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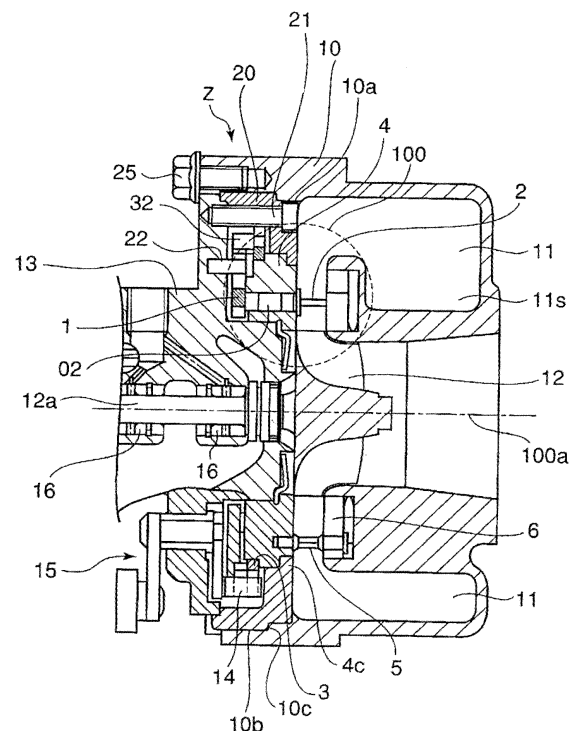
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(54) **Mounting structure for variable nozzle mechanism in variable-throat exhaust turbocharger**

(57) Provided is a variable-throat exhaust turbocharger in which a nozzle assembly including a nozzle mount (4) and nozzle vanes (2) has a firm support structure without affection by a thermal deformation of a turbine casing (10) and an external force exerted to the turbine casing (10), and a scroll portion (11) is formed in a substantially opened configuration so that the nozzle assembly can be simply formed in order to reduce the number of mold cores for a scroll (11) during casting of the turbine casing (10), and thereby it is possible to enhance the productivity of the turbine casing (10).

FIG.1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a mounting structure for a variable nozzle mechanism which is used in a variable-throat exhaust turbocharger, and which introduces exhaust gas from an engine (internal combustion engine) to apply the exhaust gas onto a turbine rotor by way of a scroll and a plurality of nozzle vanes formed in a turbine casing, and which is configured so as to change the blade angles of the plurality of nozzle vanes.

Description of the Related Art

[0002] A patent document 1 (Japanese Patent Laid-Open No. 2001-207858) discloses an example of a relatively small-sized turbocharger which is used for a vehicle internal combustion engine or the like, and in which engine exhaust gas charged in a scroll within a turbine casing is fed through a plurality of nozzle vanes provided on the inner peripheral side of the scroll, and is then applied to a turbine rotor provided on the inner peripheral side of the nozzle vanes. Further, there have been prosperously used a variable-throat radial flow exhaust turbocharger incorporating a variable nozzle mechanism which is capable of changing the blade angle of a plurality of nozzle vanes.

[0003] Further, as for example, Japanese Patent document 2 (Japanese Patent Laid-Open No. 2004-132367) discloses another example of the variable-throat radial flow exhaust turbocharger incorporating a variable nozzle mechanism.

[0004] Referring to Fig. 12, which shows a conventional example of the variable-throat radial flow exhaust turbocharger incorporating the above-mentioned variable nozzle mechanism, in a sectional view along the rotating axis thereof, there are shown a turbine casing 10, a scroll 11 formed in a spiral-like configuration on the outer peripheral side of the turbine casing 11, and a radial flow turbine rotor 12 arranged coaxially with a compressor 8. The turbine rotor 12 has a turbine shaft 12a which is rotatably journaled to a bearing housing 13 through the intermediary of a bearing 16. Further, there are shown a compressor housing 7 accommodated therein with the compressor 8, an air inlet 9 of the compressor housing, spiral air passages 7a and the rotating axis 100a of the exhaust turbocharger.

[0005] Further, there are shown a plurality of nozzle vanes 2 which are arranged in the circumferential direction of the turbine on the inner peripheral side of the scroll 11 at equal intervals. Each of the nozzle vanes 2 is coupled at its end part with a nozzle shaft 02 which is rotatably supported in a nozzle mount 4 secured to the turbine casing 10. Further, the blade angle of the nozzle vanes can be changed by a variable nozzle mechanism 100.

[0006] In the variable nozzle mechanism 100, the nozzle vanes 2 are arranged between the nozzle mount 4 and an annular nozzle plate 6 which is coupled to the nozzle mount 4 through the intermediary of a plurality of nozzle supports. Further the nozzle plate 6 is fitted in an attaching part of the turbine casing 10.

[0007] There is shown a drive ring 3 which is formed in a disc-like shape and which is rotatably supported to the turbine casing 10. The drive ring 3 is fixed thereto with drive pins 32 at circumferentially equal intervals. There are shown lever plates 1 each having on the inlet side a groove which is engaged therein with the associated drive pin 32, and fixed on the outlet side to the associated nozzle shaft 02.

[0008] There are shown a link 15 coupled to a drive source (which is not shown) for the nozzle vanes 2, and a pin 14 which is coupled to the link 15. The pin 14 is engaged with the drive ring 3 which is therefore rotated.

[0009] During the operation of the variable-throat exhaust turbocharger incorporating the variable nozzle mechanism having the above-mentioned configuration, exhaust gas from an engine (which is not shown) is led into the scroll 11 so as to be swirled along spiral passages in the scroll, and is then introduced through the nozzle vanes 2. Then the exhaust gas flows through the gaps between the vanes and then flows onto the turbine rotor 12 from the outer periphery of the latter. Thereafter, the exhaust gas flows radially toward the center of the turbine rotor 12 so as to carry out an expansive work to the turbine rotor 12. Thereafter, the exhaust gas axially flows being led to a gas outlet 10b from which the exhaust gas is discharged, outside of the supercharger.

[0010] In order to control the delivery volume of the above-mentioned variable-throat turbine, a blade angle of the nozzle vanes 2 is set in the actuator by a blade angle control means (which is not shown) in order to regulate the flow rate of exhaust gas passing through the nozzle vanes to a desired value. The reciprocal displacement of the actuator in response to the thus set blade angle is transmitted by way of the link 15 and the pin 14 to the drive ring 3 which is therefore rotated.

[0011] The rotation of the above-mentioned drive ring 3 causes drive pins 32 which are secured to the drive ring 3 at equal intervals in the circumferential direction thereof to rotate the lever plates 1 around the nozzle shafts 02. Due to the rotation of the nozzle shafts 02, the nozzle vanes 2 are configured so as to be turned in order to change the blade angle thereof up to the value set to the actuator.

[0012] Further, Patent Document 2 (Japanese Patent Laid-Open No. 2004-132367) discloses another example of the variable-throat radial flow exhaust turbocharger, which incorporates the above-mentioned variable nozzle mechanism.

[0013] However, the conventional variable-throat radial flow exhaust turbocharger incorporating the above-mentioned variable nozzle mechanism, which is shown in Fig. 12 and which is disclosed in the Patent Document

1 (Japanese Patent Laid-Open No. 2001-207858), the Patent Document 2 (Japanese Laid-Open No. 2004-132367) or the like, has raised the following problems which should be solved:

[0014] In the variable-throat radial flow exhaust turbocharger incorporating the variable nozzle mechanism 100, as shown in Fig. 12, a drive force is transmitted from an actuator having a diaphragm or a motor driven actuator to the drive ring 3 by way of the link 15 and the pin 14. Thus, the drive ring 3 is rotated, and accordingly, the drive pins 32 rotate the lever plates 1 around the nozzle shafts 02 through the rotation of the drive ring 3. Due to the rotation of the nozzle shafts 02, the nozzle vanes 2 are turned so as to change the blade angle thereof to a value set by the actuator.

[0015] In the variable nozzle mechanism 100 having the configuration as stated above, the above-mentioned nozzle plates 6 may serve as slide surfaces on which the above-mentioned nozzle vanes 2 slide, and accordingly, it is sufficient to allow the nozzle plates 6 alone to have an acid resistance and a strength which can prevent deformation. Thus, the durability of the variable nozzle mechanism can be prevented from being affected by a strength or the same of the turbine casing 10.

[0016] Meanwhile, a nozzle assembly composed of the nozzle vanes 2, the nozzle plates 6, the nozzle supports 5, the nozzle mount 4 and the like is held by the nozzle mount 4 whose outer peripheral flange is supported by the inner diameter side flange of the turbine casing 10.

[0017] Thus, the nozzle mount 4 which is a main support member for the nozzle assembly is supported by the turbine casing 10. Thus, should the turbine casing 10 be thermally deformed, or should a large external force be exerted to the turbine casing 10, the turbine casing 10 would possibly be largely deformed.

[0018] As a result, a fastening force with which the nozzle mount 4 is supported by the turbine casing 10 would be greatly decreased. Thus, there would be caused such a problem that the structure for securing the main body of the nozzle assembly including the nozzle mount 4 to the turbine casing 10 side is damaged during operation of the turbocharger.

