(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 912 284 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
21.06.2017 Bulletin 2017/25

(21) Application number: **13783882.7**

(22) Date of filing: **21.10.2013**

(51) Int Cl.:
F01D 25/30 *(2006.01)*

(86) International application number:
PCT/EP2013/071927

(87) International publication number:
WO 2014/064031 (01.05.2014 Gazette 2014/18)

(54) EXHAUST GAS COLLECTOR AND GAS TURBINE

ABGASKOLLEKTOR UND GASTURBINE

COLLECTEUR DE GAZ D'ÉCHAPPEMENT ET TURBINE À GAZ

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **22.10.2012 IT FI20120221**

(43) Date of publication of application:
02.09.2015 Bulletin 2015/36

(73) Proprietor: **Nuovo Pignone S.r.l.**
50127 Florence (IT)

(72) Inventors:
- **TOZZI, Benedetto**
  I-50127 Florence (IT)
- **MEI, Luciano**
  I-50127 Florence (IT)
- **LANDI, Giacomo**
  N-1338 Sandvika (NO)

(74) Representative: **Illingworth-Law, William Illingworth**
GPO Europe
GE International Inc.
The Ark
201 Talgarth Road
Hammersmith
London W6 8BJ (GB)

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Description

FIELD OF THE INVENTION

[0001] Embodiments of the present disclosure generally relate to gas turbine engines and more particularly to exhaust gas collectors or plenums.

DESCRIPTION OF THE RELATED ART

[0002] GB 809 811 A discloses a turbine which drives through a power shaft a reduction gear unit with a casing connection to a tail-pipe portion.

[0003] Gas turbine engines are widely used as prime movers in mechanical drive applications as well as in power generation. Often, aeroderivative gas turbines are used for these purposes. In mechanical drive applications the gas turbine engine drives one or more turbomachines, e.g. a compressor or a compressor train. In power generation applications the gas turbine engine is used to drive an electric generator connected to an electric distribution grid.

[0004] The gas turbine engine combusts a fuel to generate hot combustion gases, which flow through a power turbine to drive a load, e.g., an electrical generator or a compressor. At high velocities and temperatures, an exhaust gas exits the turbine and enters an exhaust gas diffuser and an exhaust gas collector arranged downstream the exhaust gas diffuser.

[0005] The exhaust gas collector is usually mounted on and supported by the diffuser. Vibrations of the exhaust gas collector are thus transmitted to the diffuser and to the gas turbine engine bearings.

[0006] The exhaust gas collector forms a plenum with an exhaust aperture in fluid communication with an exhaust stack. The exhaust aperture can be oriented vertically upwardly or sideways, depending upon design constraints imposed upon the gas turbine arrangement. The exhaust collector must therefore be designed or adapted each time to the specific orientation of the exhaust aperture.

[0007] Figs 1 and 2 illustrate a gas turbine engine and an exhaust diffuser-collector arrangement according to the current art. In Fig. 1, a diagram of a gas turbine engine power plant 10 is illustrated. A gas turbine engine 12, for example an aeroderivative gas turbine engine, is coupled to an exhaust diffuser-collector assembly 14. An electrical generator 16 is coupled to the gas turbine engine 12 through a linkage 18. The gas turbine engine 12, the exhaust diffuser-collector assembly 14, and the electrical generator 16 may be securely attached to a skid or base plate 20. Clean air for combustion is supplied by an air intake and filtration system 22. The air is compressed in a compressor section of the gas turbine engine 12 and mixed with a liquid fuel or gas fuel, such as natural gas. The fuel-air mixture is then combusted in a combustion chamber of the gas turbine engine 12. Hot pressurized combustion gas resulting from the combustion of the fuel-air mixture then passes through a plurality of turbine stages in the gas turbine engine 12. The hot pressurized combustion gas will cause the turbine to rotate, driving the load 16 through the linkage 18.

[0008] The exhaust diffuser-collector assembly 14 captures and routes the hot exhaust gas for further use, for example by a heat recovery system, or directs the exhaust gas towards an exhaust stack 23.

[0009] Fig. 2 illustrates a sectional view of an embodiment of an exhaust diffuser-collector assembly 14 according to the current art. The exhaust diffuser-collector assembly 14 includes an axial exhaust diffuser 24 coupled to a radial exhaust collector 26. The axial exhaust diffuser 24 includes features to at least partially deflect the exhaust gas flow from an axial direction toward a radial direction to enable use of the axial exhaust diffuser 24 with the radial exhaust collector 26. The illustrated axial exhaust diffuser 24 has an annular wall 25, which gradually increases in diameter in a flow direction of exhaust flow from the gas turbine engine 12 toward the radial exhaust collector 26. The smaller diameter end of the axial exhaust diffuser 24 is coupled to the gas turbine engine 12 (only partly shown in Fig.2). The axial exhaust diffuser 24 diffuses an axial flow of the exhaust gas flowing from the gas turbine engine 12. The radial exhaust collector 26 is attached to the axial exhaust diffuser 24, e.g. by means of a coupling disk 28, by circumferentially bolting the coupling disk 28 to a retaining flange included in a wall 30 of the radial exhaust collector 26. The flange and bolt attachment embodiments enable the axial exhaust diffuser 24 and the radial exhaust collector 26 to remain securely adjoined during the operation of the gas turbine engine 12, while also allowing for maintenance and disassembly during periods of engine inactivity. The radial exhaust collector is sometimes overhung on the axial exhaust diffuser. In other known embodiments, rear legs are provided to support the weight, in combination with a connection to the gas turbine diffuser.

[0010] The radial exhaust collector 26 has an inner exhaust plenum or collector chamber with a vertically upwardly oriented aperture 42 provided in a top wall of the exhaust plenum.

SUMMARY OF THE INVENTION

[0011] The present invention is defined in in claim 1. According to some embodiments, an exhaust collector for gas turbines is provided, comprising: a plenum with a gas inlet wall, a gas inlet aperture in the gas inlet wall, and a gas discharge aperture; a plurality of first connectors arranged around the gas inlet aperture; a plurality of second connectors, arranged around the gas inlet aperture, generally opposite the plurality of first connectors. The plurality of first connectors and the plurality of second connectors are paired, i.e. each first connector is arranged opposite a corresponding second connector and vice versa. This arrangement allows pairs of one first connector and one second connector to be selectively used for connecting the exhaust collector to an exhaust diffuser of a gas turbine in a selected one of a plurality of alternative angular positions. The same exhaust collector can thus be arranged in different angular positions with respect to the gas turbine. The orientation of the exhaust gas discharge aperture can thus be selected depending upon layout requirements. Moreover, the angular position of the exhaust collector can be changed during transportation of the gas turbine module, to reduce the overall dimension and the footprint of the module.

[0012] According to some embodiments, the connectors are arranged so as to limit the mechanical stresses applied by the exhaust collector to the exhaust diffuser of the gas turbine. Specifically, the load of the exhaust collector can be discharged directly onto the gas turbine skid, while only a limited reaction force is required between the exhaust collector and the exhaust diffuser of the gas turbine, to support the exhaust collector in the correct overhung position.

[0013] According to some embodiments, the first connectors are positioned along an arc of a circumference. The second connectors can also be positioned along a respective arc of a circumference. The distance between the first connector and the second connector of each pair is constant, so that the exhaust collector can be selectively connected to the same exhaust diffuser of the gas turbine in any one of a plurality of alternative angular positions.

[0014] In some embodiments the first connectors are arranged at a first distance from a center of the gas inlet aperture, and the second connectors are arranged at a second distance from the center of the gas inlet aperture of the exhaust collector. The second distance can be greater than first distance.

[0015] The exhaust collector can be comprised of a ring constrained to the gas inlet wall and surrounding the gas inlet aperture. The first connectors can be arranged along said ring. According to some embodiments, the exhaust collector can further comprise a frame constrained to the gas inlet wall, distanced from the gas inlet aperture and opposite the gas discharge aperture. The second connectors can be arranged along said frame. The frame can have a trough or box shape, e.g. extending along an arc of a circumference.

[0016] In some embodiments, the plenum comprises a front wall opposite the gas inlet wall. The front wall and the gas inlet wall can be inclined one with respect to the other. The box-shaped or trough-shaped frame can have a variable transverse dimension so as to form a planar surface substantially parallel to the front wall.

[0017] According to a further aspect, there is provided a gas turbine comprising a base plate, an exhaust diffuser constrained to the base plate, and an exhaust collector as described above. The exhaust collector is connected to the gas turbine by means of a selected one of the first connectors constrained to the exhaust diffuser and a selected one of the second connectors constrained to the base plate. A major part of the weight of the exhaust collector is thereby supported by said base plate through the second connector. Preferably substantially the entire weight of the exhaust collector is supported by the base plate through the second connector.

