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(54) **GENERATOR SET**

STROMERZEUGERAGGREGAT

ENSEMBLE DE GÉNÉRATEUR

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Description

[0001] The present patent application for industrial invention relates to a generator set.

[0002] As it is known, a generator set is a machine capable of generating electrical energy from combustion thermal energy by means of two conversions in cascade: from thermal energy to mechanical energy and from mechanical energy to electrical energy. A generator set may operate continuously or may replace the electrical mains in case of failure in order to remedy an emergency situation. In fact, the distribution of electrical energy may be impaired by interference of different kind (for example, storms, material damage, etc.) that may cause an interruption of the electrical mains.

[0003] The generator sets of the prior art comprise:

- an internal combustion engine that generates mechanical energy from the combustion of a fuel,
- an alternator that converts the mechanical energy into electrical energy, and
- a switchboard that is configured to distribute the electrical energy generated by the alternator in a safe way, protecting the parts of the alternator and the utilities powered by the generator set.

[0004] The internal combustion engine consists in an engine that is powered with diesel, gasoline, compressed natural gas or, more rarely, liquid propane gas.

[0005] A casing is provided in order to cover and protect the engine, the alternator and the switchboard in the generator sets that are suitable for being installed outdoor and are therefore exposed to climatic phenomena and weather agents. Generally speaking, such a casing comprises metal walls that are internally covered with sound-absorbing panels, in such a way to reduce the noise produced by the generator set. However, in spite of the improvements made to reduce as much as possible the noise produced by the generator sets, the acoustic impact in decibels (dB) produced by the generator sets of the prior art is still very high.

[0006] In fact, the internal combustion engine generates a high noise level. Moreover, the external casing of the generator sets must be necessarily provided with slots in order to put the interior of the casing in communication with the exterior in order to guarantee a correct operation of the engine. As a matter of fact, because of the provision of said slots in the casing, the comburent air that is necessary for the combustion of the fuel, as well as the air that is necessary for cooling the engine can be sucked from the exterior. Obviously, said slots are not covered with sound-absorbing material, thus inevitably impairing the acoustic insulation of the generator set.

[0007] JP2003090224A discloses a generator according to the preamble of claim 1.

[0008] The purpose of the present invention is to overcome the drawbacks of the prior art by disclosing a gen-

erator set comprising a casing that is capable of guaranteeing a high sound-insulation level, while still permitting an appropriate air flow from the exterior to the interior of the casing.

[0009] By means of experimental tests, the inventor surprisingly has discovered that the best acoustic insulation results of a generator set are obtained by providing the casing of the generator set with an internal covering obtained with sound-absorbing panels having a thickness that is equal to or higher than 6 cm.

[0010] In particular, the inventor has discovered that the sound insulation level of a generator set varies considerably according to the thickness of the sound-absorbing panels used for internally covering the casing of the generator set.

[0011] In fact, the inventor has performed several experimental tests with the following results:

- an acoustic impact of 74 dB at 7 m, with sound-absorbing panels with 3 m thickness;
- an acoustic impact of 68 dB at 7 m, with sound-absorbing panels with 6 cm thickness;
- an acoustic impact of 56 dB at 7 m, with sound-absorbing panels with 10 cm thickness.

[0012] Based on these results, the inventor has developed a generator set provided with a casing that is internally covered with sound-absorbing panels with thickness higher than or equal to 6 cm. Because of the reduction of the acoustic impact down to 56 dB, measured at a distance of 7 meters from the generator set, the generator set according to the invention may be installed in industrial areas and also in residential areas in compliance with the strictest standards on acoustic pollution.

[0013] After several experimental tests, the inventor has surprisingly discovered that the residual noise perceived from the exterior can be reduced by providing the casing with a set of partitions made of sound-absorbing material disposed in parallel adjacent position near the slots obtained in the casing for the passage of air.

[0014] Therefore, the generator set of the invention comprises partitions made of sound-absorbing material in spaced arrangement inside the casing near the slots for the entrance of the air flow, in such a way to guarantee a high reduction of the acoustic emissions perceived outside the generator set.

[0015] **The generator according to the invention is defined in claim 1.**

[0016] Additional features of the invention will appear manifest from the following detailed description, which refers to a merely illustrative, not limiting embodiment, as illustrated in the appended figures, wherein:

Fig. 1 is an axonometric view of a generator set
 Fig. 2 is a side view of the generator set of Fig. 1;
 Fig. 3 is a top view of a first embodiment of the generator set **which is not part** of the invention, wherein the upper panel of the casing is omitted to show the

parts disposed inside the compartment of the casing; Fig. 4 is a top view of a second embodiment of the generator set according to the invention, wherein the upper panel of the casing is omitted to show the parts disposed inside the compartment of the casing; Fig. 5 is an axonometric view of the generator set of Fig. 4.

