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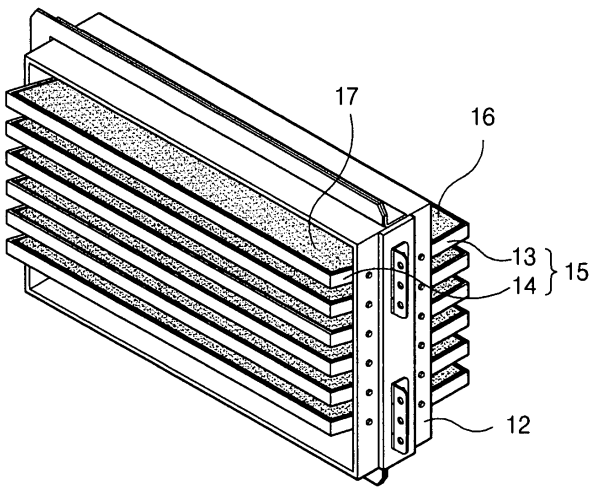
(54) Noise silencer for construction equipment

(57) A noise silencer for construction equipment is used to minimize outward propagation of noises generated from an engine room (11). The noise silencer is mounted in air intake (18) and/or discharge openings (19) of an engine room, and includes a frame (12) mounted in the one of the air intake and discharge openings of the engine room, and noise damping members (15) fixed to the frame at uniform intervals, and each including a first member (13), which is disposed inside the engine room in a horizontal direction such that cooling air introduced from outside to inside of the engine room by operation of a cooling fan (20) smoothly flows, and a second member (14), which is integrally formed with the first member and is disposed outside the engine room so as to be inclined upwardly at a predetermined inclination.

Fig. 2



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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from Korean Patent Application No. 10-2008-0071088, filed on July 22, 2008, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The present invention relates to a noise silencer for construction equipment, which is mounted in air intake and/or discharge openings of an engine room, smoothly guides a flow of air introduced into the engine room, and makes it possible to absorb low- and high-frequency noises using low- and high-frequency sound absorbing materials having different sound-absorbing characteristics.

[0003] More particularly, the present invention relates to a noise silencer for construction equipment, which is used to minimize outward propagation of noises generated from an engine room, has a horizontal structure inside an engine room in order to smooth a flow of cooling air and an inclined structure outside the engine room in order to prevent the noise from directly being propagated, thereby making it possible to optimally exert its function.

[0004] Here, the cooling air refers to air that is introduced from outside to inside of the engine room through the air intake opening by operation of a cooling fan, cools a radiator, and then is discharged through the air discharge opening along with noise.

DESCRIPTION OF THE RELATED ART

[0005] In general, various kinds of construction equipment such as excavators are used in the field of construction. Noise generated from the field of construction is regarded as an environmental problem, and thus regulation thereof is gradually increasing. As low noise technology complying with increases in European noise regulation takes the spotlight, there is a tendency to close side doors or engine hoods mounted on engine rooms during work so as to minimize outward propagation of noise from the engine room.

[0006] As illustrated in FIG. 1, a conventional noise silencer 5 for construction equipment is mounted in the air intake opening 3 of an engine room 2, wherein noise damping members 4 are fixed in the air intake opening 3 at uniform intervals so as to absorb and damp noise generated from the engine room 2 when an engine 1 and a cooling fan 6 are driven.

[0007] Although not illustrated in the figures, the noise silencer 5 may be installed in an air discharge opening 7 through which cooling air, which is introduced from outside to inside of the engine room 3 through the air intake opening 3 by the driving of the cooling fan 6 and then cools the radiator 8, is discharged.

[0008] Among reference numbers that have not yet been described, 9 indicates a muffler that discharges exhaust gas from the engine 1 to the air, and 10 indicates a hydraulic pump that is connected to the engine 1 and supplies hydraulic oil to a hydraulic actuator (e.g. a hydraulic cylinder).

[0009] Each noise damping member 4 has a symmetrical V-shaped cross section. The noise generated from the engine room 2 when the engine 1 and the cooling fan 6 are driven is absorbed and shielded, i.e. damped, by contact and collision with the noise damping members 4, so that the noise damping members 4 reduce the noise of the engine room 2 to some extent.

[0010] However, the noise damping members 4 largely employ only one sound absorbing material out of sound absorbing materials having different sound absorbing characteristics, specifically, only one sound absorbing material out of a sound absorbing material having high low-frequency sound absorptivity and a sound absorbing material having high high-frequency sound absorptivity. As such, the noise silencer 5 for reducing noises of low- and high-frequency region noises generated from the engine room 2 has a low noise reducing effect.

[0011] Further, a flow of cooling air introduced from outside to inside of the engine room 2 when the cooling fan 6 is driven interferes with the V-shaped noise damping members 4, which results in remarkable reduction of cooling performance of the engine room 2.

SUMMARY OF THE INVENTION

[0012] Embodiments of the present invention are directed to a noise silencer for construction equipment, capable of reducing noises generated from an engine room and emitted to the outside, and guiding a smooth flow of cooling air to maintain cooling performance by optimizing shape and structure of noise damping members.