[0019] Thus, the nozzle assembly is excited by vibration from the engine, and accordingly, the nozzle assembly and the nozzle link mechanism coupled to the former are worn so as to lower the function of the variable nozzle mechanism 100. As a result, the boost pressure (air supply pressure) to the engine is greatly lowered.

[0020] Meanwhile, the variable displacement type exhaust turbocharger inevitably has a cut part 11s which defines a scroll underline in the lower portion of the scroll 11 in the turbine casing 10. Accordingly, in order to increase the sectional area A of the scroll 11, it is required to enlarge the scroll in both radial and axial directions for increasing the sectional area A thereof. As a result, there would be caused such a problem that the turbine casing 10 becomes large-sized.

[0021] In particular, in the case of enlarging the scroll 11 in the radial direction of the turbine, the distance R between the rotating center axis 100a and the center of the sectional area of the scroll 11 becomes also larger, and accordingly, there would be caused such a problem that the ratio A/R between the sectional area A and the distance R is not so appreciably increased.

[0022] Meanwhile, if the distance R is decreased, it is necessary to shift the scroll 11, radially inward. In this case, there would be caused a constraint since a turbine outlet diffuser or the like is arranged, radially inward, and accordingly, there would be caused such a problem that the shifting of the scroll as stated above is difficult.

[0023] Further, the distance R to the center of the sectional area can be decreased by flattening the scroll 11 in the radial direction of the turbine. However, there would be caused such a problem that the scroll 11 itself becomes longer in the axial direction of the turbine.

[0024] Further, as stated above, since the ratio A/R between the sectional area A and the distance R is set to be large, the scroll 11 shown in Fig. 12 is formed therein with the undercut part 11s in order to cause the turbine outlet side to have a large bulge. This undercut part 11a is advantageous in order to ensure a satisfactory aerodynamic performance. However, the manufacture of a mold core for the scroll of the turbine casing 10 having the under cut part 11s causes a high degree of difficulty in working, resulting in a problem of low productivity.

[0025] In this configuration, as stated above, a flange 11t is present on the inner diameter side of the turbine casing 10. Thus, the turbine casing 10 itself is not opened axially as viewed as a single element, and accordingly, the number of mold cores for the scroll becomes larger. As a result, there would be caused such a problem that the productivity of the turbine casing is hindered.

[0026] Further, the turbine casing is usually made of cast iron. However, the above-mentioned structure inevitably requires split-type core, and accordingly, burring is possibly caused within the scroll 11.

SUMMARY OF THE INVENTION

[0027] The present invention is devised in view of the above-mentioned problems inherent to the prior art, and accordingly, an object of the present invention is to provide a nozzle assembly including a nozzle mount and nozzle vanes, which has a firm support structure while avoiding receiving affection by a thermal deformation of a turbine casing or an external force applied to the turbine casing.

[0028] Another object of the present invention is to facilitate the formation of the nozzle assembly by simplifying a scroll portion so as to have a substantially opened configuration.

[0029] Further, another object of the present invention is to provide a variable-throat exhaust turbocharger with enhanced productivity of a turbine casing by decreasing the number of mold cores for the scroll, used during cast-

ing of the turbine casing.

[0030] In order to achieve the above-mentioned objects, according to the present invention, there is provided such a configuration that exhaust gas from an engine is led through a scroll formed in a turbine casing and a plurality of nozzle vanes arranged on the inner peripheral side of the scroll, and is then adapted to act upon a turbine rotor provided on the inner peripheral side of the nozzle vanes.

[0031] Further, according to the present invention, there is provided a variable-throat exhaust turbocharger incorporating a variable nozzle mechanism in which the plurality of nozzle vanes are rotatably supported on an annular nozzle mount so as to change the blade angle of the nozzle vanes in order to regulate the volume of the exhaust gas fed onto the turbine rotor.

[0032] Further, according to the present invention, there is provided such a configuration that is characterized by an insert member which is formed in an annular shape, and which is removably mounted to the outer periphery of the nozzle mount.

[0033] Further, according to the present invention, there is provided such a configuration that is characterized in that the outer periphery of the insert member is fitted in an attaching bore which is formed so as to be opened from the scroll of the turbine casing toward the bearing housing, in order to mount the insert member to the bearing housing.

[0034] Further, the present invention specifically includes the following configurations:

(1) The nozzle mount and the insert member are integrally incorporated with each other so as to constitute an integrated nozzle mount type insert member, and the integrated nozzle mount type insert member is fitted at its outer periphery in an attaching bore which is formed in the turbine casing so as to be opened from the scroll toward the bearing housing in order to attach the integrated nozzle mount type insert member to the bearing housing;

(2) The insert member is attached thereto with a variable nozzle mechanism including the nozzle mount and nozzle vanes mounted to the nozzle mount so as to constitute an assembly structure of the nozzle mount and the insert member which are integrally incorporated with each other. The assembly structure of the nozzle mount and the insert member is secured to the bearing housing by means of fastening members including bolts and attaching screws;

(3) The insert member is formed at its outer peripheral part with a flange which is then clamped between flanges formed in the turbine casing and the bearing housing, and the thus obtained clamped parts are joined at its outer periphery together in a fluid tight manner by means of a coupling.

(4) A snap ring is fitted in a ring groove formed in the side end part of the bearing housing in the turbine casing. The outer peripheral parts of the bearing

housing and the insert member are clamped between the inside of the snap ring and the turbine casing, that is, the bearing housing and the insert member are fixed to the turbine casing by the inside surface of the snap ring.

(5) A female thread is formed in the attaching bore of the turbine casing while a male thread is formed at the outer peripheral part of the insert member. The female thread is engaged with the male thread so as to secure the outer peripheral part of the insert member between the turbine casing and the bearing housing.

(6) The outer peripheral part of the insert member is welded to the bearing housing and the turbine casing;

(7) A piston ring for fluid tight sealing is inserted between the outer periphery of the insert member and the inner periphery of the attaching bore of the turbine casing so as to make the outer peripheral surface of the piston ring into slidable contact with the inner peripheral surface of the attaching bore in the turbine casing.

(8) A piston ring for fluid tight sealing is inserted between the inner peripheral surface of the insert member and the outer peripheral surface of nozzle mount which is opposed to the above-mentioned inner peripheral surface.

[0035] Further, according to the present invention, there is provided a variable-throat exhaust turbocharger incorporating a variable nozzle mechanism, characterized in that an opening which has no protrusion projected from the inner peripheral surface of the scroll in the turbine casing toward the outer peripheral side thereof, and which is axially linear is formed in the turbine casing. Further, the present invention is characterized in that an insert shroud having a protrusion projected toward the outer peripheral side and serving as a part of the inner surface of the scroll is attached to the opening, and the support part of an annular nozzle plate which is coupled to the nozzle mount through the intermediary of the nozzle supports is formed in the insert shroud.

[0036] Further, according to the present invention, there is provided a variable-throat exhaust turbocharger incorporating the variable nozzle mechanism, characterized in that an insert member formed in an annular shape is removably attached to the outer periphery of the nozzle mount, and the outer periphery of the insert member is fitted in an attaching bore which is formed so as to be opened from the scroll of the turbine casing toward the bearing housing side in order to mount the insert member to the bearing housing. Further, the present invention is characterized in that an opening having no protrusion which is projected from the inner peripheral part of the scroll of the turbine casing toward the outer peripheral side thereof and which is axially linear is formed in the turbine casing, then an insert shroud having a protrusion projected toward the outer peripheral part of the scroll,

and which serves as a part of the inner surface of the scroll is attached to the opening, and a support part of an annular nozzle plate which is coupled to the nozzle mount through the intermediary of the nozzle supports is formed in the insert shroud.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037]

Fig. 1 is a longitudinal sectional view of a relevant part on the turbine side of a variable-throat exhaust turbocharger equipped with a variable nozzle mechanism of a first embodiment of the present invention. Fig. 2 is an enlarged view illustrating a Z part in Fig. 1 of the first embodiment.

Fig. 3 is a longitudinal sectional view of a relevant part in an upper half on the turbine side of a second embodiment of the present invention.

Fig. 4 is a view illustrating a third embodiment of the present invention, corresponding to Fig. 2.

Fig. 5 is a view illustrating a fourth embodiment of the present invention, corresponding to Fig. 2.

Fig. 6 is a view illustrating a fifth embodiment of the present invention, corresponding to Fig. 2.

Fig. 7 is a view illustrating a sixth embodiment of the present invention, corresponding to Fig. 2.

Fig. 8 is a view illustrating a seventh embodiment of the present invention, corresponding to Fig. 2.

Fig. 9 is a view illustrating an eighth embodiment of the present invention, corresponding to Fig. 2.

Fig. 10A is a sectional view of a relevant part of a turbine casing part in a ninth embodiment of the present invention.

Fig. 10B is a side view illustrating a turbine casing in the ninth embodiment.

Fig. 11 is a view illustrating a tenth embodiment of the present invention, corresponding to Fig. 1.