[0018] Features and embodiments are disclosed here below and are further set forth in the appended claims, which form an integral part of the present description. The above brief description sets forth features of the various embodiments of the present invention in order that the detailed description that follows may be better understood and in order that the present contributions to the art may be better appreciated. There are, of course, other features of the invention that will be described hereinafter and which will be set forth in the appended claims. In this respect, before explaining several embodiments of the invention in details, it is understood that the various embodiments of the invention are not limited in their application to the details of the construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[0019] As such, those skilled in the art will appreciate that the conception, upon which the disclosure is based, may readily be utilized as a basis for designing other structures, methods, and/or systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] A more complete appreciation of the disclosed embodiments of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 illustrates a side view of a power generator plant with a gas turbine engine of the current art;

Fig.2 illustrates a section of an exhaust diffuser-collector assembly of the current art;

Fig.3 illustrates a side schematic view of a power generator plant with a gas turbine engine according to one embodiment of the present disclosure;

Fig.4 illustrates an enlarged side view and partial section of the exhaust diffuser-collector assembly of the system of Fig.3;

Fig.5 illustrates an enlargement of Fig.4;

Fig.6 illustrates a detail of the connection of the exhaust collector to the gas turbine base plate;

Fig.7 illustrates an enlargement of detail VII in Figs 8 and 9, of the connection between the exhaust collector and the exhaust diffuser; and

Figs. 8 and 9 illustrate perspective views of alternative positions of the exhaust collector on the gas turbine base plate.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0021] The following detailed description of the exemplary embodiments refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. Additionally, the drawings are not necessarily drawn to scale. Also, the following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims.

[0022] Reference throughout the specification to "one embodiment" or "an embodiment" or "some embodiments" means that the particular feature, structure or characteristic described in connection with an embodiment is included in at least one embodiment of the subject matter disclosed. Thus, the appearance of the phrase "in one embodiment" or "in an embodiment" or "in some embodiments" in various places throughout the specification is not necessarily referring to the same embodiment(s). Further, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0023] In Fig.3, a diagram of a gas turbine engine power plant 110 for the production of electric power is illustrated. This system is provided just as an exemplary embodiment of a possible application of the subject matter disclosed herein. The features of an exhaust collector as described herein and the advantages thereof can be exploited in different gas turbine systems, e.g. for mechanical drive applications, where the gas turbine engine is used to drive a load such as a turbomachine, e.g. a compressor or a compressor train.

[0024] Turning now again to the exemplary embodiment of Fig.3, a gas turbine engine, briefly also indicated as gas turbine 112, for example an aeroderivative gas turbine engine, is coupled to an exhaust diffuser-collector assembly 114. An electrical generator 116 is coupled to the gas turbine engine 112 through a linkage 118. The gas turbine engine 112, exhaust diffuser-collector assembly 114, and electrical generator 116 may be securely attached to a skid or base plate 120. Clean air for combustion is supplied by an air intake and filtration system 122. The air is compressed in a compressor section of the gas turbine engine 112 and mixed with a liquid fuel or gas fuel, such as natural gas. The fuel-air mixture is then combusted in a combustion chamber of the gas turbine engine 112. Hot pressurized combustion gas resulting from the combustion of the fuel-air mixture then passes through a plurality of turbine stages in the gas turbine engine 112. The hot pressurized combustion gas will cause the turbine to rotate, driving the load 116 through the linkage 118.

[0025] The exhaust diffuser-collector assembly 114 captures and routes the hot exhaust gas for further use, for example by a heat recovery system, or directs the exhaust gas towards an exhaust stack 123.

[0026] The features of the exhaust diffuser-collector arrangement 114 will now be described in greater detail reference being made to Figs. 4-9.

[0027] In Fig.4 only the last portion of the gas turbine engine 112 is depicted, namely the power turbine. The exhaust diffuser-collector assembly 114 is arranged downstream the gas turbine engine 112. The exhaust diffuser-collector assembly 114 may comprise an axial exhaust diffuser 124 coupled to a radial exhaust collector 126. The axial exhaust diffuser 124 includes features to at least partially deflect the exhaust gas flow from an axial direction toward a radial direction to enable use of the axial exhaust diffuser 124 with the radial exhaust collector 126. These features will not be described in detail herein, since they are well known to those of ordinary skill in the art.

[0028] The illustrated axial exhaust diffuser 124 has an annular wall 125, which gradually increases in diameter in a flow direction F of exhaust flow from the gas turbine engine 112 toward the radial exhaust collector 126. The smaller diameter end of the axial exhaust diffuser 124 is coupled to the gas turbine engine 112 (only partly shown in Fig.4). The axial exhaust diffuser 124 diffuses an axial flow of the exhaust gas flowing from the gas turbine engine 112. The radial exhaust collector 126 is attached to the gas turbine baseplate 120 and to the axial exhaust diffuser 124 as will be described in greater detail here below.

[0029] The axial exhaust diffuser 124 can be constrained to the gas turbine skid or base plate 120 by means of a pair of brackets 128. The axial exhaust diffuser 124 can be hinged at said two brackets 128 about a transverse horizontal axis B-B (Figs. 8 and 9). A gib 130 can further be provided, wherein the exhaust diffuser is freely slidably arranged. The gib 130 provides a transversal reaction force in case of rotor unbalancing.

[0030] The exhaust diffuser 124 may comprise a terminal annular flange or ring 127 arranged at the larger diameter end, facing the exhaust collector 126. The annular flange 127 substantially surrounds the exhaust diffuser outlet. In the uppermost position of the annular flange 127 a first connector member 129 is constrained to the exhaust diffuser 124. One exemplary embodiment of the first connector member 129 is illustrated in detail in Fig.7. The first connector member 129 can comprise a plate 131 screwed to the annular flange 127 by means of a plurality of screws 133. A shim 134 can be provided between the plate 131 and the annular flange 127. The plate 131 can be rigidly constrained to or monolithically formed with an appendage 137 projecting in a substantially radial direction from the annular flange 127. The appendage 137 forms part of a first connection arrangement for connecting the exhaust collector 126 to the exhaust diffuser 124 as will be described in greater detail later on.

[0031] The exhaust collector 126 comprises a gas inlet wall 135 and an opposite front wall 138, opposite said gas inlet wall 135. The gas inlet 135 wall is oriented towards the exhaust diffuser 124 and is provided with a gas inlet aperture 139. A collector chamber or collector plenum 141 can be provided in the exhaust collector 126. The collector chamber 141 can be bounded by the gas inlet wall 135, by the front wall 138 and by a side wall 143 (Figs 8 and 9). The side wall 143 can be opened at 143A forming a gas discharge aperture 143A. In the exemplary embodiment the gas discharge aperture 143A is rectangular.

[0032] In some embodiments, the gas inlet wall 135 and the front wall 138 of the exhaust collector are non-parallel. The gas inlet wall 135 and the front wall 138 can be inclined one with respect to the other in a converging-diverging arrangement, so that the collector chamber 141 has a dimension, in the axial direction of the gas turbine, which decreases from the gas discharge aperture 143A towards the end of the collector chamber 141 opposite said gas discharge aperture 143A.

[0033] The inner volume of the collector chamber 141 can be annular. In the collector chamber 141 a central wall 145 can be arranged. In some embodiments, the central wall has the shape of a solid of revolution. In the embodiment shown in the drawings the central wall 145 has a frustum-conical shaped portion 145A and is connected at the large-diameter end of said frustum-conical portion to the front wall 138 by a rounded wall portion 145B. The central wall 145 extends through the inlet gas aperture 139, substantially coaxially to the rotation axis A-A of the gas turbine engine 112.

[0034] An advantageously substantially cylindrical sleeve 147 can be introduced in the gas inlet aperture 139 and rigidly constrained to the gas inlet wall 135. The sleeve 147 is substantially coaxial with the central wall 145 so that an annular gas inlet passage is thus formed between the central or inner wall 145 and the sleeve 147, said annular gas inlet passage placing in fluid communication the interior of the exhaust diffuser 124 with the collector chamber 141.

[0035] Along the end of the sleeve 147 facing the gas turbine engine 112 an inner flange 149 is provided. Along the inner flange 149 a plurality of pairs of holes 151 are arranged. In some embodiments three pairs of holes 151 can be arranged, spaced from one another by approx. 45°. As will be explained in greater detail below, one of said hole pairs can be selected for attaching the exhaust collector to the gas turbine engine in a selected angular position.

[0036] Each pair of holes 151 can be used for anchoring the exhaust collector 126 to the exhaust diffuser 124 by means of the appendage 137. As shown in the enlargement of Fig.7, connection between the exhaust collector 126 and the appendage 137 is made by a fork-shaped component 153, which can be screwed to the inner flange 149 by means of two screws 155 engaging the selected pair of holes 151.The fork-shaped component 153 is arranged so that the two prongs thereof are located on the two sides of the appendage 137. A fixing plate 157 is screwed to the opposed prongs of the fork-shaped component 153 to form a closed frame surrounding the appendage 137. The fork-shaped component 153 along with the appendage 137 form the first connection member for connecting the exhaust collector 126 to the exhaust diffuser 124.