[0013] Embodiments of the present invention are also directed to a noise silencer for construction equipment, capable of simultaneously reducing low- and high-frequency noises of an engine room using low- and high-frequency sound absorbing materials, which have different sound absorption characteristics and are attached to each noise damping member, and thus optimally producing a function of each noise damping member.

[0014] According to an aspect of the present invention, there is provided a noise silencer for construction equipment, which reduces noises propagated through air intake and discharge openings of an engine room of the construction equipment. The noise silencer includes a frame mounted in the air intake and/or discharge openings of the engine room, and noise damping members fixed to the frame at uniform intervals, and each including a first member, which is disposed inside the engine room in a horizontal direction such that cooling air introduced from outside to inside of the engine room by operation of a cooling fan smoothly flows, and a second member,

which is integrally formed with the first member and is disposed outside the engine room so as to be inclined upwardly at a predetermined inclination.

[0015] In an exemplary embodiment of the present invention, the first member may include a high-frequency sound absorbing material absorbing high-frequency sound, and the second member may include a low-frequency sound absorbing material absorbing low-frequency sound.

[0016] In an exemplary embodiment of the present invention, the first member may include a low-frequency sound absorbing material absorbing low-frequency sound, and the second member may include a high-frequency sound absorbing material absorbing high-frequency sound.

[0017] In an exemplary embodiment of the present invention, the first and second members may have free ends of semi-circular and quadrilateral cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

[0018] In an exemplary embodiment of the present invention, the first and second members may have free ends of triangular and quadrilateral cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

[0019] In an exemplary embodiment of the present invention, the first and second members may have free ends of quadrilateral and semi-circular cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

[0020] In an exemplary embodiment of the present invention, the first and second members may have free ends of quadrilateral and triangular cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

[0021] In an exemplary embodiment of the present invention, the first and second members may have free ends of semi-circular cross sections, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

[0022] In an exemplary embodiment of the present invention, the first and second members may have free ends of quadrilateral cross sections, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

[0023] According to exemplary embodiments of the present invention, the noise silencer for construction equipment provides the following advantages.

[0024] Due to optimized shape and structure of the noise damping members constituting the noise silencer, the noise silencer can reduce noises generated from the engine room and propagated to the outside of the engine room, guide a smooth flow of cooling air to maintain cooling performance, and thus improve reliability of a product.

[0025] Further, the noise silencer reduces low- and high-frequency noises generated from the engine room using low- and high-frequency sound absorbing materials, which have different sound absorbing characteristics and are used as sound absorbing materials attached to the noise silencer, so that the noise silencer can produce an optimal function and thus improve competitiveness of a product.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate exemplary embodiments of the invention, and together with the description serve to explain the aspects of the invention.

FIG. 1 illustrates the operation of a conventional noise silencer.

FIG. 2 is a schematic perspective view illustrating a noise silencer for construction equipment according to a first embodiment of the present invention.

FIG. 3 illustrates the operation of a noise silencer for construction equipment according to a first embodiment of the present invention.

FIG. 4 illustrates the operation of a noise silencer for construction equipment according to a second embodiment of the present invention.

FIG. 5 illustrates the operation of a noise silencer for construction equipment according to a third embodiment of the present invention.

FIG. 6 illustrates the operation of a noise silencer for construction equipment according to a fourth embodiment of the present invention.

FIG. 7 illustrates the operation of a noise silencer for construction equipment according to a fifth embodiment of the present invention.

FIG. 8 illustrates the operation of a noise silencer for construction equipment according to a sixth embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0027] Exemplary embodiments of the present invention will be explained below in detail so that one skilled in the art may easily work the invention. However, the following description is not intended to limit the technical ideas or scope of the present invention.

[0028] According to embodiments of the present invention as illustrated in FIGS. 2 through 8, a noise silencer for construction equipment which is mounted in an air intake opening and/or an air discharge opening of an engine room of the construction equipment includes a frame 12 mounted at a predetermined position (e.g. in

an air intake opening 18 through which external air is introduced from outside to inside of an engine room 11 when a cooling fan 20 is driven) of the engine room 11, and noise damping members 15 fixed to the frame 12 at uniform intervals in a vertical direction, and each including a first member 13, which is disposed inside the engine room 11 in a horizontal direction such that cooling air introduced from outside to inside of the engine room 11 by operation of the cooling fan 20 smoothly flows, and a second member 14, which is integrally formed with the first member 13 and is disposed outside the engine room 11 so as to be inclined upwardly at a predetermined inclination in order to contact and shield noise (high-frequency noise caused by operation of an engine 21 and low-frequency noise caused by the operation of the cooling fan 20) propagated to the outside of the engine room 11.

[0029] At this time, the first member 13 is mounted with a high-frequency sound absorbing material 16 (e.g. made of polyurethane, polypropylene, glass fiber, felt, foam resin, polyvinyl chloride, or the like) which mainly absorbs high-frequency sound, and the second member 14 is mounted with a low-frequency sound absorbing material 17 (e.g. made of inorganic material such as mineral) that mainly absorbs low-frequency sound.

[0030] In order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11, each of the first and second members 13 and 14 has a free end formed in a quadrilateral cross section.