[0017] With reference to Figs. 1 and 2, a generator set according to a first embodiment **which is not part** of the invention is disclosed, which is generally indicated with reference numeral (100).

[0018] The generator set (100) comprises a casing (1) with parallelepiped shape, comprising two lateral walls (10), two transverse walls (11), a top wall (12) and a bottom wall (13). It must be noted that, although a parallelepiped casing is illustrated in the appended figures, said casing (1) can have different shapes and sizes.

[0019] The walls (10, 11, 12, 13) define a compartment (V) (Fig. 3) that houses an internal combustion engine, an alternator and a switchboard.

[0020] Each wall (10, 11, 12, 13) of the casing has an internal surface directed towards the compartment (V) of the casing and covered with panels made of sound-absorbing material, having a thickness higher than or equal to 6 cm. Advantageously, said sound-absorbing panels have a thickness between 6 cm and 15 cm.

[0021] Slots (2) are obtained in one of the transverse walls (11) of the casing in order to put the compartment (V) of the casing in communication with the exterior. In view of the above, the external air can be partially conveyed into the compartment (V) of the casing (1) through said slots (2), thus guaranteeing a correct operation of the internal combustion engine disposed inside the compartment (V). Evidently, said slots (2) can be obtained in any one of the walls (10, 11) of the casing.

[0022] With reference to Fig. 3, the generator set (100) comprises a set of partitions (3) made of sound-absorbing material which are disposed in spaced arrangement inside the compartment (V) of the casing (1) near the slots (2). In particular, said partitions (3) are disposed in orthogonal direction relative to the wall (10, 11) of the casing provided with the slots (2) and in adjacent parallel position in such a way that a gap is generated between two adjacent partitions (3), said gap receiving the air sucked from the exterior through said slots (2). More precisely, the distance (d) between two adjacent partitions (3) is advantageously comprised between 1 cm and 15 cm. The provision of said partitions (3) made of sound-absorbing material considerably reduces the acoustic emissions perceived outside the generator set. In view of the above, the air sucked by the slots (2) is forced to flow and pass through the separation gaps between the partitions (3) of said set of partitions (3) of sound-absorbing material, optimizing the acoustic insulation of the generator set.

[0023] The dimensions of the sound-absorbing partitions (3) can be modified according to the sound-absorp-

tion level to be achieved. Evidently, the larger the area of each partition (3), the higher the sound-absorbing capacity of the set of partitions (3) will be. Moreover, the lower the distance (d) between two adjacent partitions (3) of the set of partitions, the higher the sound-absorption capacity of the set of partitions (3) will be.

[0024] With reference to Figs. 4 and 5, a second embodiment of the generator set according to the invention is described, which is generally indicated with reference numeral (200).

[0025] The generator set (200) comprises a first set of partitions (3) and a second set of partitions (3) made of sound-absorbing material and disposed in cascade inside the compartment (V) of the casing, in parallel, staggered position. More precisely, the second set of partitions (3) is disposed inside the compartment (V) of the casing, in proximal rear position relative to the first set of partitions (3), along the forward traveling direction of the air that is conveyed inside the compartment (V) of the casing. Specifically, the partitions (3) of the second set of partitions (3) lie on vertical planes that pass in the gaps that separate the partitions (3) of the first set of partitions (3), i.e. of the set in most proximal position to the slots (2). Because of such a staggered arrangement of the two sets of partitions (3) inside the compartment (V) of the casing, said two sets of partitions (3) form a sort of labyrinth that is capable of completely insulating the compartment (V) of the casing (1) from the exterior, while still permitting an appropriate air flow from the exterior to the interior of the casing (1).

[0026] Moreover, although not shown in the figures, it must be noted that the generator set according to the invention may comprise more than two sets of partitions of sound-absorbing material. Evidently, the higher the number of sound-absorbing partitions disposed in cascade inside the compartment (V) of the casing, the higher the reduction of the noise perceived outside the generator set will be.