[0037] The pairs of holes 151 are arranged along a circumference at a constant distance from the axis of the sleeve 147 and therefore from the axis of the annular gas inlet passage formed by the coaxially arranged sleeve 147 and central wall 145. The exhaust collector 126 can therefore be latched on to the appendage 137 in any one of the plurality of angular positions defined by the pairs of holes 151, in each position the exhaust collector 126 being substantially coaxial with the exhaust diffuser 124.

[0038] The pairs of holes 151 thus form a plurality of first connectors for connecting the exhaust collector 126 to the gas turbine engine 112 and more specifically to the exhaust diffuser 124 thereof.

[0039] The exhaust collector 126 can be further provided with a plurality of second connectors, arranged for connecting the exhaust collector 126 to the base plate or skid 120 of the gas turbine engine 112. In some embodiments said plurality of second connectors can be arranged along a circumference centered on the axis of the gas turbine engine 112 and on the axis of the annular gas inlet passage between the sleeve 147 and the central wall 145. As shown e.g. in Figs. 8 and 9, a frame 161 is attached to the outer surface of the gas inlet wall 135. The frame can have a semi-circular shape and be centered on the axis A-A of the gas turbine engine 112 when the exhaust collector 126 is mounted on the exhaust diffuser 124. In other embodiments, the frame 161 can extend around less than a semi-circumference, e.g. by 90°. In general the frame 161 is positioned opposite the pairs of holes 151 with respect to the axis A-A of the gas turbine engine 112.

[0040] Along the frame 161 a plurality of second connectors is provided, the number of said second connectors being equal to the number of said first connectors. Thus, for each pair of holes 151 a second connector on the frame 161 is provided. Each second connector can comprise a hole 163 in the frame 161. The angular pitch between the holes 161 is the same as the angular pitch between the pairs of holes 151. Pairs of first and second connectors are therefore formed. Each first connector 151 corresponds to a second connector 163 and the distance between paired first and second connectors 151, 163 is constant.

[0041] Each second connector can co-act with a second connection member 171 provided for connecting the exhaust collector 126 to the gas turbine engine 112 and to the exhaust diffuser 124. The second connection member 171 is constrained to the base plate or skid 120 of the gas turbine engine 112.

[0042] The second connection member 171 can comprise a substantially horizontally extending pin 173, which can be introduced selectively into one or the other of said holes 161 forming the second connectors on the exhaust collector side. The pin-hole arrangement thus obtained forms a constraint between the exhaust collector 126 and the skid or base plate 120, which is capable of supporting vertical loads. In addition to the mechanical connection provided by the pin-hole connection described above, the second connection member 171 can further comprise a plate 175 with through holes, for screwing the plate 175 to a counter-plate 177 arranged inside the frame 161. This screw connection provides for additional stability of the link between the skid or base plate 120 and the exhaust collector 126.

[0043] The frame 161 can be box-shaped. In some embodiments, the frame 161 can have a rectangular or U-shaped cross section, as shown in particular in Fig. 5. The counter-plate 177 arranged in the frame 161 can be housed in the empty space formed by the box-shaped structure of the frame. The counter-plate 177 can be fixed and extend along the entire extension of the frame 161. It can be provided with threaded holes, e.g. four threaded holes, for screws 179.

[0044] When the gas inlet wall 135 is inclined (non-orthogonal) with respect to the axis of the gas turbine engine 112, as in the exemplary embodiment shown in the drawings, the box-shaped frame 161 has preferably a shape such that the surface 161A of the frame 161 where the holes 163 are provided is orthogonal to the gas turbine axis A-A when the exhaust collector is in the assembled condition.

[0045] The plurality of first and second connectors 151, 163 provided around the annular gas inlet passage of the exhaust collector allow the exhaust collector to be connected to the base plate or skid 120 and to the exhaust diffuser 124 in one of several angular positions. Two such angular positions are shown in Figs. 8 and 9. In Fig.8 the exhaust collector 126 is mounted such that the gas discharge aperture 143A is oriented vertically upwardly. In Fig. 9 the exhaust collector 126 is mounted with the gas discharge aperture 143A oriented sideways in a horizontal direction. The two positions are thus angularly shifted by 90°. Either one or the other of said two positions can be selected, depending upon the location of the exhaust stack 123, for instance. If the exhaust stack 123 is arranged above the gas turbine engine 112, the configuration of Fig. 8 is chosen. If the exhaust stack is arranged sideways of the gas turbine engine, the configuration of Fig.9 would be preferred. Further angular positions are possible. For example a further position, where the gas discharge aperture 143A is oriented horizontally but opposite to the position of Fig.9, can be obtained by rotating the exhaust collector by 180° with respect to the arrangement of Fig.9, e.g. if the exhaust stack is arranged on the opposite side of the gas turbine engine 112.

[0046] In some embodiments, the exhaust collector can have a first smaller transverse dimension and a second, larger transverse dimension. In Fig.8 the exhaust collector 126 is mounted with the smaller transverse dimension oriented horizontally, while in Fig.9 the horizontal dimension is the larger one. If the configuration of Fig.9 is selected, transportation of the gas turbine engine module, including the gas turbine engine 112 and the skid 120, can be made with the exhaust collector 126 in the configuration of Fig. 8 to reduce the horizontal cross dimension of the module and render transportation easier. On site the exhaust collector can be disengaged from the exhaust diffuser, rotated by 90° and re-assembled in the final configuration of Fig.9.

[0047] The arrangement and configuration of the first connectors and second connectors is such that once mounted the lower constraint, provided by the second connection member 171 on the skid or base plate 120 and the respective second connector on the exhaust collector, said lower constraint transmits both horizontal as well as vertical constraint forces. Substantially the entire weight of the exhaust collector is thus transmitted through the second connector to the skid or base plate of the gas turbine, rather than to the exhaust diffuser. Vibrations generated in the exhaust collector generate constraint stresses on the lower constraint between the exhaust collector 126 and the skid or base plate 120, and do not negatively affect the bearings or other components of the turbomachine 112. The direct link between the exhaust collector 126 and the exhaust diffuser 124, provided by the first connection member 137, 153 and the selected first connector 151 on the exhaust collector 126 is such that only horizontal forces, but no vertical loads, are transmitted directly from the exhaust collector 126 to the exhaust diffuser 124. The exhaust diffuser remains therefore broadly free of additional loads, both static as well as dynamic, generated by the exhaust collector 126. More specifically, since the exhaust collector 126 is mounted in a cantilever fashion, i.e. overhung with respect to the base plate 120, a limited horizontal constraint force is provided by the upper constraint provided by the first connection member, said horizontal constraint force generating a momentum sufficient to balance the momentum generated by the weight of the exhaust collector 126.

[0048] While the disclosed embodiments of the subject matter described herein have been shown in the drawings and fully described above with particularity and detail in connection with several exemplary embodiments, it will be apparent to those of ordinary skill in the art that many modifications, changes, and omissions are possible without materially departing from the novel teachings, the principles and concepts set forth herein, and advantages of the subject matter recited in the appended claims. Hence, the proper scope of the disclosed innovations should be determined only by the broadest interpretation of the appended claims so as to encompass all such modifications, changes, and omissions. In addition, the order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments.

Claims

1. An exhaust collector (126) for gas turbines (112), comprising: a plenum (141) with a gas inlet wall (135), a gas inlet aperture (139) in said gas inlet wall, and a gas discharge aperture (143A); a plurality of first connectors (151) arranged around said gas inlet aperture (139); a first connector member (129); a plurality of second connectors (163), arranged around said gas inlet aperture (139), generally opposite said plurality of first connectors (151); wherein said plurality of first connectors (151) and said plurality of second connectors (163) are paired; wherein pairs of one first connector and one second connector are selectively usable for mounting said exhaust collector on an exhaust diffuser (124) of a gas turbine (112) in a selected one of a plurality of alternative angular positions; **characterised in that**
said first connector member (129) is designed and configured to cooperate with the first connectors (151) to support horizontal loads but not vertical loads.

2. An exhaust collector (126) according to claim 1, wherein: said first connectors (151) are positioned along an arc of a circumference; said second connectors (163) are positioned along an arc of a circumference; the distance between the first connector and the second connector of each pair being constant.

3. An exhaust collector (126) according to claim 1 or 2, wherein said first connectors (151) are arranged at a first distance from a center of said gas inlet aperture, and said second connectors (163) are arranged at a second distance from the center of said gas inlet aperture (139).

4. An exhaust collector (126) according to claim 1, 2 or 3, comprising a ring constrained to said gas inlet wall (135) and surrounding said gas inlet aperture (139), said plurality of first connectors (151) being arranged along said ring.

5. An exhaust collector (126) according to any one of the preceding claims, comprising a frame constrained to said gas inlet wall (135), distanced from said gas inlet aperture (139) and opposite said gas discharge aperture (143A), said plurality of second connectors (163) being arranged along said frame.