[0031] Although not illustrated, the first member 13 may be mounted with the low-frequency sound absorbing material that mainly absorbs low-frequency sound, and the second member 14 may be mounted with the high-frequency sound absorbing material that mainly absorbs high-frequency sound.

[0032] Among reference numbers that have not yet been described in the figures, 26 indicates a muffler that discharges exhaust gas from the engine 21 to the air, and 24 indicates a hydraulic pump that is connected to the engine 21 and supplies hydraulic oil to a hydraulic actuator (e.g. a hydraulic cylinder).

[0033] Now, a configuration of the noise silencer for construction equipment according to a first embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0034] As illustrated in FIG. 3, in the case of construction equipment such as an excavator, when an engine 21 and a cooling fan 20 are driven, cooling air is introduced into an engine room 11 through an air intake opening 18, cools a radiator 22, and then is discharged to the outside of the engine room 11 through an air discharge opening 19.

[0035] Further, when the engine 21 and the cooling fan 20 are driven, noises are also generated from the engine room 11, and then are propagated to the outside of the engine room 11 along the cooling air. At this time, the generated noises are shielded and damped by a noise silencer mounted in the air intake opening 18.

[0036] In detail, the noises generated from the engine room when the engine 21 and the cooling fan 20 are driven are sorted into high-frequency noise generated by the operation of the engine 21 and low-frequency noise generated by the operation of the cooling fan 20. These noises can be absorbed and shielded, i.e. damped by first and second members 13 and 14 constituting each noise damping member 15.

[0037] At this time, the first member 13 of each noise damping member 15 is disposed inside the engine room 11 in a horizontal direction, and the second member 14 of each noise damping member 15 is disposed outside the engine room 11 so as to be inclined in an upward direction. With this configuration, the cooling air introduced into the engine room 11 through the noise damping members 15 by the operation of the cooling fan 20 can be smoothly guided without interference.

[0038] In this manner, since the first member 13 of each noise damping member 15 is disposed inside the engine room 11 in the horizontal direction, and the second member 14 of each noise damping member 15 is disposed outside the engine room 11 so as to be inclined in the upward direction, the high- and low-frequency noises generated from the engine room 11 by the operation of the engine 21 and the cooling fan 20 are absorbed and damped by a high-frequency sound absorbing material 16 mounted on the first member 13 of each noise damping member 15 and a low-frequency sound absorbing material 17 mounted on the second member of each noise damping member 15.

[0039] According to the noise silencer for construction equipment as described above, a flow of the cooling air introduced into the engine room 11 through the air intake opening 18 when the cooling fan 20 is driven does not interfere with the noise damping members 15, so that the cooling air can be smoothly introduced into the engine room 11. Thus, an amount of the introduced cooling air is increased to effectively cool the radiator 22 and the engine 21, so that cooling efficiency can be improved.

[0040] Further, the high- and low-frequency noises generated from the engine room 11 by the operation of the engine 21 and the cooling fan 20 are absorbed and shielded by the high-frequency sound absorbing material 16 of the first member 13 and the low-frequency sound absorbing material 17 of the second member 14, so that a function of the noise silencer can be optimized. In other words, when passing through the high-frequency sound absorbing material 16 of the first member 13 and the low-frequency sound absorbing material 17 of the second member 14, the high- and low-frequency noises are subjected to conversion of sound pressure energy into frictional energy. As a result, high- and low-frequency noises can be absorbed and shielded, i.e. damped.

[0041] As illustrated in FIG. 4, the noise silencer for construction equipment according to a second embodiment of the present invention is configured so that, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11 through

the air intake opening 18, the first member 13 of each noise damping member 15 has the free end of a semi-circular cross section, and the second member 14 of each noise damping member 15 has the free end of a semi-circular cross section.

[0042] At this time, the configuration other than that of the second member 14, the free end of which has the semi-circular cross section in order to minimize the air resistance caused by the contact with each noise damping member 15 when the cooling air is introduced from the outside into the engine room 11 through the air intake opening 18 by the operation of the cooling fan 20, is substantially identical to that described in the first embodiment of the present invention (see FIG. 3), and thus detailed description thereof is omitted, and the same reference numerals are used to designate the same components.

[0043] As illustrated in FIG. 4, the noise silencer for construction equipment according to a second embodiment of the present invention is configured so that, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11 through the air intake opening 18, the first member 13 of each noise damping member 15 has the free end of a quadrilateral cross section, and the second member 14 of each noise damping member 15 has the free end of a semi-circular cross section.

[0044] At this time, the configuration other than that of the second member 14, the free end of which has the semi-circular cross section in order to minimize the air resistance caused by the contact with each noise damping member 15 when the cooling air is introduced from outside to inside of the engine room 11 through the air intake opening 18 by the operation of the cooling fan 20, is substantially identical to that described in the first embodiment of the present invention (see FIG. 3), and thus detailed description thereof is omitted, and the same reference numerals are used to designate the same components.

[0045] As illustrated in FIG. 5, the noise silencer for construction equipment according to a third embodiment of the present invention is configured so that, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11 through the air intake opening 18, the first member 13 of each noise damping member 15 has the free end of a quadrilateral cross section, and the second member 14 of each noise damping member 15 has the free end of a triangular cross section.

