact, for the members 104, the forces and bending
10 moment about the base of the members 104 are slightly lower compared to that for a straight edge.

 • ***Noise mitigation***

There are typically many machineries and noise generating activities on a
15 construction site and the decision for a particular slant angle " α " to adopt is preferably to be dependent on the possible distance of major noise generating machinery or activity on the site. Particularly, it is desirable for the angularly arranged members 104 to be positioned directly facing the major noise source. But if the noise source is located relatively far from the barrier 100, it is then
20 desirable to configure the slant angle " α " to be substantially close to 90°. In a typical scenario where a machine is placed about 5 metres to 10 metres away from the barrier 100, the slant angle " α " can accordingly be set to about 45°. It is to be appreciated that the longer the length of the member 104 (i.e. corresponding to the height " h " in FIG. 1b), the better the noise mitigation
25 performance achieved. However, due to safety considerations, a length of the member 104 is configured to be around 5% to 20 % of the height of the body 102, as afore mentioned. It is also to be appreciated that between different members 104, the length configured for each member 104 may be different too, if necessary.

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 • ***Designs for test bedding at construction sites***

For test beds of the barrier 100 set up at construction sites, the range of the slant angle " α " of the plurality of members 104 usable for different configurations

500, 510, 520, 530 of the barrier 100 of height between 8 metres to 12 metres are respectively shown in FIGs. 5a to 5d for reference and illustration.

Further embodiments of the invention will be described hereinafter. For the sake
5 of brevity, description of like elements, functionalities and operations that are common between the embodiments are not repeated; reference will instead be made to similar parts of the relevant embodiment(s).

FIG. 6a shows a perspective view of another noise barrier 600, according to a
10 second embodiment, and FIG. 6b shows a variant member 650 to be angularly arranged at an edge of the body 102 of the noise barrier 600. It is to be appreciated that the barrier 600 of the second embodiment is largely similar to the barrier 100 of the first embodiment, except that each variant member 650 is arranged to have a tapered configuration with a substantially flat tip (instead of a
15 rounded tip). Arranging the variant member 650 with a flat tip improves noise reduction performance of the barrier 600 by enabling diffracting and creating destructive interferences of sound waves corresponding to the noise, when the sound waves impinge edges of the variant member 650. Simulations have demonstrated that a 5 dBA noise level reduction is achievable for the barrier 600
20 of the second embodiment, versus a conventional noise barrier having “straight-edged” cantilevers (i.e. the cantilevers are not angularly arranged on the edge of the body of the noise barrier). For avoidance of doubt, the dimensions of the variant member 650 illustrated in FIG. 6b are simply for example, and are not intended to be limiting in any way of possible dimensions configurable for the
25 variant member 650.

In summary, the proposed barrier 100, 600 enables mitigation of noise (transmitted to recipients in the vicinity) as generated by construction machineries, or machineries where noise generation is a major concern.
30 Specifically, the barrier 100, 600 includes the plurality of members 104, 650 which are angularly arranged at the edge of the body 102, and each member 104, 650 is configured with the protruding end portion, in which such a combination of the said features devised for the members 104, 650 help to enhance noise mitigation performance of the barrier 100, 600. When
35 experimentally assessed at different work sites, the barrier 100 of the first

embodiment shows an improvement (or additional insertion loss) of around 3.5 dB noise level reduction (as measured at a first work site), whereas the barrier 600 of the second embodiment shows an improvement of about 5 dB noise level reduction (as measured at a second work site, which is different in locale to the first work site). It is to be appreciated that both sets of said results are compared with reference to the conventional noise barrier having the “straight-edged” cantilevers. Further, it is to be appreciated that an optimal slant angle “ α ” configurable for the members 104, 650 generally tends to be smaller (thus leaning towards a configuration parallel to the horizontal axis of the body 102) for a noise source positioned closer to the barrier 100, 600, but tends to be larger (thus leaning towards a configuration parallel to the vertical axis of the body 102) for a noise source positioned further away from the barrier 100, 600. The slant angle “ α ” can be tailored to physical and/or acoustic characteristics of a location at where a major noise source is (e.g. generated due to construction activities, or heavy machineries) on a construction site, and also a specific location where the barrier 100, 600 may be deployed at the said construction site, based on site constraints. As an example, the barrier 100, 600 may find applications for use in construction sites, be deployed as building balconies to reduce noise pollution for residents, or be adapted for usage by louvre windows.

While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary, and not restrictive; the invention is not limited to the disclosed embodiments. Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practising the claimed invention.

For example, the plurality of members 104 may integrally be formed together as a single contiguous portion. Alternatively, the plurality of members 104 may respectively be independently formed, and are then arranged sequentially at the edge of the body 102. The barrier 100, 600 may be formed of metal/plastic, or any other suitable materials, and in certain cases, the barrier 100, 600 may also internally be constructed to include sound absorption materials/foams to better absorb noise impinging on the barrier 100, 600. In addition, for certain variations, the members 100, 650 need not be sequentially arranged, such that

other additionally features may also be disposed between the different members 100, 650, resulting in an irregular arrangement of the members 100, 650.

5 Further, the edge of the body 102, at where the plurality of members 104 angularly are arranged, may not necessarily be parallel to the horizontal axis of the body 102. That is, the edge can be any edge of the body 102, e.g. a vertical side edge of the body 102. Moreover, more than one edge of the body 102 may also be arranged with the plurality of members 104 in an angular configuration. It is also to be appreciated that the plurality of members 104 may also be
10 angularly arranged on multiple edges of respective bodies of conventional noise barriers, e.g. window boundaries of a room, a T-shaped noise barrier, Y-shaped noise barrier, or an arrow-shaped noise barrier with two edge profiles.

Claims

1. A noise barrier for reducing noise transmitted to at least one recipient, the noise generated by at least one noise source, the barrier configured to be
5 arranged intermediate the recipient and noise source, the barrier comprising:
a body; and
a plurality of members angularly arranged on at least one edge of the body, each member configured with a protruding end portion to increase insertion loss of the barrier for reducing the noise transmitted to the recipient.
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2. The noise barrier of claim 1, wherein the edge of the body is parallel to the horizontal axis of the body.
3. The noise barrier of any preceding claims, wherein the plurality of
15 members are integrally formed together as a single contiguous portion.
4. The noise barrier of any preceding claims, wherein the plurality of members are respectively independently formed, and are arranged sequentially at the edge of the body.
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5. The noise barrier of any preceding claims, wherein the protruding end portion has a tapered configuration with a substantially rounded tip.
6. The noise barrier of any preceding claims, wherein the protruding end
25 portion has a tapered configuration with a substantially flat tip.
7. The noise barrier of any preceding claims, wherein the height of each member is configured to be about 5% to 20% of the height of the body.
- 30 8. The noise barrier of any preceding claims, wherein the plurality of members being angularly arranged at the edge of the body includes being angularly arranged at an angle substantially between 0° to 90° with respect to the horizontal axis of the body.

9. The noise barrier of any preceding claims, wherein intersecting edges of any two adjacent members are arranged to define an angle, which is configured to be between about 45° to 90°.