6. An exhaust collector (126) according to claim 5, wherein said frame is box-shaped.

7. An exhaust collector (126) according to claim 6, wherein: said plenum (141) comprises a front wall opposite said gas inlet wall (135); said front wall and said gas inlet wall are inclined one with respect to the other; and said box-shaped frame has a variable transverse dimension forming a planar surface substantially parallel to said front wall.

8. An exhaust collector (126) according to any one of the preceding claims, wherein said second connectors (163) are designed and configured to support vertical loads.

9. An exhaust collector (126) according to any one of the preceding claims, wherein each first connector (151) comprises holes for screw-connection of a fork-shaped component.

10. An exhaust collector (126) according to any one of the preceding claims, wherein each second connector (163) comprises a hole.

11. An exhaust collector (126) according to any one of the preceding claims, wherein said first connectors (151) are distribute along an arc of at least approximately 90°, and preferably of at least approximately 180°, and said second connectors (163) are distribute along an arc of at least approximately 90°, and preferably of at least approximately 180°.

12. A gas turbine (110) comprising a base plate (120), an exhaust diffuser (124) constrained to said base plate (120), and an exhaust collector (126) according to any one of the preceding claims; wherein said exhaust collector is connected to said gas turbine by means of a selected one of said first connectors constrained to said exhaust diffuser and a selected one of said second connectors constrained to said base plate.

13. A gas turbine according to claim 12, wherein weight of said exhaust collector is substantially entirely supported by said base plate through said second connector.

14. A gas turbine according to claim 12 or 13, wherein: said exhaust diffuser (124) comprises a first connection member configured and arranged for co-action with a selected one of said first connectors; and said base plate (120) comprises a second connection member configured and arranged for co-action with a selected one of said second connectors.

Patentansprüche

1. Abgassammler (126) für Gasturbinen(112), umfassend: einen Verteilerkanal (141) mit einer Gaseingangswand (135), einer Gaseingangsöffnung (139) in der Gaseingangswand, und einer Gasabführungsöffnung (143A); eine Vielzahl erster Verbindungsglieder (151), die um diese Gaseingangsöffnung (139) herum angeordnet sind; ein erstes Verbindungselement (129); eine Vielzahl zweiter Verbindungsglieder (163), die um die Gaseingangsöffnung (139) herum angeordnet sind, im Allgemeinen gegenüberliegend den ersten Verbindungsgliedern (151);
wobei die Vielzahl erster Verbindungsglieder (151) und die Vielzahl zweiter Verbindungsglieder (163) gepaart sind; wobei Paare eines ersten Verbindungsglieds und eines zweiten Verbindungsglieds selektiv verwendet werden können, um den Abgassammler auf einem Abgasdiffusor (124) einer Gasturbine (112) in einer ausgewählten von alternativen Winkelpositionen zu montieren;
dadurch gekennzeichnet, dass
das erste Verbindungselement (129) entworfen und konfiguriert ist, um mit den ersten Verbindungsgliedern (151) zusammenzuarbeiten, um Horizontallasten zu tragen, jedoch keine Vertikallasten.

2. Abgassammler (126) nach Anspruch 1, wobei: die ersten Verbindungsglieder (151) entlang eines Bogens eines Umfangs positioniert sind; die zweiten Verbindungsglieder (163) sind entlang eines Bogens eines Umfangs positioniert; wobei der Abstand zwischen dem ersten Verbindungsglied und dem zweiten Verbindungsglied jedes Paars konstant ist.

3. Abgassammler (126) nach Anspruch 1 oder 2, wobei die ersten Verbindungsglieder (151) in einem ersten Abstand von einer Mitte der Gaseingangsöffnung angeordnet sind, und die zweiten Verbindungsglieder (163) in einem zweiten Abstand von der Mitte der Gaseingangsöffnung (139) angeordnet sind.

4. Abgassammler (126) nach Anspruch 1, 2 oder 3, umfassend einen Ring, der auf der Gaseingangswand (135) eingespannt ist und die Gaseingangsöffnung (139) umgibt, wobei die Vielzahl erster Verbindungsglieder (151) entlang dieses Rings angeordnet ist.

5. Abgassammler (126) nach einem der vorigen Ansprüche, umfassend einen Rahmen, der auf der Gaseingangswand (135) eingespannt ist und in einem Abstand von der Gaseingangsöffnung (139) und gegenüberliegend der Gasabführungsöffnung (143A) angeordnet ist, wobei die Vielzahl zweiter Verbindungsglieder (163) entlang dieses Rahmens angeordnet ist.

6. Abgassammler (126) nach Anspruch 5, wobei der Rahmen kastenförmig ist.

7. Abgassammler (126) nach Anspruch 6, wobei: der Verteilerkanal (141) eine vordere Wand umfasst, die der Gaseingangswand (135) gegenüberliegt; wobei die vordere Wand und die Gaseingangswand in Bezug aufeinander geneigt sind, und der kastenförmige Rahmen eine variable Abmessung in der Querrichtung aufweist, die eine ebene Fläche bildet, die im Wesentlichen parallel zu der vorderen Wand ist.

8. Abgassammler (126) nach einem der vorigen Ansprüche, wobei die zweiten Verbindungsglieder (163) entworfen und konfiguriert sind, um Vertikallasten zu tragen.

9. Abgassammler (126) nach einem der vorigen Ansprüche, wobei jedes erste Verbindungsglied (151) Löcher für eine Schraubverbindung einer gabelförmigen Komponente umfasst.

10. Abgassammler (126) nach einem der vorigen Ansprüche" wobei jedes zweite Verbindungsglied (163) ein Loch umfasst.

11. Abgassammler (126) nach einem der vorigen Ansprüche, wobei die ersten Verbindungsglieder (151) entlang eines Bogens von mindestens etwa 90° angeordnet sind, und bevorzugt mindestens etwa 180°, und die zweiten Verbindungsglieder (163) sind entlang eines Bogens von mindestens etwa 90° angeordnet, und bevorzugt mindestens etwa 180°.

12. Gasturbine (110), umfassend eine Bodenplatte (120), einen Abgasdiffusor (124), der auf der Bodenplatte (120) eingespannt ist, und einen Abgassammler (126) nach einem der vorigen Ansprüche, wobei der Abgassammler mit der Gasturbine mittels eines ausgewählten der ersten Verbindungsglieder an dem Diffusor eingespannt ist, und mittels eines ausgewählten der zweiten Verbindungsglieder an der Bodenplatte eingespannt ist.

13. Gasturbine nach Anspruch 12, wobei das Gewicht des Abgassammlers im Wesentlichen vollständig von der Bodenplatte durch das zweite Verbindungsglied getragen wird.

14. Gasturbine nach Anspruch 12 oder 13, wobei: der Abgasdiffusor (124) ein erstes Verbindungselement aufweist, das konfiguriert und angeordnet ist, um mit einem ausgewählten der ersten Verbindungsglieder zusammenzuwirken, und die Bodenplatte (120) umfasst ein zweites Verbindungselement, das konfiguriert und angeordnet ist, um mit einem ausgewählten der zweiten Verbindungsglieder zusammenzuwirken.

Revendications

1. Collecteur d'échappement (126) pour turbines à gaz (112), comprenant : un plénum (141) avec une paroi d'entrée de gaz (135), une ouverture d'entrée de gaz (139) dans ladite paroi d'entrée de gaz, et une ouverture de décharge de gaz (143A) ; une pluralité de premiers raccords (151) agencés autour de ladite ouverture d'entrée de gaz (139) ; un premier élément de raccord (129) ;
une pluralité de seconds raccords (163), agencés autour de ladite ouverture d'entrée de gaz (139), de manière générale en regard de ladite pluralité de premiers raccords (151) ; dans lequel ladite pluralité de premiers raccords (151) et ladite pluralité de seconds raccords (163) sont jumelées ; dans lequel des paires d'un premier raccord et d'un second raccord sont utilisables sélectivement pour monter ledit collecteur d'échappement sur un diffuseur d'échappement (124) d'une turbine à gaz (112) dans l'une sélectionnée d'une pluralité d'autres positions angulaires ;
caractérisé en ce que
le premier élément de raccord (129) est conçu et configuré pour coopérer avec les premiers raccords (151) afin de supporter des charges horizontales mais pas des charges verticales.

2. Collecteur d'échappement (126) selon la revendication 1, dans lequel : lesdits premiers raccords (151) sont positionnés le long d'un arc d'une circonférence ; lesdits seconds raccords (163) sont positionnés le long d'un arc d'une circonférence ; la distance entre le premier raccord et le second raccord de chaque paire étant constante.

3. Collecteur d'échappement (126) selon la revendication 1 ou 2, dans lequel lesdits premiers raccords (151) sont agencés à une première distance d'un centre de ladite ouverture d'entrée de gaz, et lesdits seconds raccords (163) sont agencés à une seconde distance du centre de ladite ouverture d'entrée de gaz (139).