[0046] At this time, the configuration other than that of the second member 14, the free end of which has the triangular cross section in order to minimize the air resistance caused by the contact with each noise damping member 15 when the cooling air is introduced from outside to inside of the engine room 11 through the air intake opening 18 by the operation of the cooling fan 20, is substantially identical to that described in the first embodiment of the present invention, and thus detailed description thereof is omitted, and the same reference numerals are used to designate the same components.

[0047] As illustrated in FIG. 6, the noise silencer for construction equipment according to a fourth embodiment of the present invention is configured so that, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11 through the air intake opening 18, the first member 13 of each noise damping member 15 has the free end of a semi-circular cross section, and the second member 14 of each noise damping member 15 has the free end of a quadrilateral cross section.

[0048] At this time, the configuration other than that of the first member 13, the free end of which has the semi-circular cross section in order to minimize the air resistance caused by the contact with each noise damping member 15 when the cooling air is introduced from outside to inside of the engine room 11 through the air intake opening 18 by the operation of the cooling fan 20, is substantially identical to that described in the first embodiment of the present invention, and thus detailed description thereof is omitted, and the same reference numerals are used to designate the same components.

[0049] As illustrated in FIG. 7, the noise silencer for construction equipment according to a fifth embodiment of the present invention is configured so that, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11 through the air intake opening 18, the first member 13 of each noise damping member 15 has the free end of a triangular cross section, and the second member 14 of each noise damping member 15 has the free end of a quadrilateral cross section.

[0050] At this time, the configuration other than that of the first member 13, the free end of which has the triangular cross section in order to minimize the air resistance caused by the contact with each noise damping member 15 when the cooling air is introduced from outside to inside of the engine room 11 through the air intake opening 18 by the operation of the cooling fan 20, is substantially identical to that described in the first embodiment of the present invention, and thus detailed description thereof is omitted, and the same reference numerals are used to designate the same components.

[0051] As illustrated in FIG. 8, the noise silencer for construction equipment according to a sixth embodiment of the present invention is configured so that, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room 11 through the air intake opening 18, the first and second members 13 and 14 of each noise damping member 15 have free ends of a semi-circular cross section.

[0052] At this time, the configuration other than that of the first and second members 13 and 14, the free ends of which have the semi-circular cross section in order to minimize the air resistance caused by the contact with each noise damping member 15 when the cooling air is introduced from outside to inside of the engine room 11

through the air intake opening 18 by the operation of the cooling fan 20, is substantially identical to that described in the first embodiment of the present invention, and thus detailed description thereof is omitted, and the same reference numerals are used to designate the same components.

[0053] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. A noise silencer for construction equipment, which reduces noises propagated through air intake and discharge openings of an engine room of the construction equipment, the noise silencer comprising:

   a frame mounted in at least one of the air intake and discharge openings of the engine room; and noise damping members fixed to the frame at uniform intervals, and each including a first member, which is disposed inside the engine room in a horizontal direction such that cooling air introduced from outside to inside of the engine room by operation of a cooling fan smoothly flows, and a second member, which is integrally formed with the first member and is disposed outside the engine room so as to be inclined upwardly at a predetermined inclination.

2. The noise silencer of claim 1, wherein the first member includes a high-frequency sound absorbing material absorbing high-frequency sound, and the second member includes a low-frequency sound absorbing material absorbing low-frequency sound.

3. The noise silencer of claim 1, wherein the first member includes a low-frequency sound absorbing material absorbing low-frequency sound, and the second member includes a high-frequency sound absorbing material absorbing high-frequency sound.

4. The noise silencer of one of claims 1 through 3, wherein the first and second members have free ends of semi-circular and quadrilateral cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

5. The noise silencer of one of claims 1 through 3, wherein the first and second members have free ends of triangular and quadrilateral cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

6. The noise silencer of one of claims 1 through 3, wherein the first and second members have free ends of quadrilateral and semi-circular cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

7. The noise silencer of one of claims 1 through 3, wherein the first and second members have free ends of quadrilateral and triangular cross sections respectively, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

8. The noise silencer of one of claims 1 through 3, wherein the first and second members have free ends of semi-circular cross sections, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

9. The noise silencer of one of claims 1 through 3, wherein the first and second members have free ends of quadrilateral cross sections, in order to reduce air resistance on coming into contact with the cooling air introduced into the engine room through the air intake opening.