Claims

1. Generator set (200) comprising:

- an internal combustion engine for generating mechanical energy from the combustion of a fuel,
- an alternator for converting the mechanical energy generated by the internal combustion engine into electrical energy,
- a switchboard electrically connected to the alternator to control and distribute the electrical energy generated by the alternator,
- a casing (1) comprising a bottom wall (13) and at least one lateral wall (10, 11), which define a compartment (V) that houses the internal combustion engine and the alternator; said bottom wall (13) and said at least one lateral wall (10,

11) comprising an internal surface directed towards the compartment (V) of the casing (1); said casing (1) comprising slots (2) obtained in said at least one lateral wall (10, 11) in order to put the compartment (V) in communication with the exterior;
 - first set of partitions (3) made of sound-absorbing material, which are disposed in spaced arrangement inside the compartment (V) of the casing (1) near the slots (2); wherein the partitions (3) of said at least one set of partitions (3) are disposed in orthogonal direction relative to said at least one lateral wall (10, 11) of the casing provided with said slots (2), and are disposed in adjacent parallel position in such a way that a gap is generated between two adjacent partitions (3), said gap receiving the air sucked from the exterior through said slots (2),

wherein said internal surface of said bottom wall (13) and of said at least one lateral wall (10, 11) of the casing is covered with sound-absorbing panels,

characterized in that

said sound-absorbing panels have a thickness higher than or equal to 6 cm, and the generator set (200) further comprises

- a second set of partitions (3) made of sound-absorbing material, which are disposed inside the compartment (V) of the casing, in proximal rear position relative to the first set of partitions (3) according to a forward traveling direction of the air that is conveyed inside the compartment (V) of the casing,

said second set of partitions (3) being in orthogonal direction relative to said at least one lateral wall (10, 11) of the casing provided with said slots (2) and said second set of partitions (3) being staggered with respect to said first set of partitions (3).

2. The generator set (200) of claim 1, wherein the partitions (3) of said second set of partitions (3) lie on vertical planes that pass in gaps obtained between the partitions (3) of the first set of partitions (3).

3. The generator set (200) of claim 1 or 2, wherein the distance (d) between two adjacent partitions (3) of said at least one set of partitions (3) is comprised between 1 cm and 15 cm.

Patentansprüche

1. Generatorsatz (200), umfassend:

- einen Verbrennungsmotor zur Erzeugung von mechanischer Energie aus der Verbrennung eines Brennstoffs,
 - einen Wechselstromerzeuger zur Umwandlung der von dem Verbrennungsmotor erzeugten mechanischen Energie in elektrische Energie,
 - eine Schalttafel, die mit dem Wechselstromerzeuger elektrisch verbunden ist, um die von dem Wechselstromerzeuger erzeugte elektrische Energie zu steuern und zu verteilen,
 - ein Gehäuse (1), umfassend eine untere Wand (13) und mindestens eine Seitenwand (10, 11), die einen Raum (V) definieren, in dem der Verbrennungsmotor und der Wechselstromerzeuger untergebracht sind; wobei die untere Wand (13), und die mindestens eine Seitenwand (10, 11) eine zu dem Raum (V) des Gehäuses (1) gerichtete innere Oberfläche umfassen; wobei das Gehäuse (1) Schlitze (2) umfasst, die in der mindestens einen Seitenwand (10, 11) herausgearbeitet sind, um den Raum (V) mit dem Außenraum in Verbindung zu setzen;
 - eine erste Reihe von Zwischenwänden (3) aus schallabsorbierendem Material, die im Inneren des Raums (V) des Gehäuses (1) nahe der Schlitze (2) zueinander beabstandet angeordnet sind; wobei die Zwischenwände (3) der mindestens einen Reihe von Zwischenwänden (3) in orthogonaler Richtung in Bezug auf die mindestens eine Seitenwand (10, 11) des mit den Schlitzen (2) versehenen Gehäuses angeordnet sind und in parallelen benachbarten Positionen angeordnet sind, so dass ein Zwischenraum zwischen zwei benachbarten Zwischenwänden (3) entsteht, wobei der Zwischenraum die durch die Schlitze (2) aus dem Außenraum angesaugte Luft aufnimmt,

wobei die innere Oberfläche der unteren Wand (13) und der mindestens einen Seitenwand (10, 11) des Gehäuses mit schallabsorbierenden Platten verkleidet ist

dadurch gekennzeichnet, dass

die schallabsorbierenden Platten eine Dicke gleich oder höher als 6 cm aufweisen; und

der Generatorsatz (200) ferner umfasst:

- eine zweite Reihe von Zwischenwänden (3) aus schallabsorbierendem Material, die im Innern des Raums (V) des Gehäuses in proximaler hinterer Position in Bezug auf die erste Reihe von Zwischenwänden (3) gemäß einer Bewegungsrichtung der ins Innere des Raums (V) des Gehäuses geförderten Luft angeordnet sind,

- une seconde série de séparateurs (3) en matériel insonorisant, disposés écartés à l'intérieur du compartiment (V) du carter (1) à proximité des fissures (2) ; où les séparateurs (3) de ladite au moins une série de séparateurs (3) sont disposés en direction orthogonale par rapport à ladite au moins une paroi latérale (10, 11) du carter muni des dites fissures (2), et sont disposés en

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2. Generatorsatz (200) nach Anspruch 1, wobei die Zwischenwände (3) der zweiten Reihe von Zwischenwänden (3) auf vertikalen Ebenen liegen, die durch die Zwischenräume hindurchgehen, die zwischen den Zwischenwänden (3) der ersten Reihe von Zwischenwänden (3) herausgearbeitet sind.