4. Collecteur d'échappement (126) selon la revendication 1, 2 ou 3, comprenant un anneau serré sur ladite paroi d'entrée de gaz (136) et entourant ladite ouverture d'entrée de gaz (139), ladite pluralité de premiers raccords (151) étant agencée le long dudit anneau.

5. Collecteur d'échappement (126) selon l'une quelconque des revendications précédentes, comprenant un châssis serré sur ladite paroi d'entrée de gaz (135), à distance de ladite ouverture d'entrée de gaz (139) et en regard de ladite ouverture de décharge de gaz (143A), ladite pluralité de seconds raccords (163) étant agencée le long dudit châssis.

6. Collecteur d'échappement (126) selon la revendication 5, dans lequel ledit châssis est en forme de caisse.

7. Collecteur d'échappement (126) selon la revendication 6, dans lequel: ledit plénum (141) comprend une paroi frontale en regard de ladite paroi d'entrée de gaz (135) ; ladite paroi frontale et ladite paroi d'entrée de gaz sont inclinées l'une par rapport à l'autre ; et ledit châssis en forme de caisse a une dimension transversale variable formant une surface plane sensiblement parallèle à ladite paroi frontale.

8. Collecteur d'échappement (126) selon l'une quelconque des revendications précédentes, dans lequel les seconds raccords (163) sont conçus et configurés pour supporter des charges verticales.

9. Collecteur d'échappement (126) selon l'une quelconque des revendications précédentes, dans lequel chaque premier raccord (151) comprend des trous pour le raccordement par vis d'un composant en forme de fourche.

10. Collecteur d'échappement (126) selon l'une quelconque des revendications précédentes, dans lequel chaque second raccord (163) comprend un trou.

11. Collecteur d'échappement (126) selon l'une quelconque des revendications précédentes, dans lequel lesdits premiers raccords (151) sont distribués le long d'un arc d'au moins environ 90°, de préférence, d'au moins environ 180°, et lesdits seconds raccords (163) sont distribués le long d'un arc d'au moins environ 90°, de préférence, d'au moins environ 180°.

12. Turbine à gaz (110) comprenant une plaque de base (120), un diffuseur d'échappement (124) serré sur ladite plaque de base (120) et un collecteur d'échappement (126) selon l'une quelconque des revendications précédentes ; dans laquelle ledit collecteur d'échappement est raccordé à ladite turbine à gaz au moyen de l'un sélectionné desdits premiers raccords serré sur ledit diffuseur d'échappement et de l'un sélectionné desdits seconds raccords serré sur ladite plaque de base.

13. Turbine à gaz selon la revendication 12, dans laquelle le poids dudit collecteur d'échappement est supporté sensiblement en totalité par ladite plaque de base à travers ledit second raccord.

14. Turbine à gaz selon la revendication 12 ou 13, dans laquelle : ledit diffuseur d'échappement (124) comprend un premier élément de raccord configuré et agencé pour coopérer avec l'un sélectionné desdits premiers raccords ; et ladite plaque de base (120) comprend un second élément de raccord configuré et agencé pour coopérer avec l'un sélectionné desdits seconds raccords.