Fig. 1

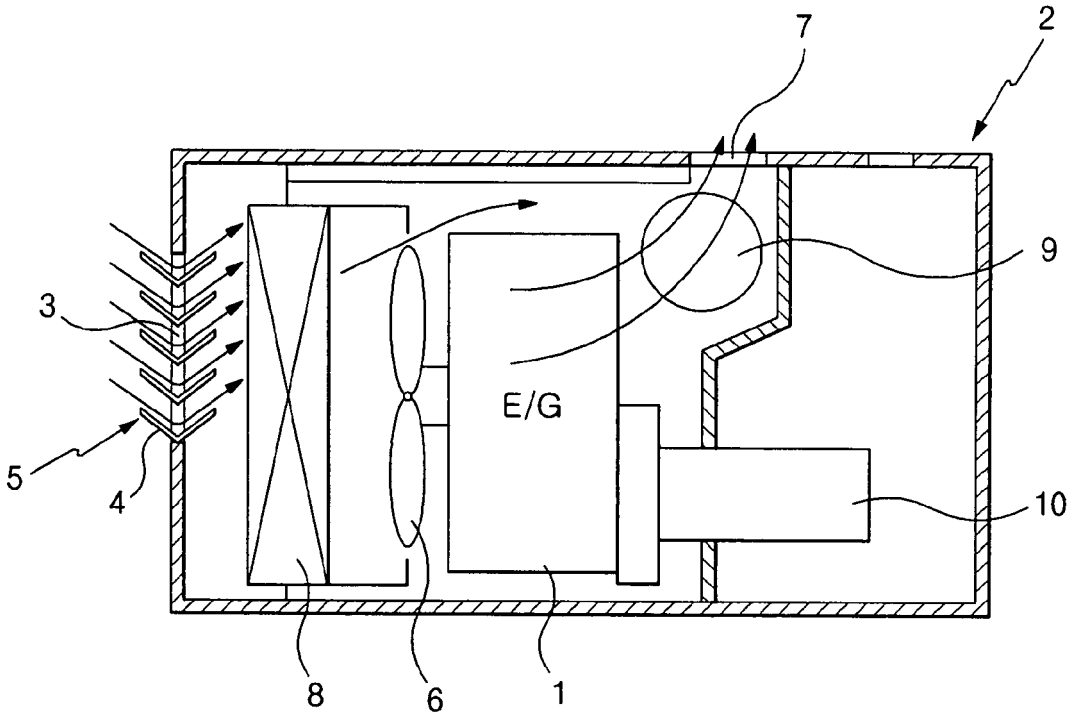


Fig. 2

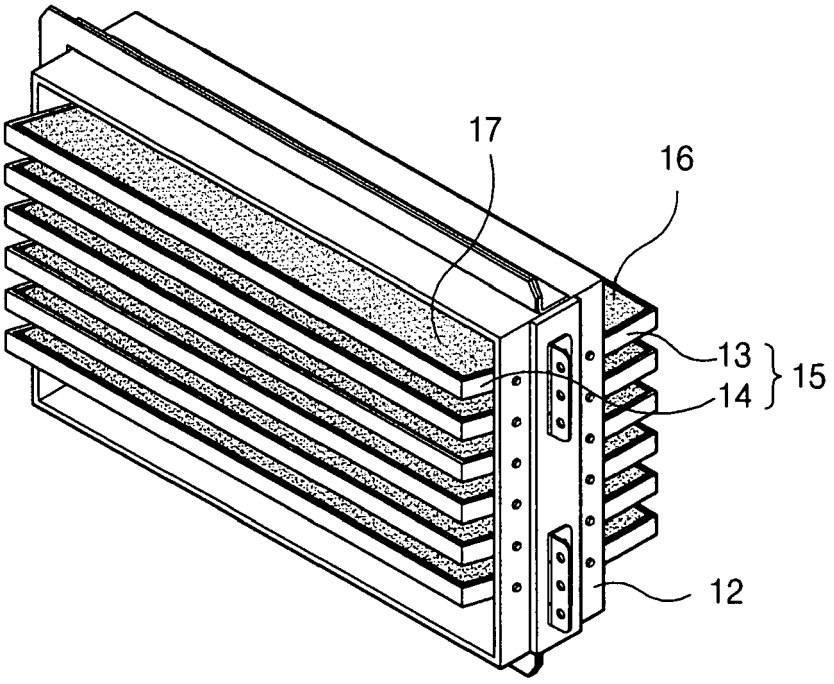


Fig. 3

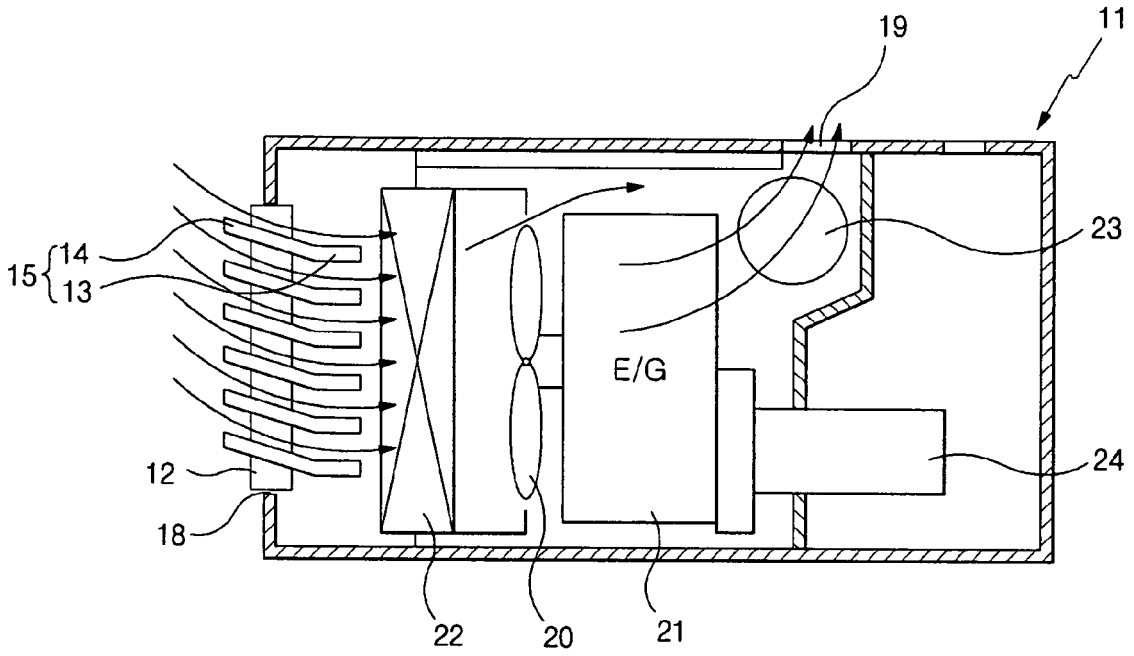


Fig. 4

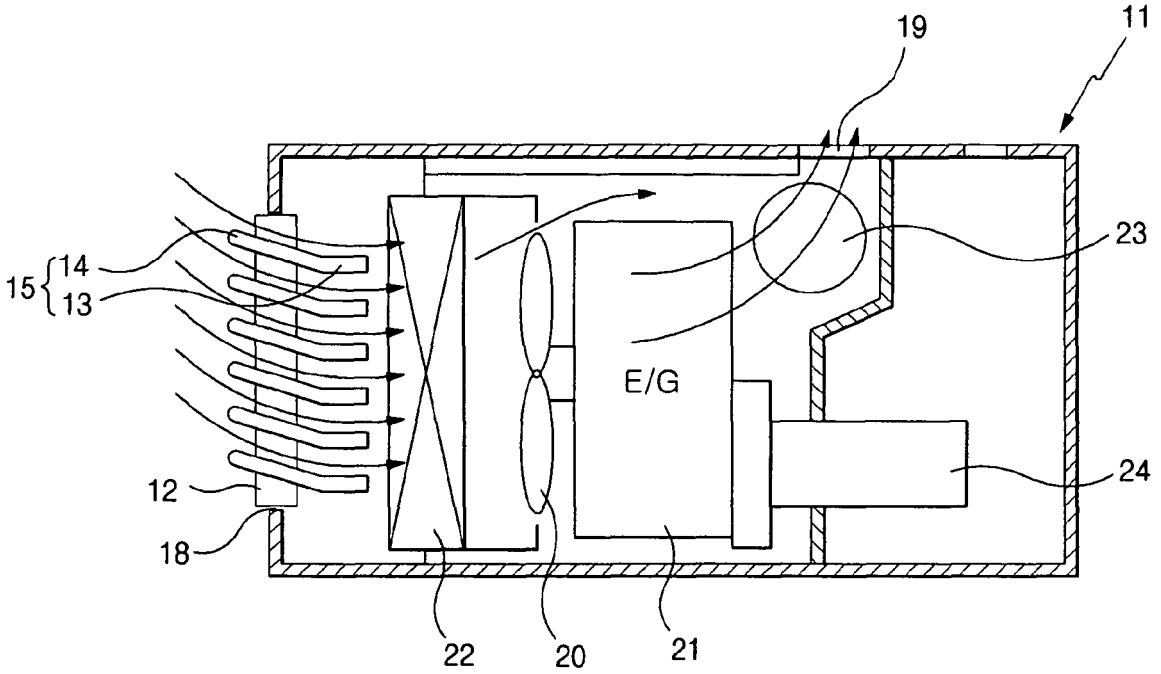


Fig. 5

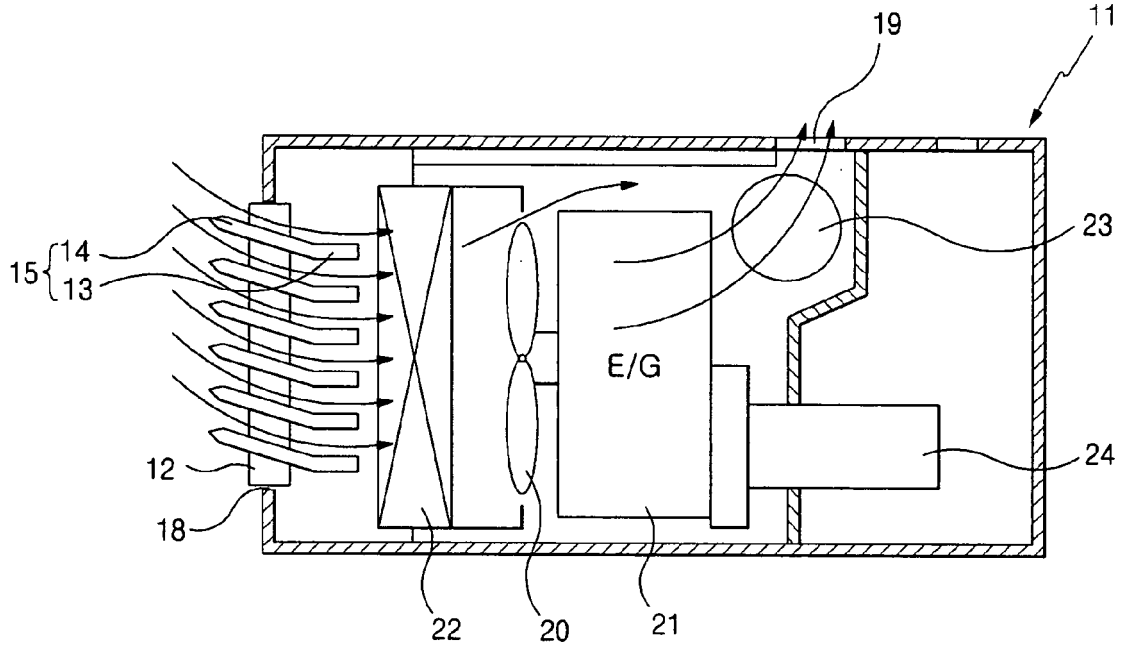


Fig. 6

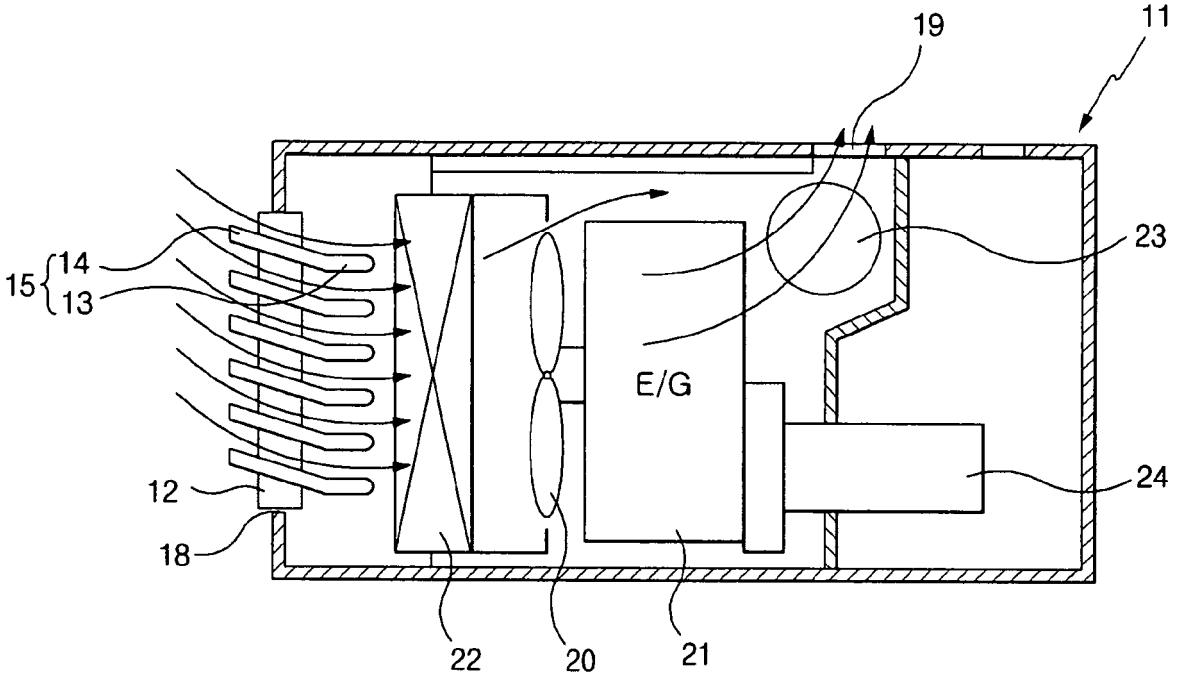


Fig. 7

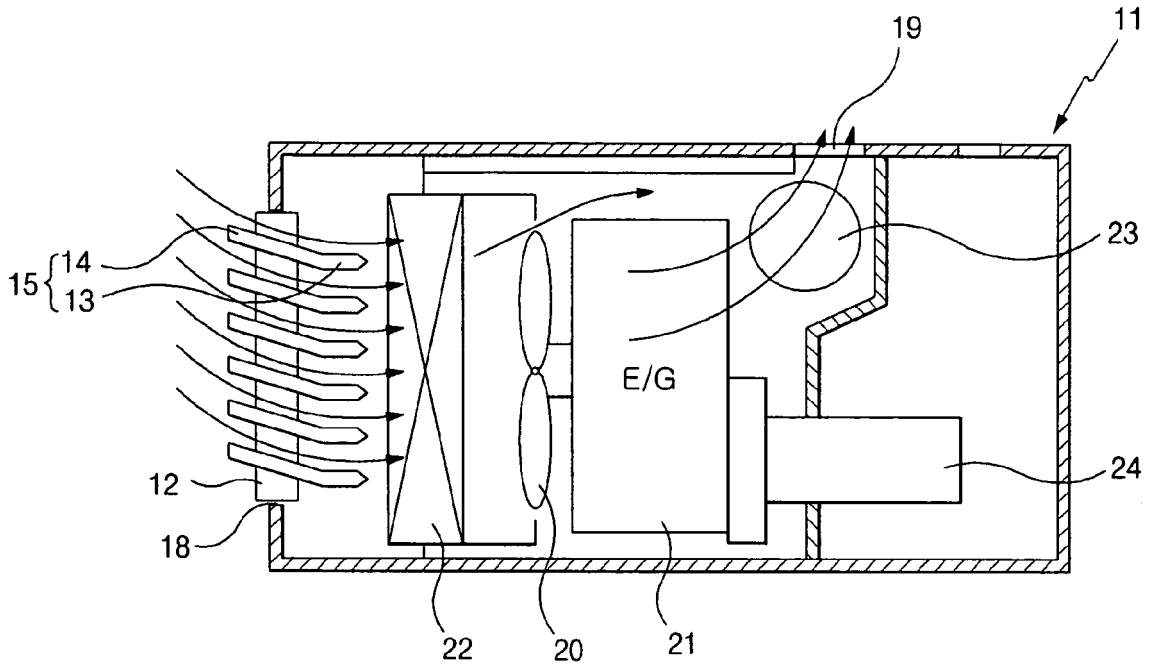
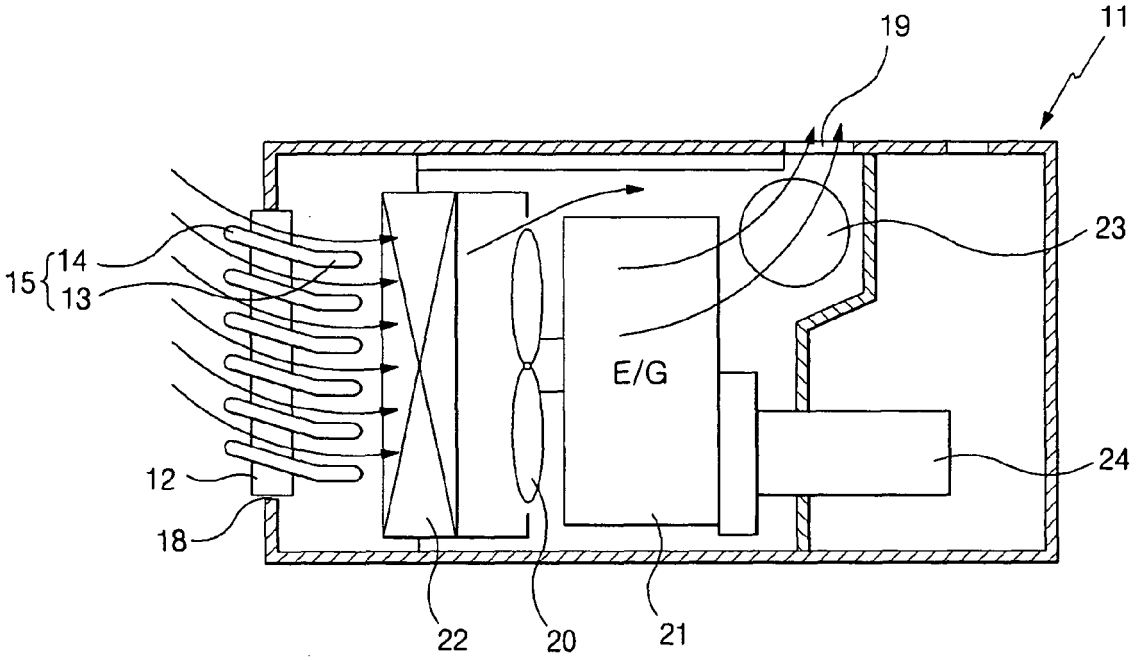


Fig. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 09 00 8928

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	JP 2008 037343 A (CATERPILLAR MITSUBISHI LTD) 21 February 2008 (2008-02-21) * abstract; figures 1,2,4 *	1	INV. E02F9/00 E02F9/08