Fig. 12 is a longitudinal sectional view illustrating a variable-throat exhaust turbocharger equipped with a conventional variable nozzle mechanism.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0038] Explanation will be hereinbelow made in the form of preferred embodiments of the present invention which are shown in the accompanying drawings. It is noted here that the dimensions, the materials, the shapes, and the relative arrangements of component parts described in these embodiments are mere examples used only for the purpose of explanation, and accordingly, are not intended to limit the technical scope of the present invention.

[0039] Fig. 1 is a longitudinal sectional view illustrating an essential part of a variable-throat exhaust turbocharger in a first embodiment of the present invention, and Fig. 2 is an enlarged view illustrating a Z part in Fig. 1, in the

first embodiment.

[0040] Referring to Figs. 1 and 2, there are shown a turbine casing 10, a scroll 11 formed in the outer peripheral part of the turbine casing, in a spiral shape, a radial flow turbine rotor 12 which is arranged coaxial with a compressor 13 (refer to Fig. 12), the turbine rotor 12 having a turbine shaft 12a rotatably journaled to a bearing housing 13 through the intermediary of bearings' 16, and a center axis 100a of the exhaust turbocharger.

[0041] A plurality of nozzle vanes 2 are provided so as to be arranged in the inner peripheral side of the scroll 11, at equal intervals in the circumferential direction of the turbine. Each of the nozzle vanes 2 is coupled at its end part with a nozzle shaft 02 which is rotatably supported on a nozzle mount 4 secured to the turbine casing 10, and is configured so as to change its blade angle by means of a variable nozzle mechanism 100.

[0042] In the variable nozzle mechanism 100, the nozzle vanes 2 are each arranged between the nozzle mount 4 and an annular nozzle plate 6 coupled to the nozzle mount 4 through the intermediary of a plurality of nozzle supports 5. The nozzle plate 6 is fitted on an attaching part of the turbine casing 10.

[0043] Further, there are shown a drive ring 3 formed in a disc-like shape, which is rotatably supported in the turbine casing 10 and which is fixed thereto with drive pins 32 at equal intervals in the circumferential direction, and lever plates 1 each having an input side groove which is engaged with the associated drive pin 32 and each having an output side which is secured to the associated nozzle shaft.

[0044] Further, there are shown a link 15 coupled to an actuator (which is not shown) serving as a drive source for the nozzle vanes 2, and a pin 14 coupled to the link 15. The pin 14 is engaged with the drive ring 3 so as to rotate the drive ring 3.

[0045] During the operation of the variable-throat exhaust turbocharger incorporating the variable nozzle mechanism having the above-mentioned configuration, exhaust gas from an engine (which is not shown) is led into the scroll 11 so as to be swirled along spiral passages in the scroll 11, then flowing into the nozzle vanes 2. The exhaust gas then passes through gaps between the nozzle vanes 2 and is led onto the turbine rotor 12 from the outer peripheral side of the latter. Thereafter, the exhaust gas radially flows toward the center axis of the turbine rotor so as to carry out expansive work for the turbine rotor 12, and then axially flows out, being led into a gas outlet 10b from which it is discharged out from the turbocharger.

[0046] In order to control the delivery volume of the variable-throat exhaust turbocharger, the blade angle of the nozzle vanes 2 is set by a blade angle control means (which is not shown) so as to regulate the flow rate of the exhaust gas flowing through the nozzle vanes 2 to a predetermined value. The reciprocal displacement of the actuator in response to the blade angle is transmitted to the drive ring 3 through the intermediary of the link 15 and

the pin 14, and accordingly, the drive ring 3 is rotated.

[0047] The rotation of the drive ring 3 causes the drive pins 32 which are secured to the drive ring 3 at equal intervals in the circumferential direction thereof, to rotate the lever plates 1 around the nozzle shafts 02. The rotation of the nozzle shafts 02 turn the nozzle vanes 2 in order to change the blade angle to a value set by the actuator.

[0048] The present invention concerns a mounting structure of the variable nozzle mechanism 100 in the variable-throat exhaust turbocharger having the above-mentioned configuration.

[Embodiment 1]

[0049] Referring to Figs. 1 and 2, an insert member 20 which is annularly formed is removably attached to the side surface of the bearing housing 13 at the outer periphery of the nozzle mount 4 by means of a plurality of fixing screws (screw caps) 21 which are circumferentially positioned. Thus, by fastening the insert member 20 to the bearing housing 13 which can be maintained at a low temperature, the value of heat transmission from the turbine casing 10 at a high temperature can be reduced. Further, by providing the fixing screws 21 at positions in proximity with the nozzle mount 4, the nozzle assembly can be prevented from being deformed or shifted as far as possible.

[0050] The turbine casing 10 is formed therein with an attaching bore 10a having a diameter substantially equal to the outer diameter of the scroll 11, being extended from the scroll 11 to the bearing housing 13. The outer peripheral part of the insert member 20 is fitted in the attaching bore 10a at the inner periphery of the latter in a spigot configuration. The insert member 20 is axially positioned by a stepped part 10c. Further, the insert member 20 is also fixed to the turbine casing 10, being clamped by the outer flange of the bearing housing 13 which is also fastened to the turbine casing 10 by bolt screws 25. Further, the inner peripheral surface of the insert member 20 is fitted on the outer peripheral surface of the nozzle mount 4 in a spigot configuration, and is axially positioned by a stepped part 4c.

[0051] Nail pins 22 serve as a detent for the nozzle mount 4. These nail pins 22 are press-fitted in the bearing housing 13 through cutouts which are formed in the lever plates 1 at a plurality of circumferential positions, from the fitted part of the nozzle mount 4 in order to serve as a detent for the nozzle mount 4.

[0052] In the first embodiment as stated above, the nozzle assembly composed of the nozzle vanes 2, the nozzle shafts 02, the nozzle plates 6, the nozzle supports 5, the nozzle mount 4 and the like is fastened to the bearing housing 13 through the intermediary of the insert member 20. Thus, the nozzle assembly cannot be affected by a thermal deformation of the turbine casing, and an external force exerted to the turbine casing 10. Accordingly, the nozzle assembly can be prevented from

being deformed by these factors. Thereby it is possible to prevent the nozzle assembly from being deformed.

[0053] Thus, nozzle assembly can be firmly fixed to the turbine casing 10 through the intermediary of the insert member 20 without decreasing the fastening force. Thus, it is possible to eliminate, as a problem inherent to the prior art, such a disadvantage that the nozzle assembly is excited by vibration from the engine side so as to cause the nozzle assembly and the nozzle link mechanism coupled to the former to be worn, resulting in lowering of the function of the variable nozzle mechanism 100, and as a result, the boost pressure (air supply pressure) fed into the engine is greatly decreased.

[0054] Further, according to the present invention, the necessity of a flange for stably fixing nozzle assembly is eliminated from the inner diameter side of the turbine casing 10, and accordingly, the insert member 20 can be fitted in the part where the above-mentioned flange has been provided. Thus, the turbine casing itself may have such a configuration that the outer peripheral part of the scroll is opened to the bearing housing 13 in the axial direction, as the turbine casing is viewed as a single component.

[0055] Thus, the configuration of mold cores during casting of the turbine casing can be simplified, that is, the number of mold cores can be reduced, and thereby it is possible to simplify the manufacture of the turbine casing 10. Further, since the turbine casing 10 is usually composed of a casting, as stated above, the presence of burrs in the scroll 11 can be easily checked through the opened part as stated above.

[0056] Further, in the turbine casing 10 incorporating the scroll 11 in which the undercut part 11s is formed, the outer peripheral part of the scroll 11 can be opened in the axial direction due to the provision of the insert member 20. Thus, even through the mold core is split, the management of the mold core can be facilitated, and accordingly, the number of mold cores can be greatly reduced in comparison with the conventional one.

[0057] Further, in the prior art, the scroll end (tongue-like part) is restrained by the turbine casing 10 therewithin, and accordingly, a thermal stress applied thereto becomes usually higher. On the contrary, in the first embodiment of the present invention, the scroll end is split by the provision of the insert member 20 so as to relieve the restraint, and thereby it is possible to prevent the scroll end (tongue-like part) from clacking.

[Second Embodiment]

[0058] Fig. 3 is a longitudinal sectional view illustrating an essential part of an upper half of a second embodiment of the present invention on the turbine side.

[0059] In this second embodiment, there is provided an integrated nozzle mount type insert member 26 in which the nozzle mount 4 and the insert member 20 that have been explained in the first embodiment are integrally incorporated with each other. The above-mentioned

integrated nozzle mount type insert member 26 is fitted at its outer periphery in an attaching bore 10a which is formed in the turbine casing 10, being opened from the scroll 11 toward the bearing housing 13. Further, the integrated nozzle mount type insert member 26 is attached to the bearing housing 13 by means of a plurality of fixing screws (cap screws) 21, as explained in the first embodiment.

[0060] The above-mentioned integrated nozzle mount type insert member 26 is fixed to the turbine casing 10 being fastened together with the outer peripheral flange of the bearing housing 13 by bolts 25 through the intermediary of a ring lock 27.

[0061] Except the above-mentioned configuration, the configuration of the second embodiment is the same as that of the first embodiment explained with reference to Figs. 1 and 2, and accordingly, same reference numerals are used to denote same parts to those explained in the first embodiment.