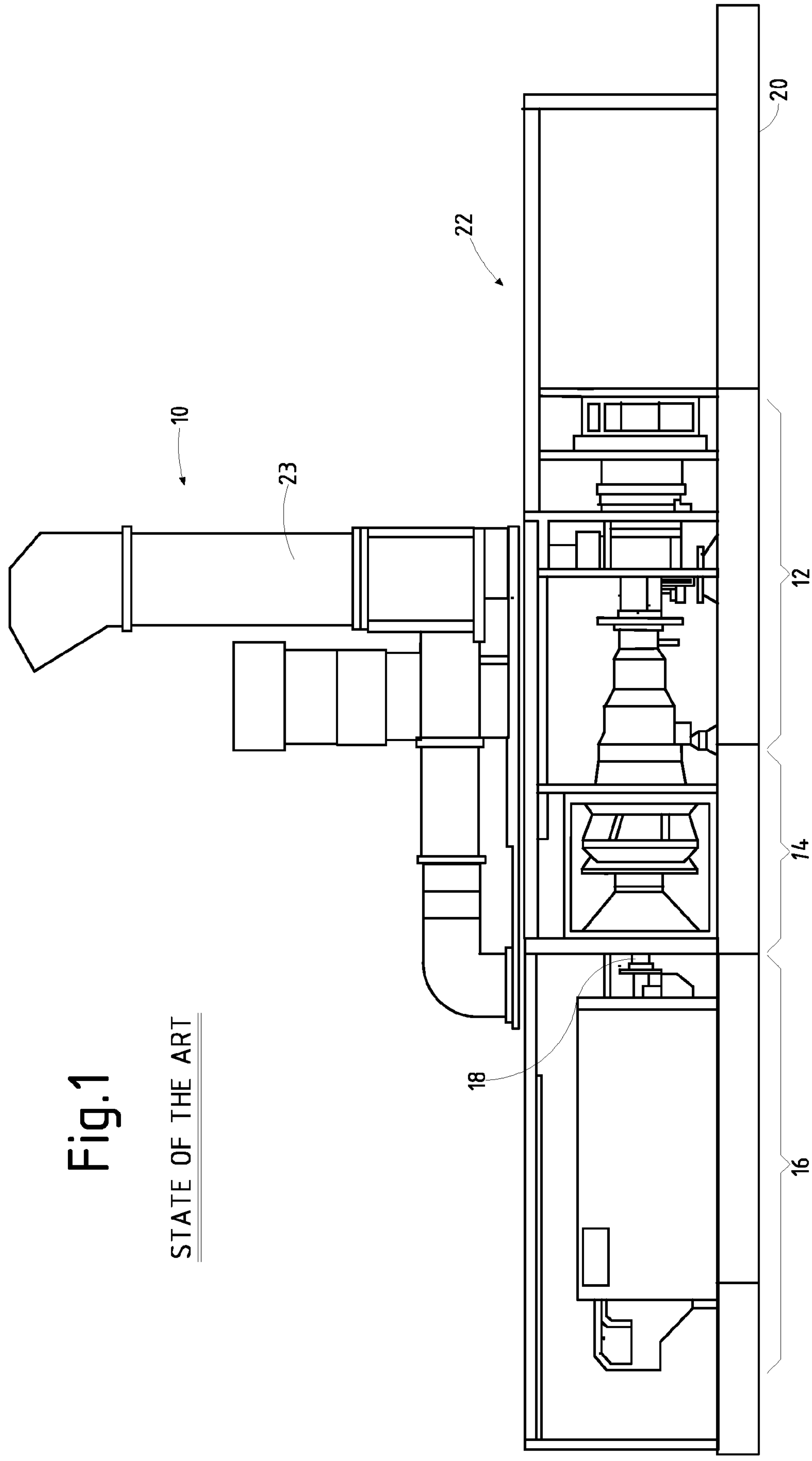


Fig.1

STATE OF THE ART

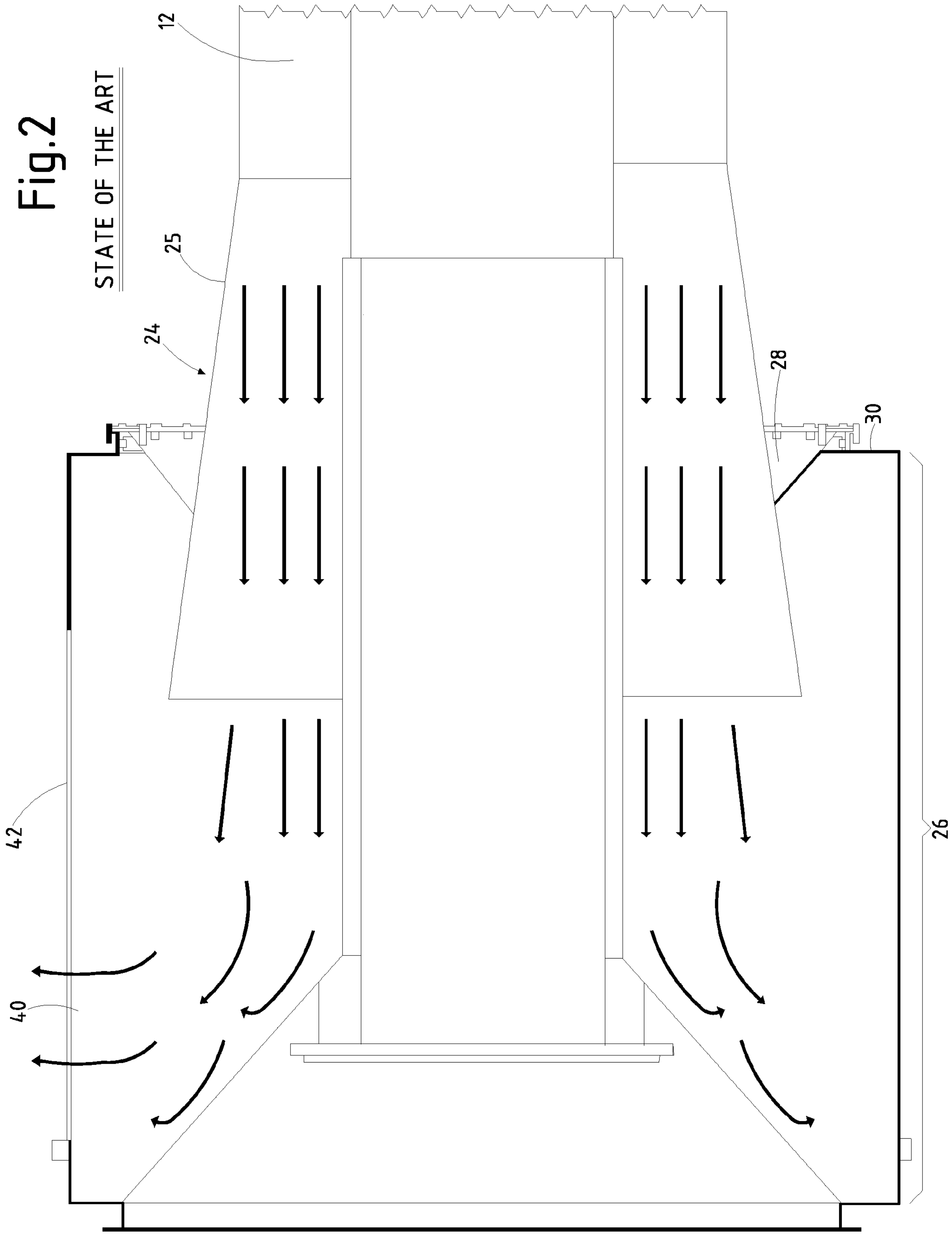


Fig.2
STATE OF THE ART

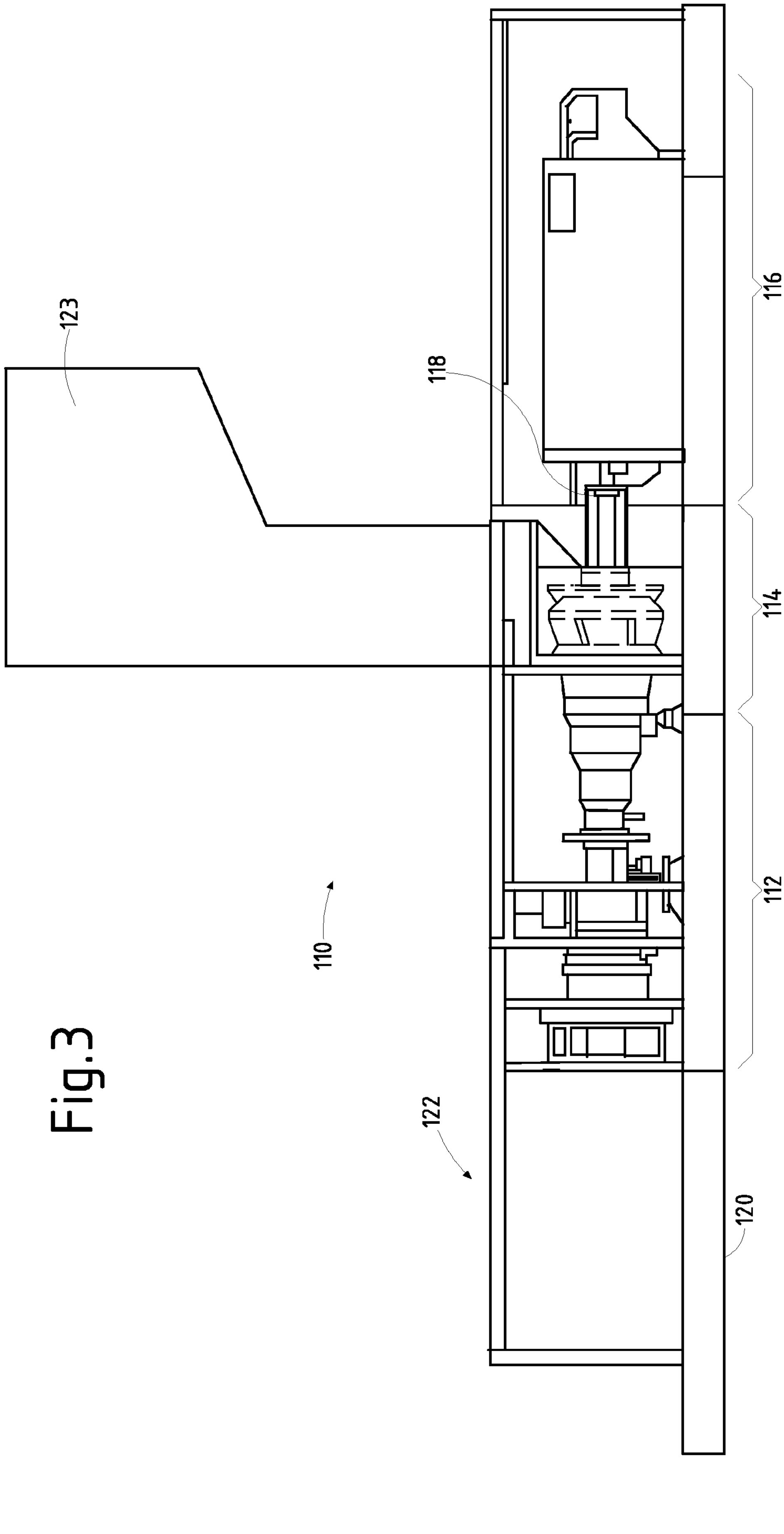
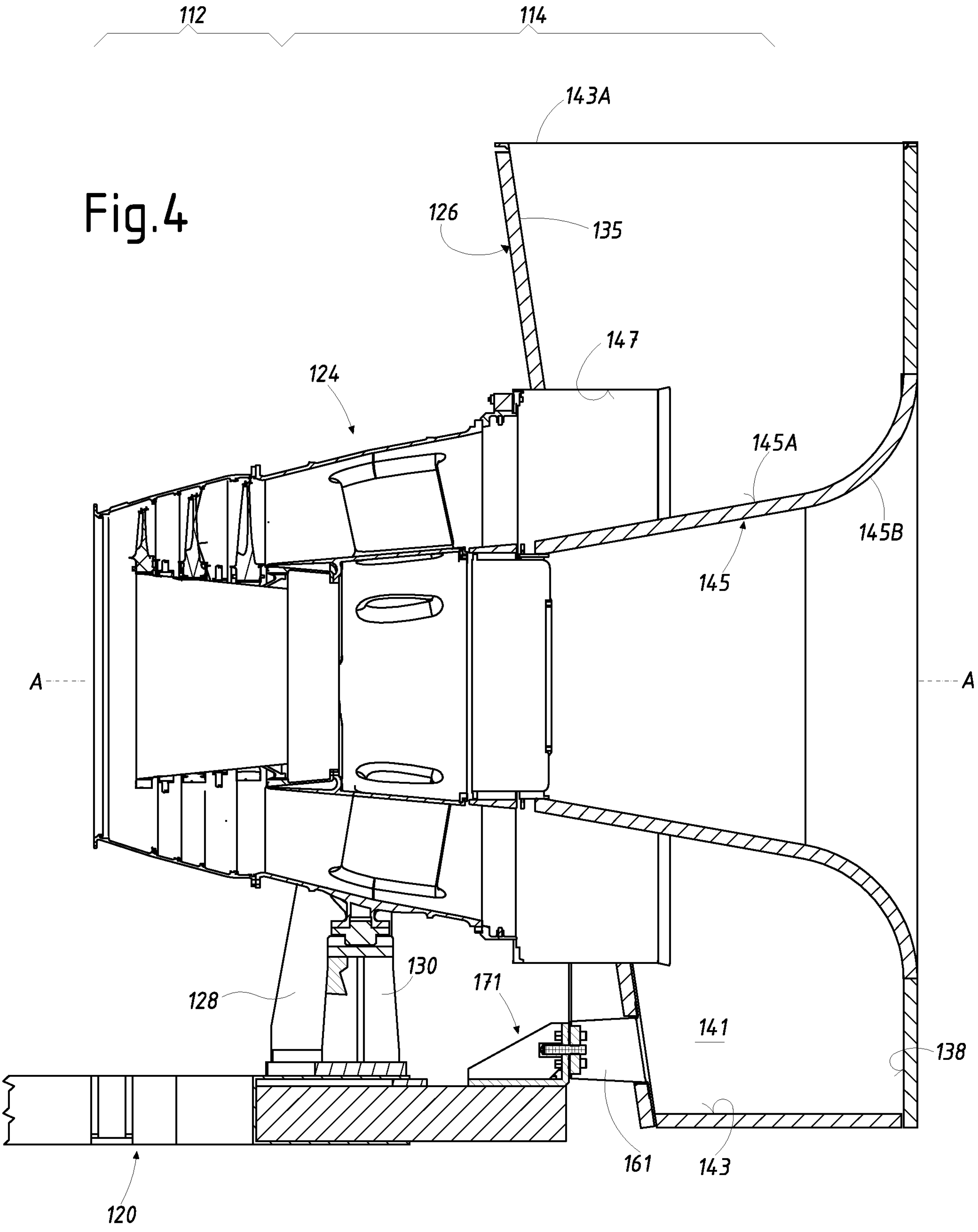