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3. Generatorsatz (200) nach Anspruch 1 oder 2, wobei der Abstand (d) zwischen zwei benachbarten Zwischenwänden (3) der mindestens einen Reihe von Zwischenwänden (3) zwischen 1 cm und 15 cm beträgt.

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Revendications

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1. Groupe électrogène (200) comprenant :

- un moteur à combustion interne pour la génération d'énergie mécanique à partir de la combustion d'un carburant,

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- un alternateur pour la conversion de l'énergie mécanique générée par le moteur à combustion interne en énergie électrique,

- un tableau électrique de commande et contrôle branché électriquement à l'alternateur pour contrôler et distribuer l'énergie électrique générée par l'alternateur,

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- un carter (1) comprenant une paroi inférieure (13) et au moins une paroi latérale (10, 11) qui délimitent un compartiment (V) où sont logés le moteur à combustion interne et l'alternateur; ladite paroi inférieure (13) et ladite au moins une paroi latérale (10, 11) comprenant une surface interne orientée vers le compartiment (V) du carter (1) ; ledit carter (1) comprenant des fissures (2) réalisées dans ladite au moins une paroi latérale (10, 11) pour que le compartiment (V) du carter soit communiquant avec l'environnement externe ;

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- une première série de séparateurs (3) en matériel insonorisant, disposés écartés à l'intérieur du compartiment (V) du carter (1) à proximité des fissures (2) ; où les séparateurs (3) de ladite au moins une série de séparateurs (3) sont disposés en direction orthogonale par rapport à ladite au moins une paroi latérale (10, 11) du carter muni des dites fissures (2), et sont disposés en

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positions parallèles adjacentes de manière à créer un écart entre deux séparateurs (3) adjacents, ledit écart recevant l'air aspiré depuis l'extérieur à travers lesdites fissures (2),

où ladite surface interne de ladite paroi inférieure (13) et de ladite au moins une paroi latérale (10, 11) du compartiment est revêtue au moyen de panneaux insonorisants **caractérisé en ce que**

lesdits panneaux insonorisants ont une épaisseur majeure ou égale à 6 cm ; et le groupe électrogène (200) comprend également :

- une seconde série de séparateurs (3) en matériel insonorisant, qui sont disposés à l'intérieur du compartiment (V) du carter, en position proximale arriérée par rapport à la première série de séparateurs (3) selon une direction d'avancement de l'air qui est transporté à l'intérieur du compartiment (V) du carter,

ladite seconde série de séparateurs (3) étant orthogonale par rapport à ladite au moins une paroi latérale (10, 11) du carter muni des dites fissures (2) et ladite seconde série de séparateurs (3) étant déphasée par rapport à ladite première série de séparateurs (3).

2. Groupe électrogène (200) selon la revendication 1, où les séparateurs (3) de ladite seconde série de séparateurs (3) sont disposés sur des plans qui passent dans des écarts réalisés entre les séparateurs (3) de la première série de séparateurs (3).

3. Groupe électrogène (200) selon la revendication 1 ou 2, où la distance (d) entre deux séparateurs (3) adjacents de ladite au moins une série de séparateurs (3) est comprise entre 1 cm et 15 cm.