[0062] In the second embodiment as stated above in which the nozzle mount 4 and the insert member 20 are integrally incorporated with each other so as to form the integrated nozzle mount type insert member 26, it is possible to more surely fasten the integrated nozzle mount type insert member 26 to the bearing housing 13, in comparison with the first embodiment. Thus, it is possible to aim at reducing the number of component parts in the second embodiment.

[0063] Further, since no seal surfaces are present at the outer diameter side flange of the nozzle mount 4 and at the turbine inner diameter side flange of the insert member 20, no risk of gas leakage would be caused. Accordingly, no severe dimensional management is required, and thereby it is possible to simplify the manufacture of the insert member 20.

[Embodiment 3]

[0064] Fig. 4 is a view which shows a third embodiment of the present invention, corresponding to Fig. 2.

[0065] In the third embodiment, the insert member 20 is formed in its outer peripheral part with a flange 20s which is clamped between the flanges which are formed at the outer peripheries of the turbine casing 10 and the bearing housing 13, and the thus clamped parts are joined at their outer peripheries together in a fluid tight manner by means of a coupling 28. Except this configuration, the configuration of the third embodiment is the same as that of the first embodiment, and accordingly, same reference numerals are used to denote same parts to those explained in the first embodiment.

[0066] In the third embodiment as stated above, since the insert member 20 can be coupled by means of the single coupling 28 alone in a fluid tight manner, the number of component parts can be reduced. Further, in the third embodiment, three components, that is, the insert member 20, the turbine casing 10 and the bearing housing 13 are fastened at their outermost peripheral

flanges by the coupling 28, and accordingly, the fastening can be made in a part which is held at a relatively lower temperature. Thus, even though the coupling 28 is made of a relatively inexpensive material, its fastening function can be satisfactory.

[Embodiment 4]

[0067] Fig. 5 is a view which illustrates a fourth embodiment of the present invention, corresponding to Fig. 2.

[0068] In the fourth embodiment, a snap ring 29 is fitted in a ring groove 30 formed in the side end part of the turbine casing 10 on the bearing housing 13 side. The outer peripheral parts of the bearing housing 13 and the insert member 20 are clamped on the inside of the snap ring 29, that is, the bearing housing 13 and the insert member 20 are pressed and secured against the turbine casing 10 by an inclined side surface 29a of the snap ring 29. In this case, since the snap ring 29 has the inclined side surface 29a, an axial force is generated by pushing the snap ring 29 into the ring groove 30. By this axial force, the outer peripheral part of the insert member 20 can be firmly held between the bearing housing 13 and the turbine casing 10.

[0069] Except the above-mentioned configuration, the configuration of the fourth embodiment 1 is the same as that of the first embodiment shown in Fig. 1, and accordingly, same reference numerals are used to denote same parts to those explained in the first embodiment.

[0070] In the fourth embodiment as stated above, with the provision of the snap ring 29 for the fastened parts of the insert member 20, the turbine casing 10 and the bearing housing 13, no risk of loosening of the fastening parts is caused, in comparison with the other embodiments mentioned above, resulting in an increase in the fastening strength against vibration transmitted from an engine. Further, with the use of one single component, that is, the snap ring 29 alone, the fastening member can be provided, and accordingly, the number of component parts can be reduced.

[0071] Further, in the fourth embodiment, the snap ring 29 is fitted in the inner diameter side of the attaching bore 10a, 10b in the turbine casing 10, and thereby it is possible to avoid increasing the outer diametrical size of the fastened part of the insert member 20.

[Fifth Embodiment]

[0072] Fig. 6 is a view illustrating a fifth embodiment of the present invention, corresponding to Fig. 2.

[0073] In the fifth embodiment, a female thread is formed in the attaching bore 10b (refer to Fig. 1) in the turbine casing 10, and a male thread is formed at the outer peripheral part of the insert member 20. With the use of the thread portion 30s in which the female thread is meshed with the male thread, the outer peripheral part of the insert member is fixed between the turbine casing

10 and the bearing housing 13.

[0074] Except the above-mentioned configuration, the configuration of the fifth embodiment is the same as that of the first embodiment. Thus, same reference numerals are used to denote same part to those explained in the first embodiment.

[0075] In the fifth embodiment as stated above, the fastened parts of the insert member 20 and the turbine casing 10 can be broadened. Thus, it is possible to stably fasten the insert member 20.

[0076] Further, in the fifth embodiment, the insert member 20 can be readily fastened to the turbine casing 10 by screwing the male thread of the former into the female thread of the latter, no particular attaching screw member is required, and thereby it is possible to miniaturize the insert member 20 itself.

[Sixth Embodiment]

[0077] Fig. 7 is a view for illustrating a sixth embodiment of the present invention, corresponding to Fig. 2.

[0078] In this sixth embodiment, the outer peripheral part of the insert member 20 is fixed by welding to the outer peripheral parts of both bearing housing 13 and the turbine casing 10, that is, by a welded part 33.

[0079] Except the above-mentioned matter, the configuration of this embodiment is the same as that of the first embodiment, and accordingly, same reference numerals are used to denote same parts to those explained in the first embodiment.

[0080] In the sixth embodiment as stated above, no particular attaching screw member and the like for fastening the insert member 20 to the bearing housing 13 or the turbine casing 10 are required, and thereby it is possible to reduce the number of component parts. Further, in the sixth embodiment, since the fastening is made by welding 33, the welding can be made around the sealing surfaces, and thereby it is possible to minimize occurrence of gas leakage.

[Seventh Embodiment]

[0081] Fig. 8 is a view illustrating a seventh embodiment, corresponding to Fig. 2.

[0082] In the seventh embodiment, a piston ring 34 for fluid-tight sealing is fitted in a groove formed in the outer peripheral part of the insert member 20, having an outer peripheral surface which is made into slidable contact with the inner peripheral surface of the attaching bore 10b in the turbine casing 10. Alternatively, the piston ring 34 may be fitted in a groove formed in the inner peripheral surface of the attaching bore 10b in the turbine casing 10, having an inner peripheral surface which is made into slidable contact with the outer peripheral surface of the insert member 20.

[0083] Except the above-mentioned matter, the configuration of the seventh embodiment is the same as that of the first embodiment shown in Fig. 1, and accordingly,

same reference numerals are used to denote same parts to those explained first embodiment.

[0084] In the seventh embodiment as stated above, gas leakage through the fitting portion between the insert member 20 and the turbine casing 10 can be surely prevented by the piston ring 34 fitted in the fitting portion.

[Eighth Embodiment]

[0085] Fig. 9 is an eighth embodiment of the present invention, corresponding to Fig. 2.

[0086] In the eighth embodiment, a piston ring 35 is fitted in the groove formed in the inner peripheral surface of the insert member 20, and has an inner peripheral surface which is made into slidable contact with the outer peripheral surface of the nozzle mount 4. Alternatively, the piston ring 35 may be fitted in a groove formed in the outer peripheral surface of the nozzle mount 4, and has an outer peripheral surface which is made into slidable contact with the inner peripheral surface of the insert member 20.

[0087] Except the above-mentioned matter, the configuration of the eighth embodiment is the same as that of the first embodiment, and accordingly, same reference numerals are used to denote same parts to those explained in the first embodiment.

[0088] In the above-mentioned eighth embodiment, gas leakage through the fitting portion between the inner periphery of the insert member 20 and the outer periphery of the nozzle mount 4 can be surely prevented by the piston ring 35. Further, the piston ring 35 does not exert an appreciably large force to its associated component, and thereby it is possible to avoid causing a risk of deformation of the nozzle mount 4 due to the fitting of the piston ring 35, and so forth.

[Ninth Embodiment]

[0089] Fig. 10 is a longitudinal sectional view illustrating an essential part of a turbine casing in a ninth embodiment of the present invention.

[0090] In this ninth embodiment, the scroll 11 in the turbine casing 10 is formed therein with an opening which is axially straight forward so as to have no protrusion projected from the inner peripheral part to the outer peripheral part of the scroll 11. Further, the opening is attached thereto with an insert shroud 36 having a protrusion 36y projected toward the outer periphery of the scroll 11 and serving as a part of the inner peripheral surface of the scroll 11, and the insert shroud 36 is formed therein with an annular nozzle plate 36z adapted to be coupled to the nozzle mount 4 through the intermediary of the nozzle supports 5. The insert shroud 36 is positioned in the turbine casing 10 at an inner spigot part 36a.

[0091] Further, the insert shroud 36 is located on the inside of the nozzle plates 6, and is fixed to the opening end surface of the turbine casing 10 by means of screw caps 27 provided along the inner periphery.

[0092] In the prior art, the scroll of the turbine casing 10 made by casting is formed only by casting, and accordingly, should an undercut 11s be formed in the scroll 11 as shown in Fig. 12, a mold core for the scroll should have a split structure. On the contrary, in the ninth embodiment as stated above, the scroll 11 is split in parts, and is formed therein with the opening which is axially straightforward, having no protrusion projected from the inner periphery toward the outer periphery of the scroll 11. Further, the opening is provided therein with an insert shroud 36 having the protrusion 36y projected toward the outer peripheral surface of the scroll and serving as a part of the inner surface of the scroll 11. Thus, the scroll 11 is axially opened.