Fig.3

Fig.4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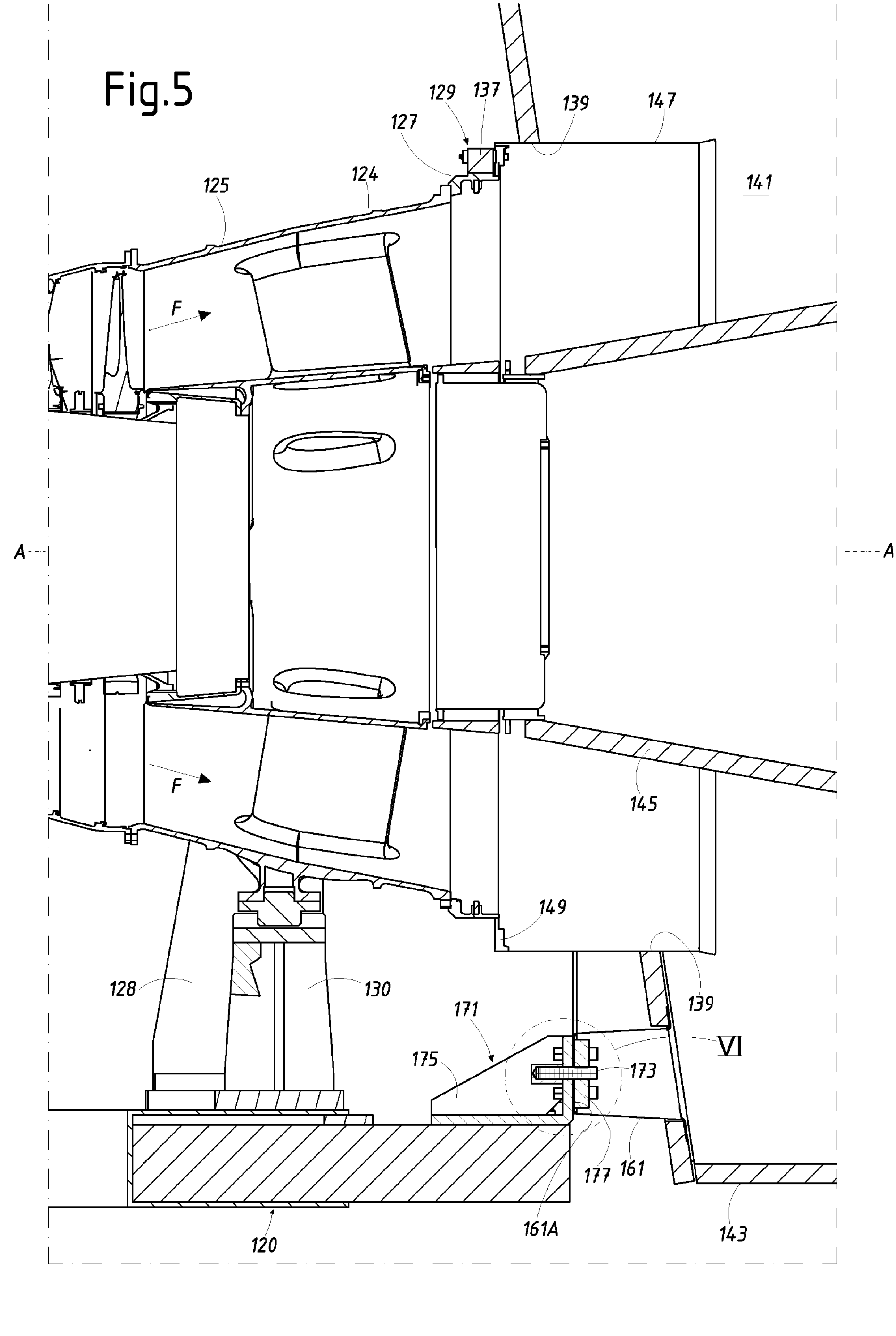
114
143A
126
135
147
124
145A
145B
145
A
A
128
130
171
141
138
161
143
120

Fig.5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F
A
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F
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139
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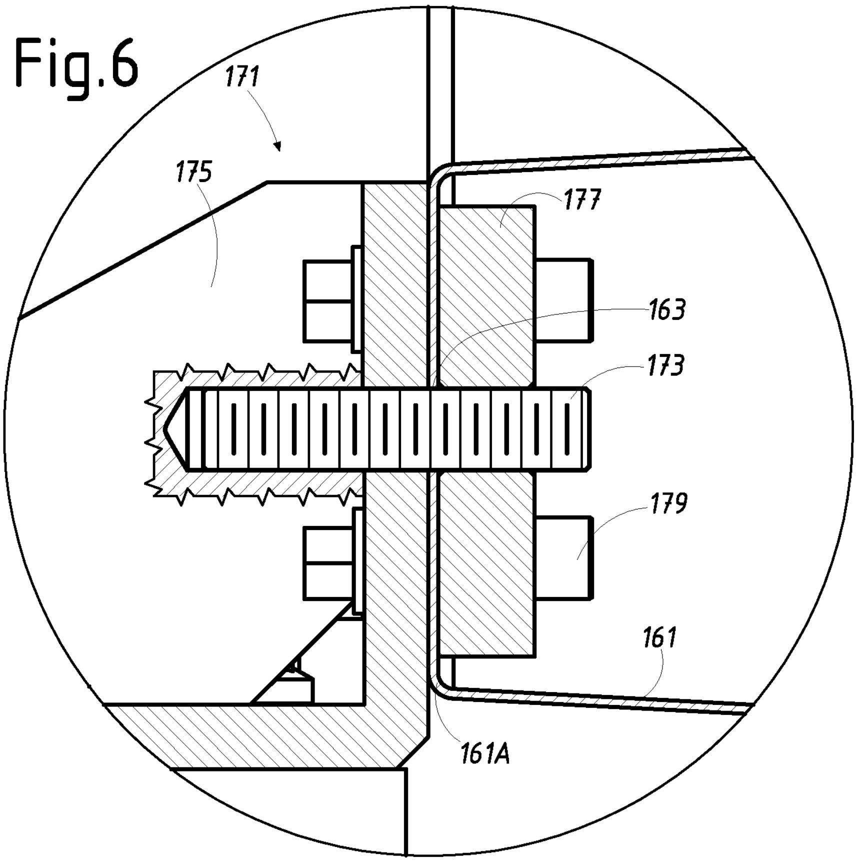
VI
175
173
177
161
161A
120
143

Fig.6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179
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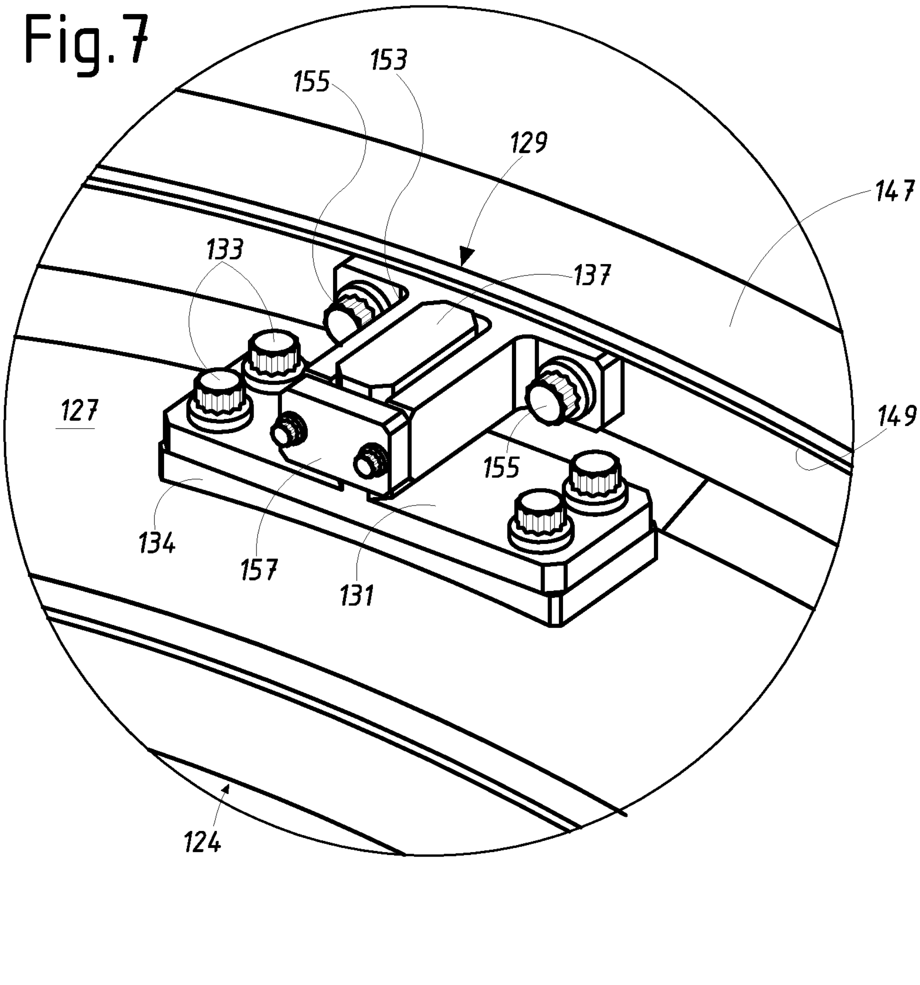
161A