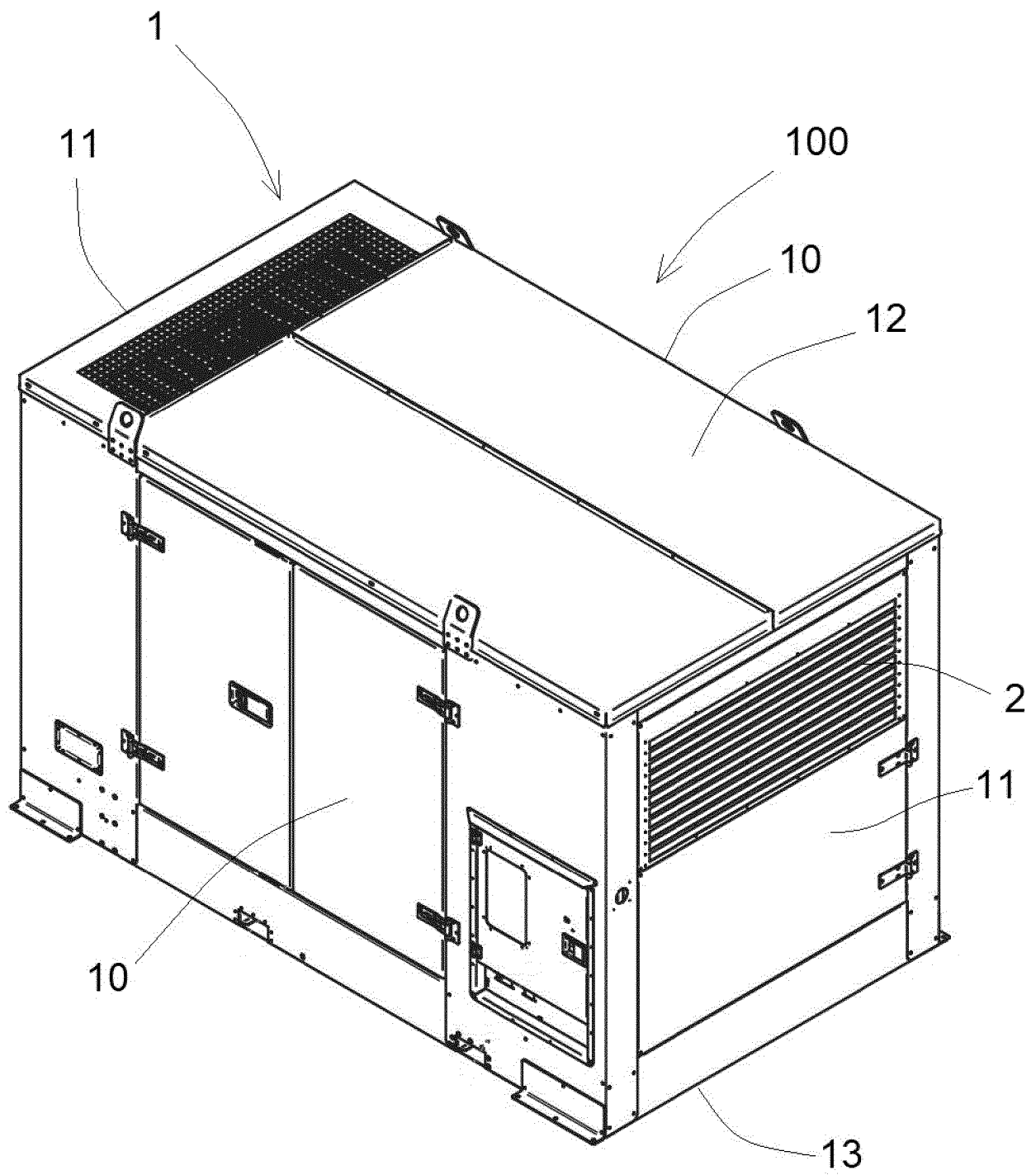


FIG. 1

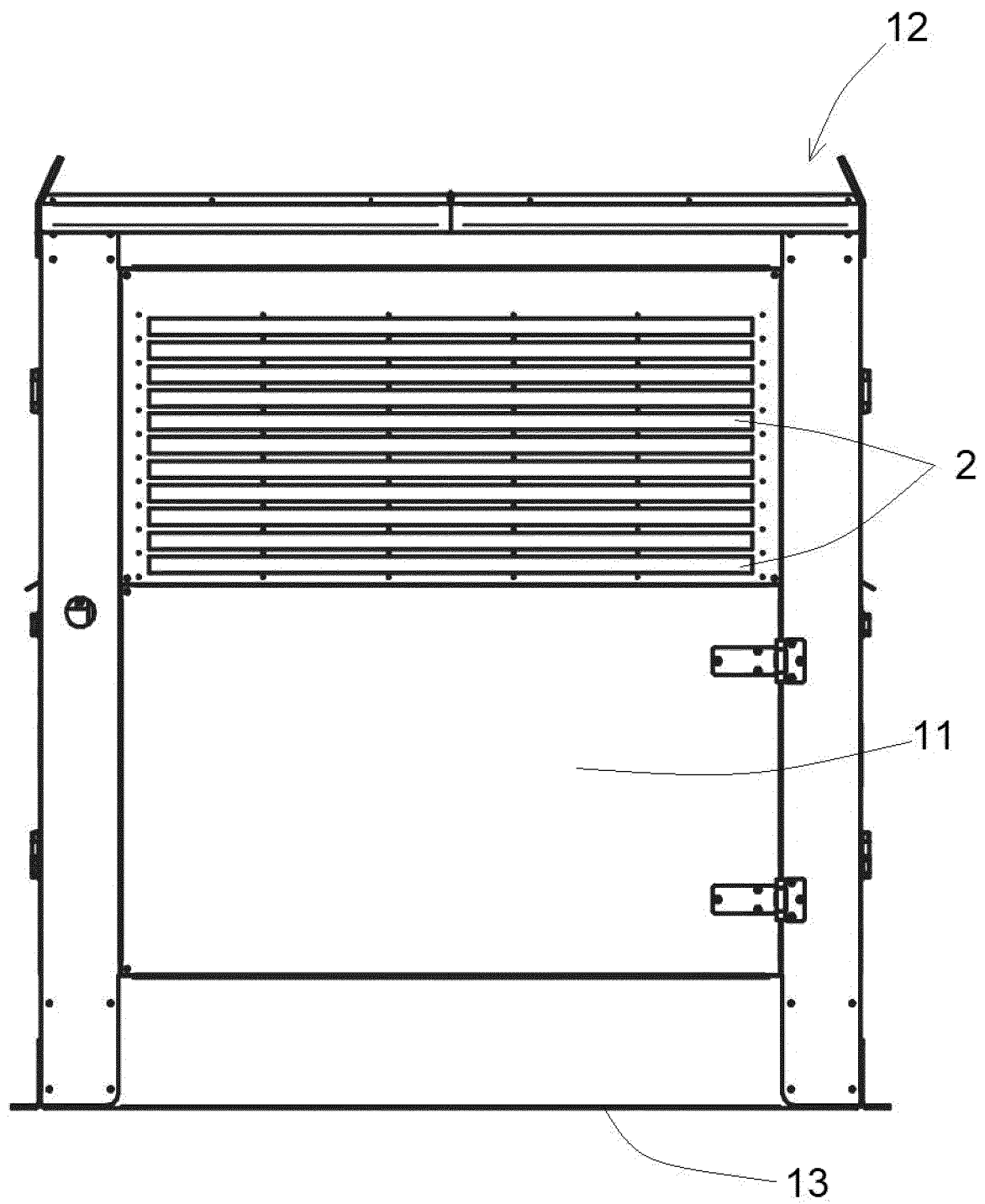