Y		2-9	
Y	EP 1 635 049 A (KOBELCO CONSTR MACHINERY LTD [JP]) 15 March 2006 (2006-03-15) * paragraphs [0088] - [0096]; figures 12B,13A *	2,3	
Y	US 3 923 114 A (SUZUKI YASUO) 2 December 1975 (1975-12-02) * column 3, lines 36-39; figure 4 *	4	
Y	JP 11 247228 A (HITACHI CONSTRUCTION MACHINERY) 14 September 1999 (1999-09-14) * abstract; figure 5 *	5	
Y	US 3 762 489 A (PROKSCH F ET AL) 2 October 1973 (1973-10-02) * column 5, lines 40-52; figure 13 *	6	TECHNICAL FIELDS SEARCHED (IPC)
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Y	JP 2007 055534 A (KOMATSU MFG CO LTD) 8 March 2007 (2007-03-08) * figure 8 *	8	F24F E02D E01C B66C
A	JP 09 195771 A (SUMITOMO CONSTR MACH) 29 July 1997 (1997-07-29) * abstract; figures 1-3 *		B66F F28C F25B
A	JP 09 060521 A (KANZAKI KOKYUKOKI MFG CO LTD) 4 March 1997 (1997-03-04) * abstract; figure 5 *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 December 2009	Papadimitriou, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 09 00 8928

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 09 00 8928

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1,2,3

realisation of a noise silencer for reducing noises of low- and high frequency region generated in the engine room of a construction machine.

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2. claims: 1,4-9

enhancing cooling of the engine room of a construction machine.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 00 8928

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-12-2009

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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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