Fig.7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124

Fig.8

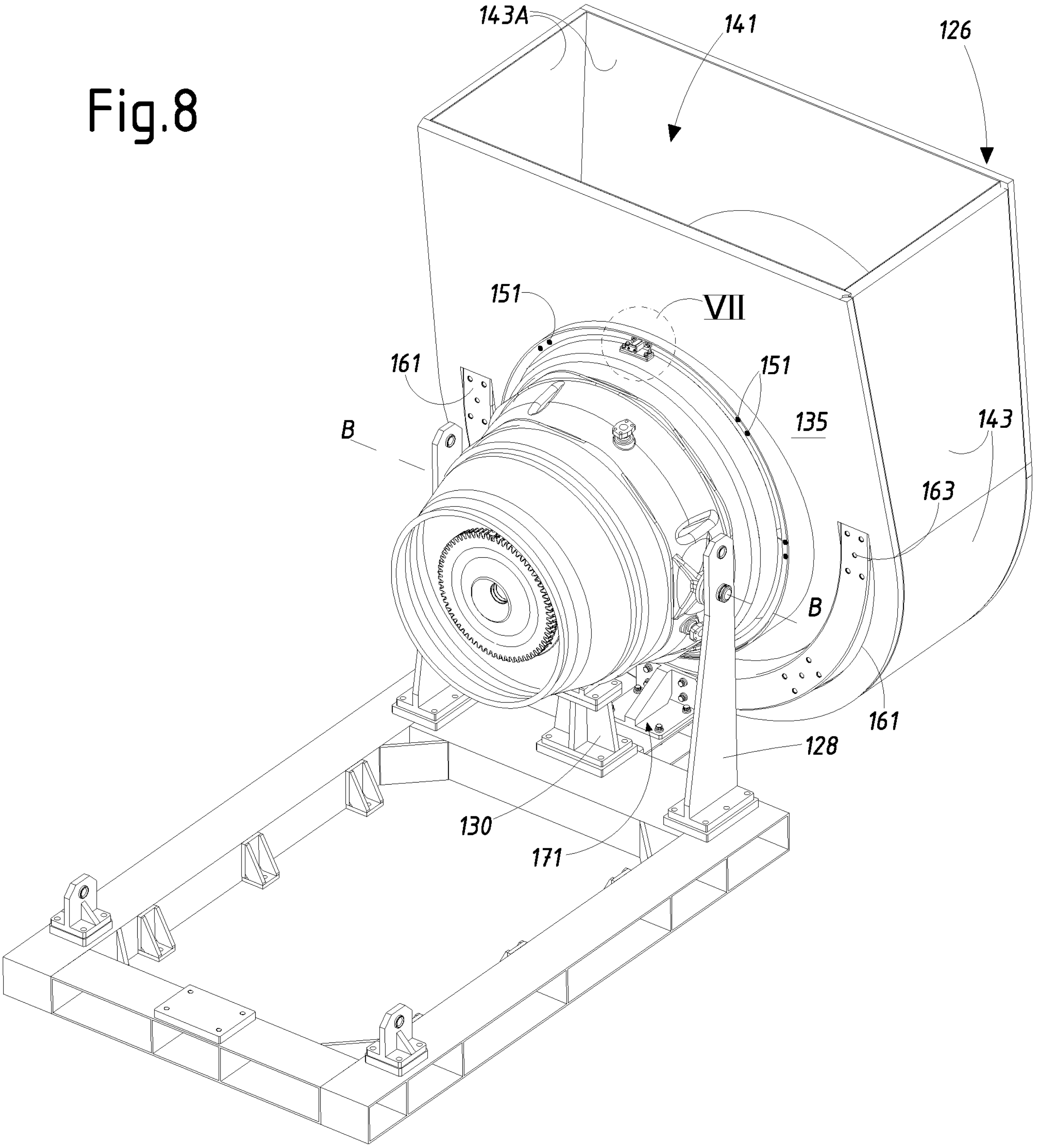
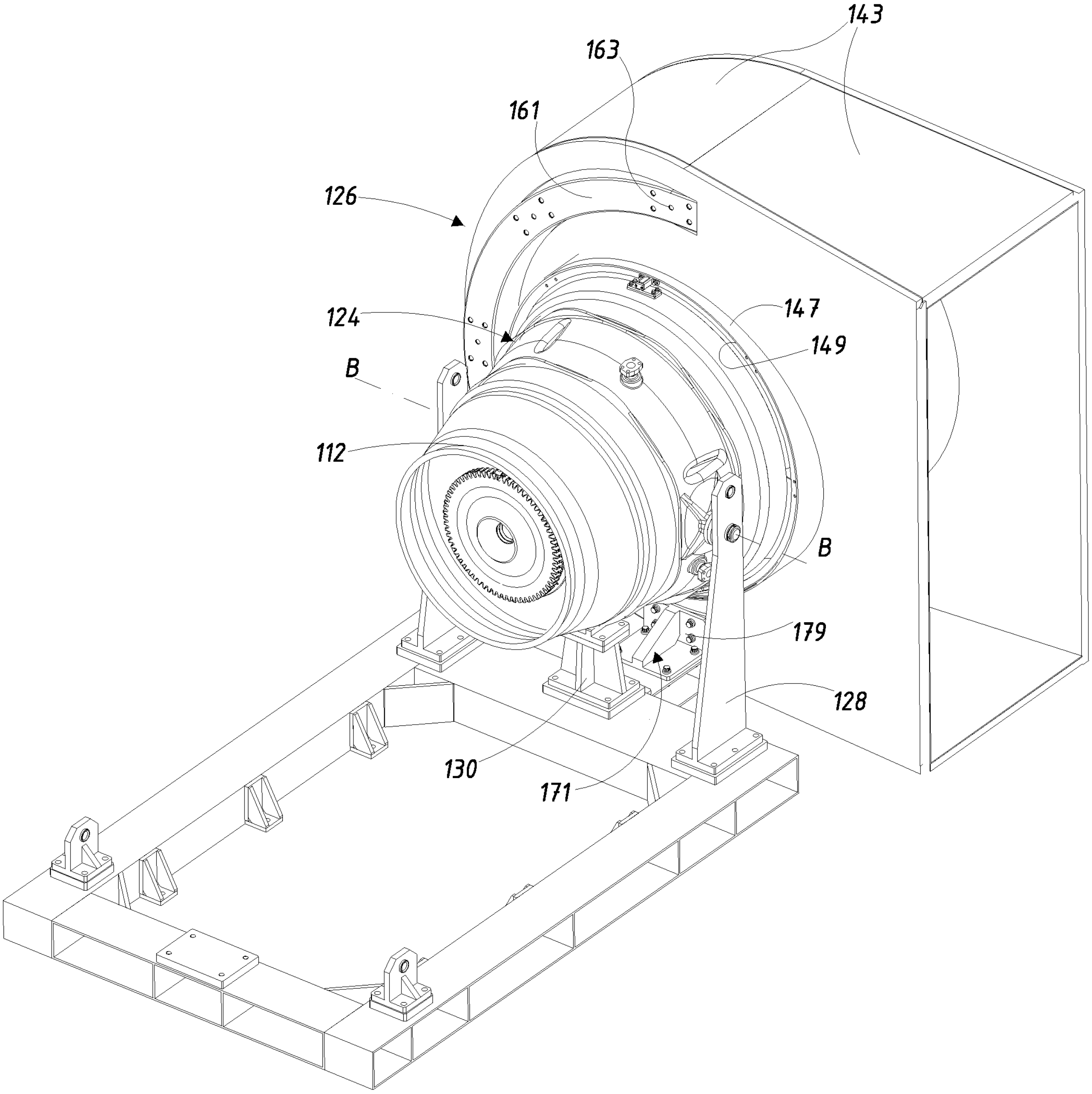


Fig.9



REFERENCES CITED IN THE DESCRIPTION

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