FIG. 2

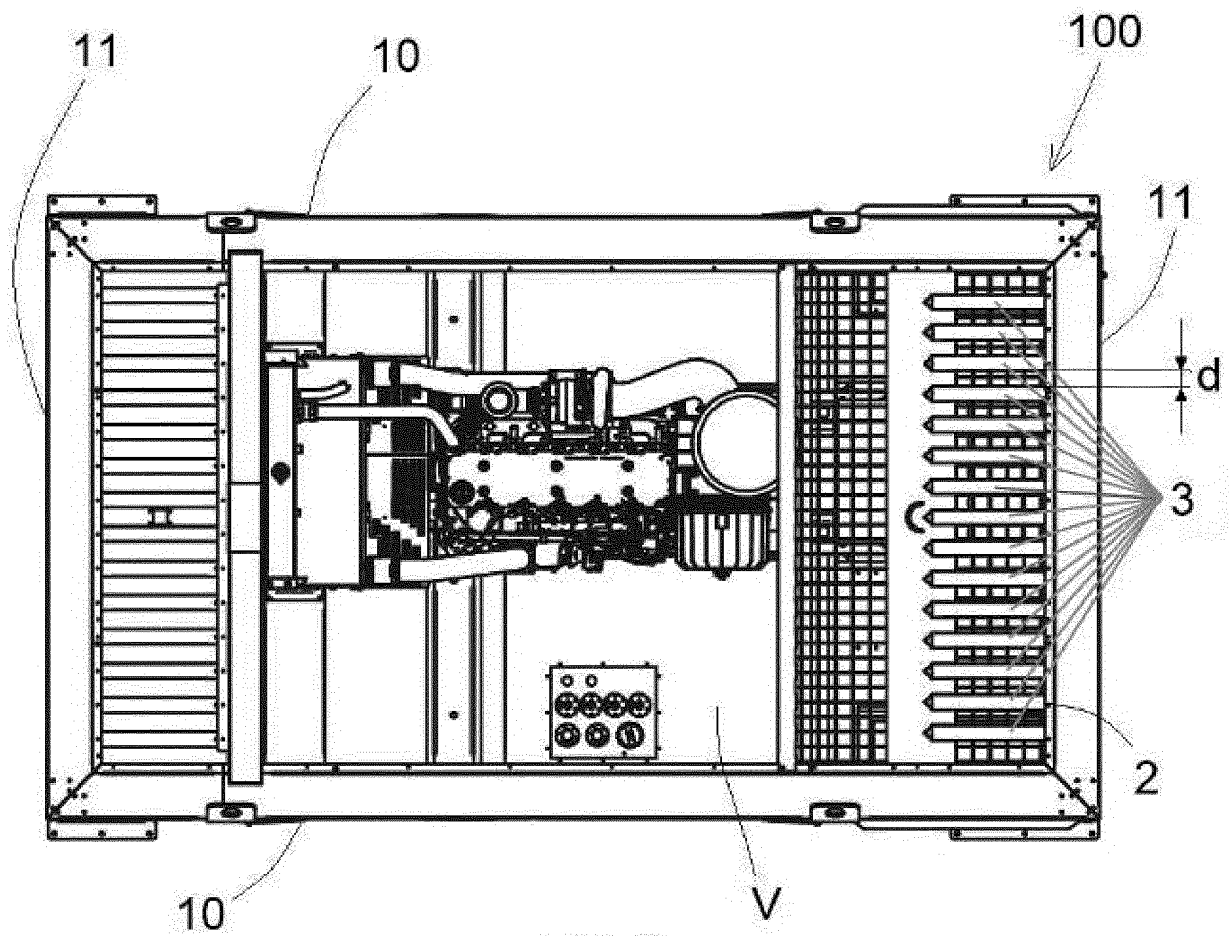


FIG. 3

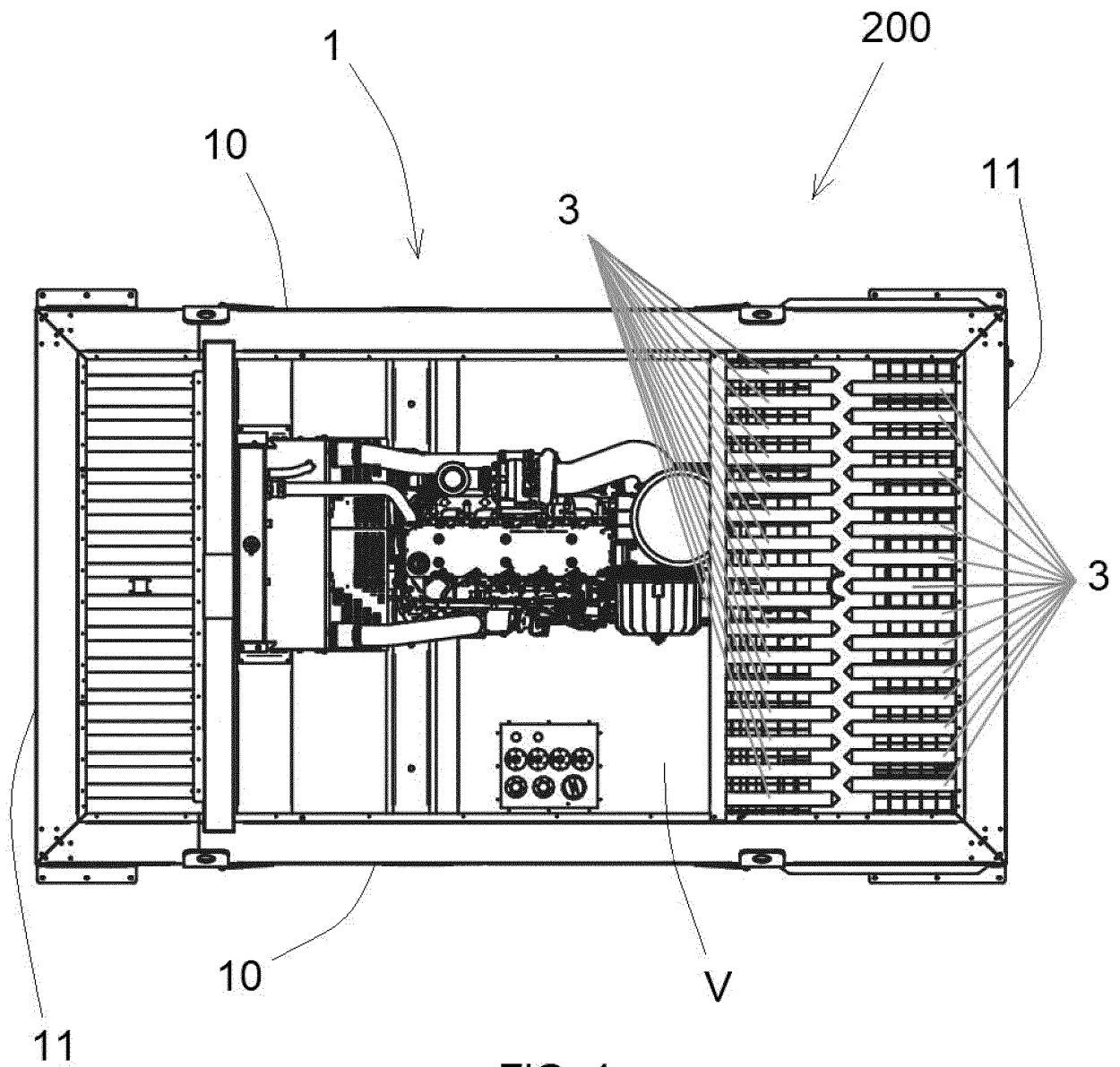