[0093] With this configuration, the undercut part 11s as in the prior art is formed by the insert shroud 36, and thereby it is possible to manufacture the turbine casing 10 from an inexpensive casting having such a configuration as to sustain satisfactory aerodynamic performance and to prevent the mold core for the scroll 11 from being formed in a split structure.

[0094] Further, although the insert shroud 36 is fastened to the turbine casing 10 by the plurality of screw caps 37, the drilling for the fastening is made in a direction the same as those of the other bolt holes and the like in the turbine casing 10. Thus, no planning for changing the direction of the drilling is required, and thereby it is possible to minimize an increase in the working man-hours for the drilling.

[0095] Further, the fastened part of the insert shroud 36 is faced to the inside of the nozzle plate 6, and accordingly, the screw caps 37 are not exposed to the gas passage, and thereby it is possible to prevent the screw caps 37 from being directly made into contact with the exhaust gas. Thus, the screw caps 37 themselves can be made of inexpensive materials. Further, even though the screw caps are loosened, their fastened condition can be maintained since the screw caps 37 are retained by the nozzle plate 6 which is arranged adjacent thereto.

[0096] It is noted that the insert shroud 36 may be fixed to the turbine casing 10, direct thereto by shrinkage fitting with no use of the plurality of cap screws 37. With this configuration, the spigot parts in both insert shroud 36 and the turbine casing 10 may be made to be longer, and thereby it is possible to ensure stable fastening.

[Tenth Embodiment]

[0097] Fig. 11 is a view illustrating a tenth embodiment of the present invention, corresponding to Fig. 1.

[0098] The tenth embodiment is has a configuration which is in combination of those of the first embodiment shown in Figs. 1 and 2, and the ninth embodiment shown in Fig. 10. That is, the above-mentioned insert member 20 which is annularly formed is removably attached to the outer periphery of the nozzle mount 4 by means of a plurality of fixing screws 21. Further, in the tenth embodiment, the insert member 20 is fitted at its outer periphery

in the attaching bore 10a which is formed in the turbine casing 10, being opened from the scroll 11 toward the bearing housing 13. The configuration of the first embodiment in which the insert member 20 is attached to the bearing housing 13, is combined with the configuration of the ninth embodiment in which the axially linear opening having no protrusion that is projected from the inner peripheral surface toward the outer peripheral surface of the scroll 11 is formed, and in which the insert shroud 36 having the protrusion 36y projected toward the outer periphery and serving as a part of the inner surface of the scroll 11 is attached to the opening while a support part 36z for the annular nozzle plate 6 that is coupled to the nozzle mount 4 through the intermediary of the nozzle supports 4 is formed in the insert shroud 36.

[0099] In the tenth embodiment as stated above, the technical effects and advantages which are synergistic in combination of the first and ninth embodiments can be obtained, and as a result, the structure for mounting the variable nozzle structure which is practically excellent can be obtained in the variable-throat exhaust turbo-supercharge.

[0100] According to the present invention, there can be provided a nozzle assembly including a nozzle mount and nozzle vanes, which has a firm support structure without being affected by a thermal deformation of the turbine casing and an external force exerted to the turbine casing. Further, according to the present invention, the configuration of the scroll is simplified so as to be substantially opened, and accordingly, the nozzle assembly can be simply formed. Further, according to the present invention, there can be provided a variable-throat exhaust turbocharger which is manufactured with a reduced number of mold cores for the scroll, that are used during casting of the turbine casing, and thereby it is possible to enhance the productivity of the turbine casing.

[0101] According to the present invention, the annularly formed insert member is removably attached to the outer periphery of the nozzle mount. Further, according to the present invention, the insert member is fitted at its outer periphery in the attaching bore formed in the turbine casing and opened from the scroll toward the bearing housing so as to attach the insert member to the bearing housing, and thereby it is possible to obtain the following technical effects and advantages:

(1) According to the present invention, by fastening the nozzle assembly to the bearing housing side through the intermediary of the insert member, the nozzle assembly can be prevented from being affected by a thermal deformation of the turbine casing and an external force exerted to the turbine casing, and accordingly, it is possible to prevent the nozzle assembly from being deformed thereby. With this configuration, the nozzle assembly can be firmly secured to the turbine casing side without decreasing the fastening force. Thus, there can be prevented occurrence of such a disadvantage, or a problem

inherent to the prior art, that the nozzle assembly is excited by vibration from the engine side, resulting in abrasion of the nozzle assembly and the nozzle link mechanism coupled to the former, and accordingly, the function of the variable nozzle mechanism is deteriorated so that the boost pressure (air supply pressure) into the engine is largely lowered;

(2) According to the present invention, the necessity of a flange, on the inner diameter side of the turbine casing, with which the nozzle assembly can be stably fixed, can be eliminated, and accordingly, the insert member can be fitted in the part where the flange has been conventionally formed. Thus, there may be provided such a configuration that the scroll is axially opened toward the bearing casing in its outer peripheral part, as the turbine casing itself is viewed as a single component. Thus the configuration of mold cores used during casting of the turbine casing can be simplified, and accordingly, the number of the mold cores can be reduced. Thus, the manufacture of the turbine casing can be simplified. Further, since the turbine casing is usually formed from castings, it is possible to check the presence of burrs in the scroll through the opening part of the bearing housing.

(3) According to the present invention, in the turbine casing incorporating the scroll with the undercut, the outer peripheral part of the scroll can be axially opened by providing the insert member. Thus, even though the mold cores are split, the management of the mold cores can be simplified, and accordingly, the number of mold cores can be greatly reduced in comparison with the prior art.

(4) Since the scroll end (tongue part) in the prior art has been restrained in the turbine casing, a higher thermal stress has been normally caused. On the contrary, according to the present invention, the scroll end is split by the insert member so as to reduce the restraint, and thereby it is possible to prevent the scroll end (tongue part) from cracking.

[0102] Further, in the present invention, the nozzle mount and the insert member are integrally incorporated with each other so as to constitute the integrated nozzle mount type insert member. The integrated nozzle mount type insert member is fitted at its outer periphery in the attaching bore which is formed in the turbine casing, being opened from the scroll toward the bearing housing. The integrated nozzle mount type insert member is attached to the bearing housing by fastening means including attaching screws. With this configuration, the integrated nozzle mount type insert member can be more surely fastened to the bearing housing. Further, the number of component parts can be reduced.

[0103] Further, since no seal surfaces are present at the flange of the nozzle mount on the inner diameter side and the flange of the insert member on the turbine inner diameter side as stated above, no risk of gas leakage

would be caused. Thus, no severe dimensional management is required, and thereby it is possible to simplify the manufacture of the insert member.

[0104] Further, in the present invention, the flange part is formed in the outer peripheral part of the insert member. This flange part is clamped between the flange parts formed in the turbine casing and the bearing housing. Further, the thus obtained clamped parts are joined by the coupling in the fluid tight manner. With this configuration, the insert member is coupled in a fluid tight manner with the use of only a single coupling, and thereby it is possible to reduce the number of component parts.

[0105] Further, the above-mentioned three components, that is, the insert member, the turbine casing and the bearing housing, are fastened at their outer peripheral flange parts by the coupling, and accordingly, they can be fastened in a part where the temperature is held at a relatively low value. The coupling which is even made of relatively inexpensive materials can satisfy its fastening function.

[0106] Further, in the present invention, the snap ring is fitted in the ring groove formed in the bearing side end part of the turbine casing. The outer peripheral parts of the bearing housing and the insert member are clamped on the inside of the snap ring, and accordingly, the bearing housing and the insert member are fixed against the turbine casing by a side surface of the snap ring. With this configuration in which the snap ring is used in the fastened parts of the insert member, the turbine casing and the bearing housing, no risk of loosening of the fastened part would be caused, in comparison with the above-mentioned embodiments, and thereby it is possible to enhance the fastening strength against vibration from the engine.

[0107] Further, according to the present invention, the fastening member can be constituted only by the single snap ring itself, and accordingly, the number of component parts can be reduced. Further, since the snap ring is fitted in the inner diameter side of the turbine casing, it is possible to avoid increasing the outer diameter size of the fastened parts.

[0108] Further, in the present invention, the female thread is formed in the attaching bore in the turbine casing, and the male thread is formed at the outer periphery of the insert member. By meshing the female thread with the male thread, the outer peripheral part of the insert member is fixed between the turbine casing and the bearing housing. With this configuration, the part where the insert member and the turbine casing are fastened can be broadened. Thus, the insert member can be stably fastened. Further, since only the insert member itself can be fastened to the turbine casing, any particular attaching screw is not required. Thus, the insert member itself can be miniaturized.

[0109] Further, in the present invention, the outer peripheral part of the insert member is fixed to the bearing housing and the turbine casing by welding. Thus, no particular attaching screw for fastening the insert member

to the bearing housing or the turbine casing is required. Thereby it is possible to reduce the number of component parts.