FIG. 4

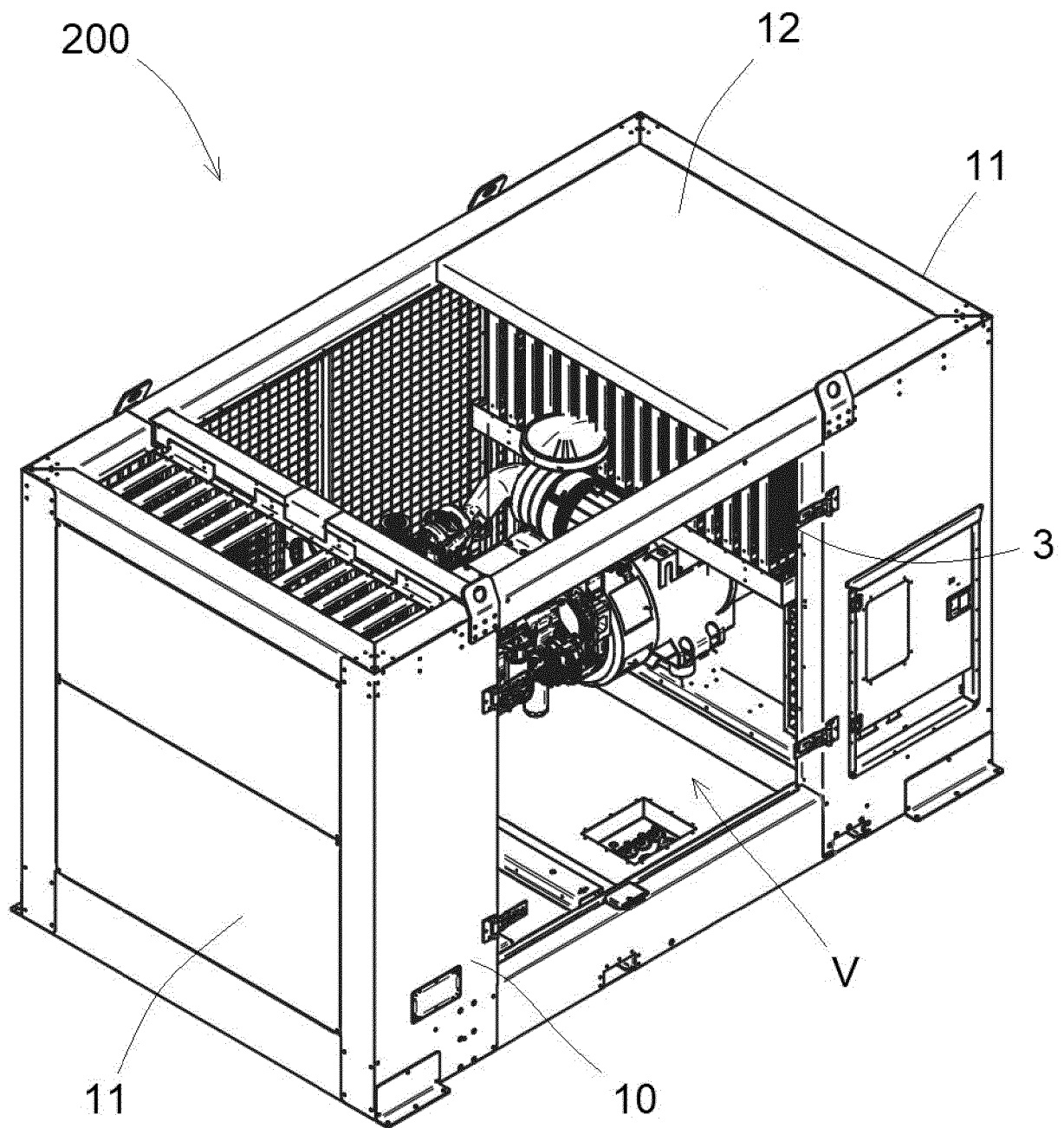


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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