[0110] Further, since the fastening is made by welding, the part around the seal surface can be welded, and thereby it is possible to minimize gas leakage.

[0111] Further, in the present invention, the piston ring for fluid-tight sealing is fitted between the outer periphery of the insert member and the inner periphery of the attaching bore in the turbine casing. The outer peripheral surface of the piston ring is made into slidable contact with the inner peripheral surface of the attaching bore in the turbine casing. With this configuration, gas leakage from the fastened part between the insert member and the turbine casing can be prevented by the piston ring fitted in the fastened part.

[0112] Further, in the present invention, the piston ring for fluid tight sealing is fitted between the inner peripheral surface of the insert member and the outer peripheral surface of the nozzle mount faced to the former. With this configuration, gas leakage from the fitted part between the insert member and the turbine casing can be prevented by the piston ring. Further, since the piston ring does not exert a force which is relatively large, to its associated part, it is not required to take care of a risk of deformation of the nozzle mount due to the fitting of the piston ring.

[0113] Further, in the prior art, the scroll of the turbine casing formed by casting has been formed of a casting alone. Thus, should the undercut part 11s be formed in the scroll as shown in Fig. 12, a mold core for the scroll should have a split structure.

[0114] On the contrary, according to the present invention, the opening which has no protrusion projected from the inner periphery toward the outer periphery of the scroll and which is axially linear is formed in the turbine casing. Further, the insert shroud having a protrusion projected toward the outer periphery of the scroll and serving as a part of the inner surface of the scroll is attached to the opening, and the support part of the annular nozzle plate which is coupled to the nozzle mount through the intermediary of the nozzle supports is formed in the insert shroud. Thus, the scroll has a partially split structure, and the opening having no protrusion projected from the inner peripheral part toward the outer peripheral part of the scroll and which is axially linear is formed in the scroll. Further, the insert shroud having the protrusion projected toward the outer periphery and serving as a part of the inner surface of the scroll is attached to the opening, and accordingly, the scroll can be axially opened.

[0115] With this configuration, the undercut part as in the prior art is formed by the insert shroud, and thereby it is possible to manufacture the turbine casing in an inexpensive casting configuration without using a split type mold core for the scroll while a satisfactory aerodynamic performance can be maintained.

[0116] Further, in the present invention, the insert shroud is fastened to the turbine casing with the use of

a plurality of screw members (cap screws or the like), and drilling for the fastening is in a direction which is the same as that of other bolts holes or the like in the turbine casing, and thereby it is possible to eliminate the necessity of such a planning that the direction of the drilling is changed. Thus, it is possible to minimize an increase in the man hours for the drilling.

[0117] Further, since the fastened part of the insert shroud is faced to the nozzle plates, the screw members (cap screws) are prevented from being exposed to the gas passage, and thereby it is possible to prevent the screw members from being exposed to the exhaust gas. Accordingly, the screw members (cap screws) themselves can be made of inexpensive materials. Further, even though the screw members are loosened, the screw members can be retained by the nozzle plate which is arranged adjacent thereto, and the fastening thereof can be maintained.

[0118] It is noted that the insert shroud may be directly fixed to the turbine casing by means of shrinkage fitting or the like without using a plurality of screw members (cap screws) as stated above. With this configuration, the spigot parts of both insert shroud and the turbine casing are made to be longer, and thereby it is possible to obtain stable fastening.

[0119] Further, the present invention can include a configuration in combination of claim 1 and claim 10. With this configuration, synergetic technical effects and advantages can be obtained from the configuration stated in claim 1 and that stated in claim 10, and thereby it is possible to obtain an attaching structure of the variable nozzle mechanism which is practically excellent, in a variable-throat exhaust turbocharger.

Claims

1. A mounting structure for a variable nozzle mechanism (100) which is incorporated in a variable-throat exhaust turbocharger, and in which exhaust gas from an engine is led through a scroll (11) formed in a turbine casing (10), and a plurality of nozzle vanes (2) arranged on the inner peripheral side of the scroll (11), and is then applied to a turbine rotor (12) provided in the inner peripheral side of the nozzle vanes (2), and the plurality of nozzle vanes (2) are rotatably supported on an annular nozzle mount (4) so as to change the blade angle of the nozzle vanes (2) in order to regulate the flow rate of the exhaust gas applied onto the turbine rotor (12), **characterized in that** an annularly formed insert member (20) is removably attached to the outer periphery of the nozzle mount (4), **in that** the insert member (20) is fitted at its outer periphery in an attaching bore (10a) which is formed in the turbine casing and which is opened from the scroll toward a bearing housing (10), and **in that** the insert member (20) is attached to the bearing housing (13).

2. A mounting structure for a variable nozzle mechanism (100) which is incorporated in a variable-throat exhaust turbocharger, and in which exhaust gas from an engine is led through a scroll (11) formed in a turbine casing (10) and a plurality of nozzle vanes (2) arranged on the inner peripheral side of the scroll (11), and is then applied to a turbine rotor (12) provided in the inner peripheral side of the nozzle vanes (2), and the plurality of nozzle vanes (2) are rotatably supported on an annular nozzle mount (4) so as to change the blade angle of the nozzle vanes (2) in order to regulate the flow rate of the exhaust gas applied onto the turbine rotor (12), **characterized in that** the nozzle mount (4) and an insert member (20) are integrally incorporated with each other so as to form an integrated nozzle mount type insert member (26), **in that** the integrated nozzle mount type insert member (26) is fitted at its outer periphery in an attaching bore (10a) which is formed in the turbine casing (10) and which is opened from the scroll (11) toward a bearing housing (13), and **in that** the integrated nozzle mount type insert member (26) is attached to the bearing housing (13).
3. A mounting structure for a variable nozzle mechanism (100) in a variable-throat exhaust turbocharger according to claim 2, **characterized in that** the insert member (20) is attached thereto with the nozzle mount (4) and a variable nozzle mechanism member including the nozzle vanes (2) attached to the nozzle mount (4) so as to form an integrated nozzle mount and insert member assembly structure, and **in that** the nozzle mount and insert member assembly structure is fixed to the bearing housing (13) by fastening members including bolts (25) and attaching screws (21).
4. A mounting structure for a variable nozzle mechanism in a variable-throat exhaust turbocharger according to claim 1 or 2, **characterized in that** the insert member (20) is formed in its outer peripheral part with a flange part (20s), **in that** the flange part is clamped between flange parts formed in the turbine casing (10) and the bearing housing (13), and **in that** the thus formed clamped parts are joined at their outer peripheries by a coupling (28) in a fluid tight manner.
5. A mounting structure for a variable nozzle mechanism (100) in a variable-throat exhaust turbocharger according to claim 1 or 2, **characterized in that** a snap ring (29) is fitted in a ring groove (30) formed in a side end part of the bearing housing (13) in the turbine casing (10), **in that** the outer peripheral parts of the bearing housing (13) and the insert member (20) are clamped between the snap ring (29) and the turbine casing (10), and **in that** the bearing housing (13) and the insert member (20) are fixed to the turbine casing (10) by a side surface of the snap ring (29).
6. A mounting structure for a variable nozzle mechanism (100) in a variable-throat exhaust turbocharger according to claim 1 or 2, **characterized in that** a female thread is formed in the attaching bore (10b) in the turbine casing (10) while a male thread is formed at the outer periphery of the insert member (20), and **in that** the outer peripheral part of the insert member (20) is fixed between the turbine casing (10) and the bearing housing (13) by meshing the female thread with the male thread.
7. A mounting structure for a variable nozzle mechanism (100) in a variable-throat exhaust turbocharger according to claim 1 or 2, **characterized in that** the outer peripheral part of the insert member (20) is fixed to the bearing housing (13) and the turbine casing (10) by welding.
8. A mounting structure for a variable nozzle mechanism (100) in a variable-throat exhaust turbocharger according to claim 1 or 2, **characterized in that** a piston ring (34) for fluid tight sealing is fitted between the outer periphery of the insert member (20) and the inner periphery of the attaching bore (10b) in the turbine casing (10), and **in that** the outer peripheral surface of the piston ring (34) is made into slidable contact with the inner peripheral surface of the attaching bore (10b) in the turbine casing (10).
9. A mounting structure for a variable nozzle mechanism (100) in a variable-throat exhaust turbocharger according to claim 1, **characterized in that** a piston ring (35) for fluid tight sealing is fitted between the inner peripheral surface of the insert member (20) and the outer peripheral surface of the nozzle mount (4) which is faced to the inner peripheral surface.
10. A mounting structure for a variable nozzle mechanism (100) which is incorporated in a variable-throat exhaust turbocharger, and in which exhaust gas from an engine is led through a scroll (11) formed in a turbine casing (10) and a plurality of nozzle vanes (2) arranged on the inner peripheral side of the scroll (11), and is then applied to a turbine rotor (12) provided in the inner peripheral side of the nozzle vanes (2), and the plurality of nozzle vanes (2) are rotatably supported on an annular nozzle mount (4) so as to change the blade angle of the nozzle vanes (2) in order to regulate the flow rate of the exhaust gas applied onto the turbine rotor (12), **characterized in that** the turbine casing (10) is formed therein with an opening which has no protrusion projected from the inner peripheral surface toward the outer periphery surface of the scroll (11), and which is axially linear, **in that** an insert shroud (36) having a protrusion

sion (36y) which is projected toward the outer periphery of the scroll (11) and which serves as a part of the inner surface of the scroll (11) is attached to the opening, and **in that** a support part of an annular nozzle plate (36z) which is coupled to the nozzle mount (4) through the intermediary of a nozzle support (5) is formed in the insert shroud. 5

- 11.** A mounting structure for a variable nozzle mechanism (100) which is incorporated in a variable-throat exhaust turbocharger, and in which exhaust gas from an engine is led through a scroll (11) formed in a turbine casing (10) and a plurality of nozzle vanes (2) arranged on the inner peripheral side of the scroll (11), and is then applied to a turbine rotor (12) provided in the inner peripheral side of the nozzle vanes (2), and the plurality of nozzle vanes (2) are rotatably supported on an annular nozzle mount (4) so as to change the blade angle of the nozzle vanes (2) in order to regulate the flow rate of the exhaust gas applied onto the turbine rotor (12), **characterized in that** an annularly formed insert member (20) is removably attached to the outer periphery of the nozzle mount (4), **in that** the insert member (20) is fitted at its outer periphery in an attaching bore (10a) which is formed in the turbine casing (10) and which is opened from the scroll (11) toward the bearing housing (13), **in that** the insert member (20) is attached to the bearing housing (13), **in that**, further, the turbine casing (10) is formed therein with an opening which has no protrusion projected from the inner peripheral surface toward the outer peripheral surface of the scroll (11) and which is axially linear, **in that** an insert shroud (36) having a protrusion (36y) which is projected toward the outer periphery of the scroll (11) and which serves as a part of the inner surface of the scroll (11) is attached to the opening, and **in that** a support part (36z) of an annular nozzle plate (6) coupled to the nozzle mount (4) through the intermediary of a nozzle support (5) is formed in the insert shroud. 10 15 20 25 30 35 40

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50

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FIG.1

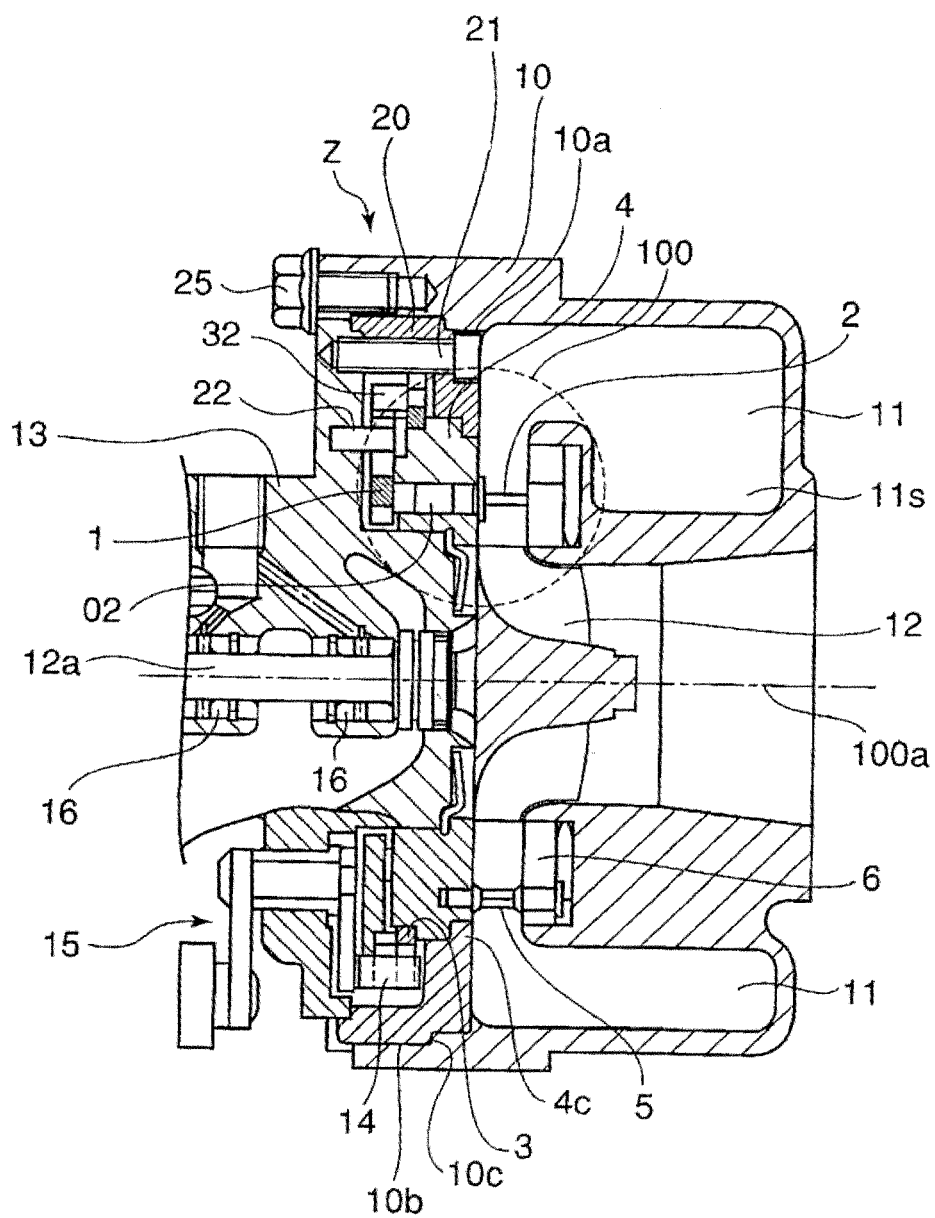


FIG.2

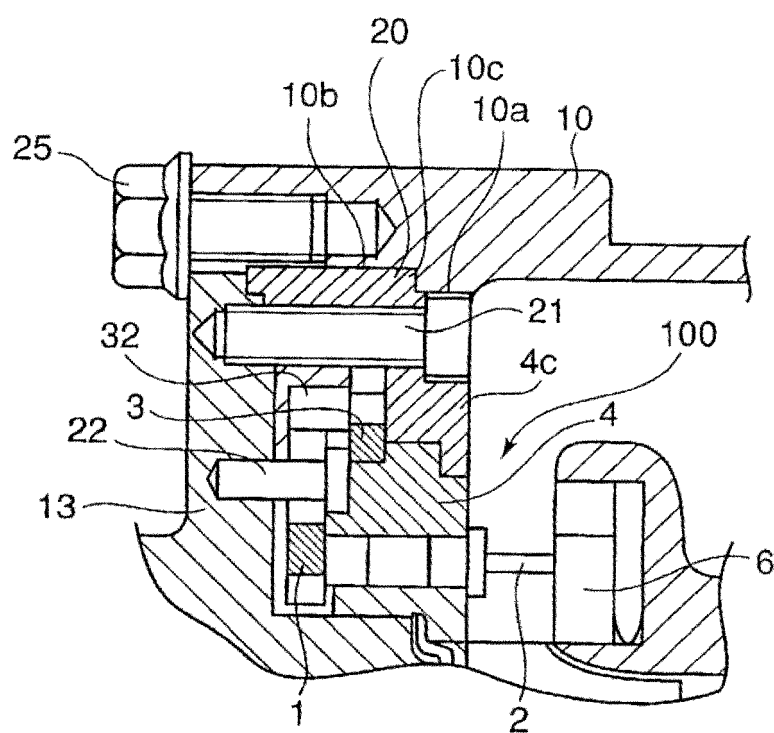


FIG.3

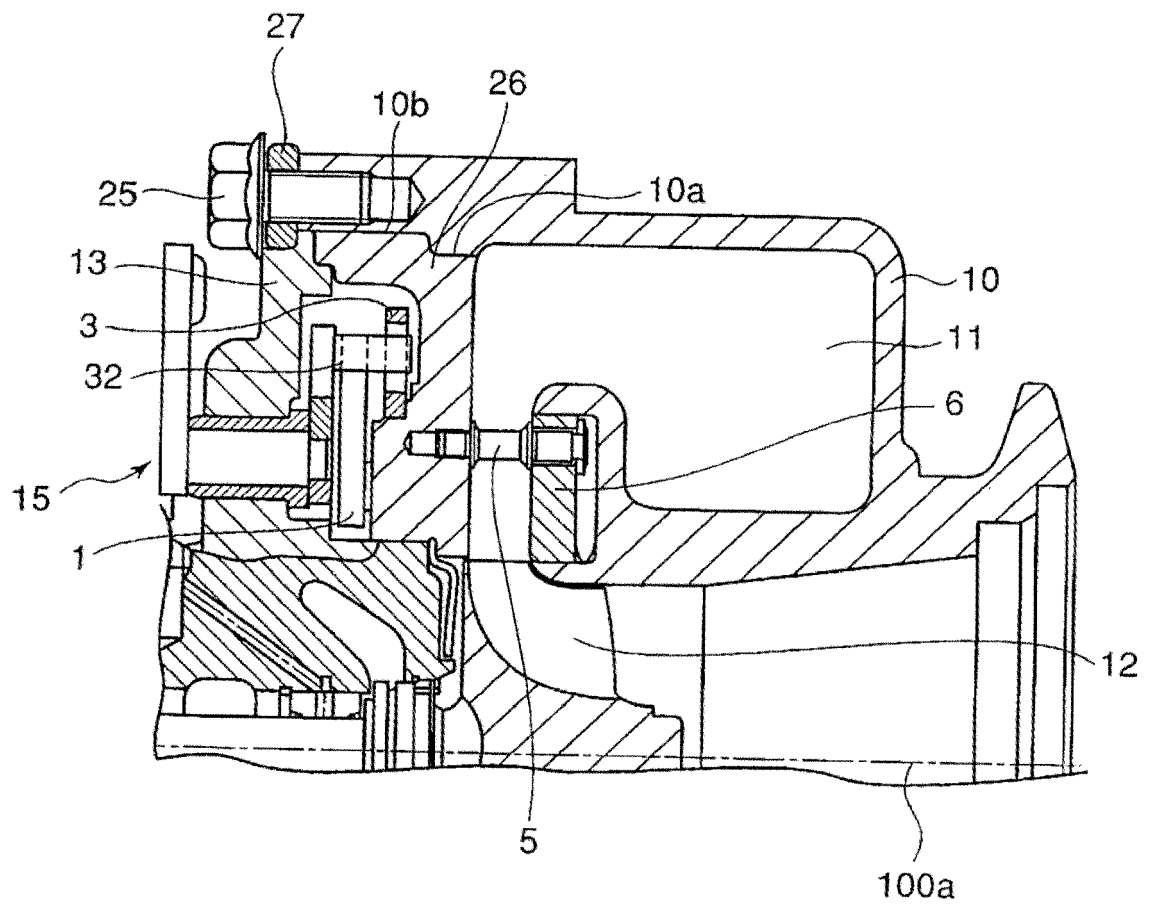


FIG.4

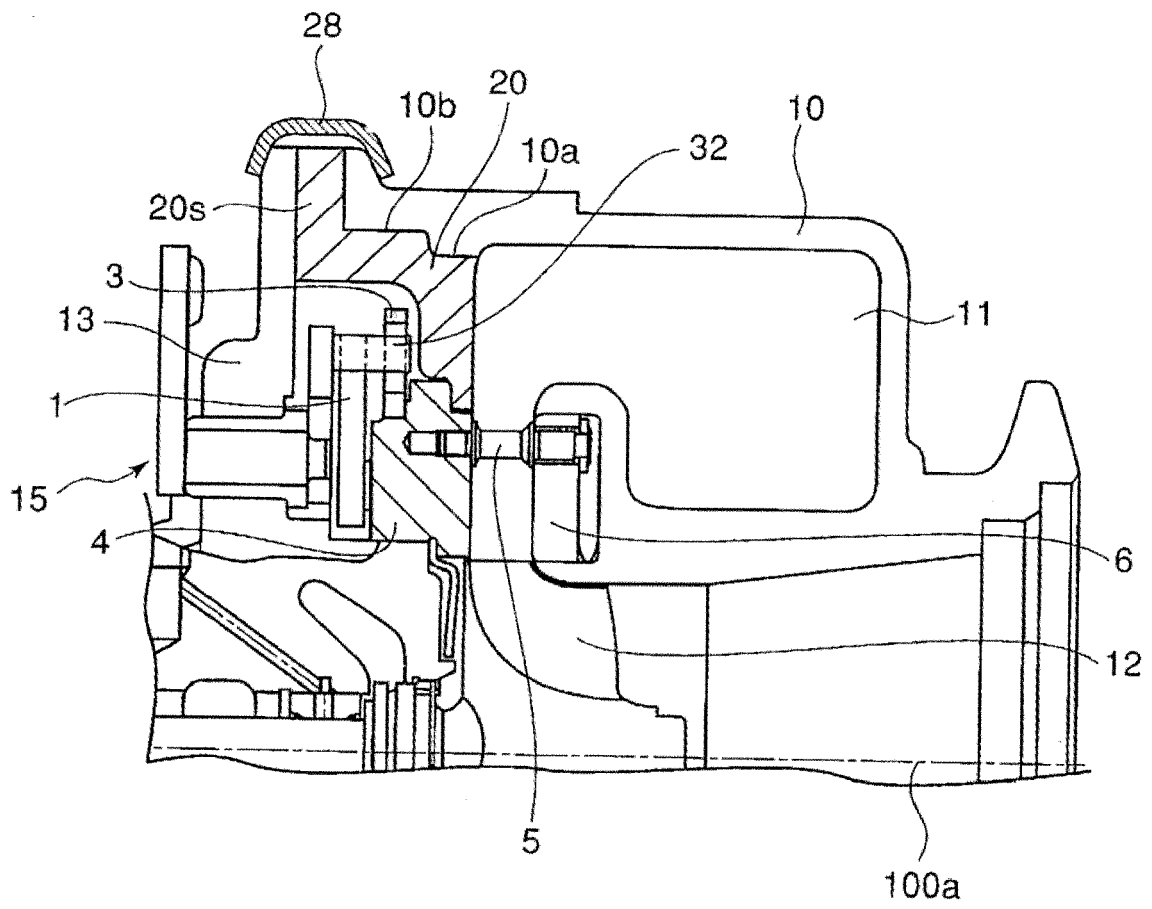


FIG.5

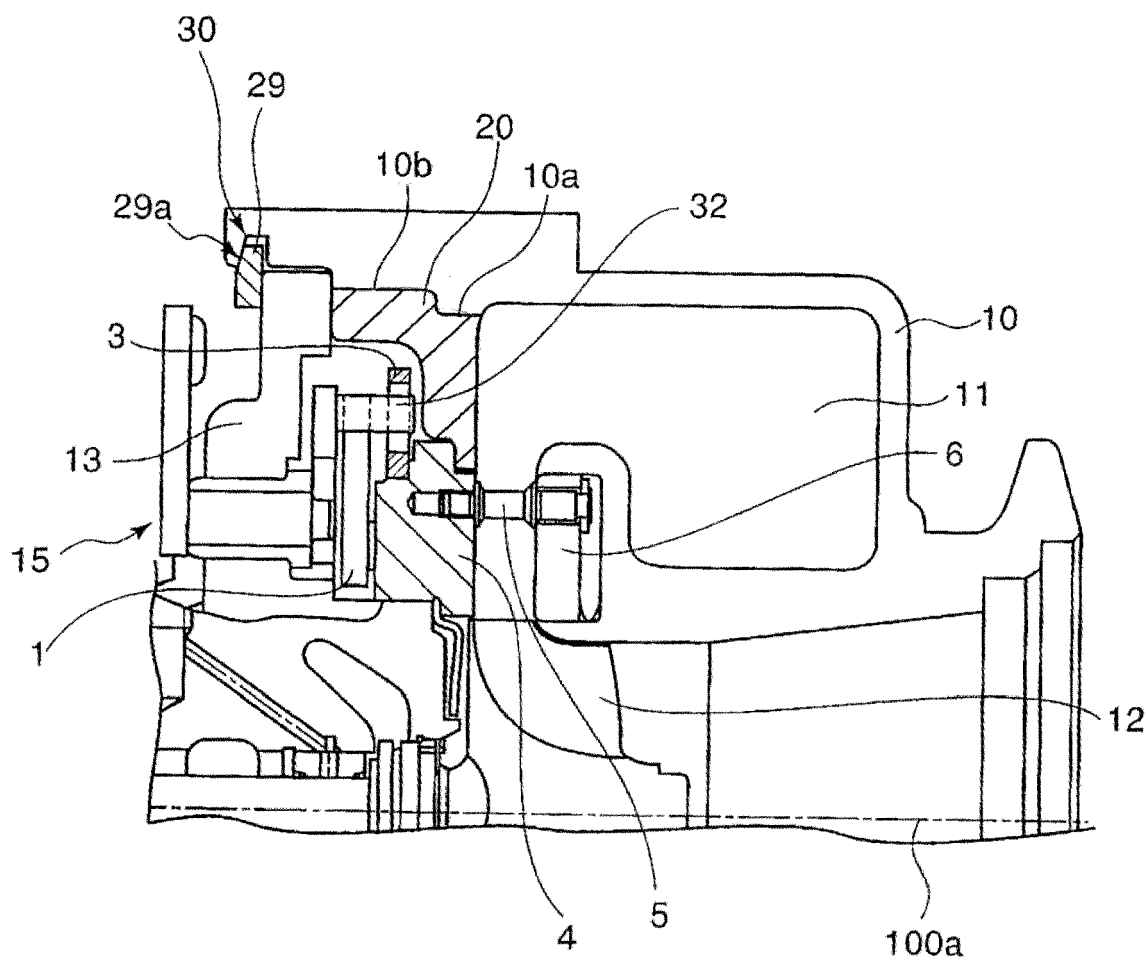


FIG.6

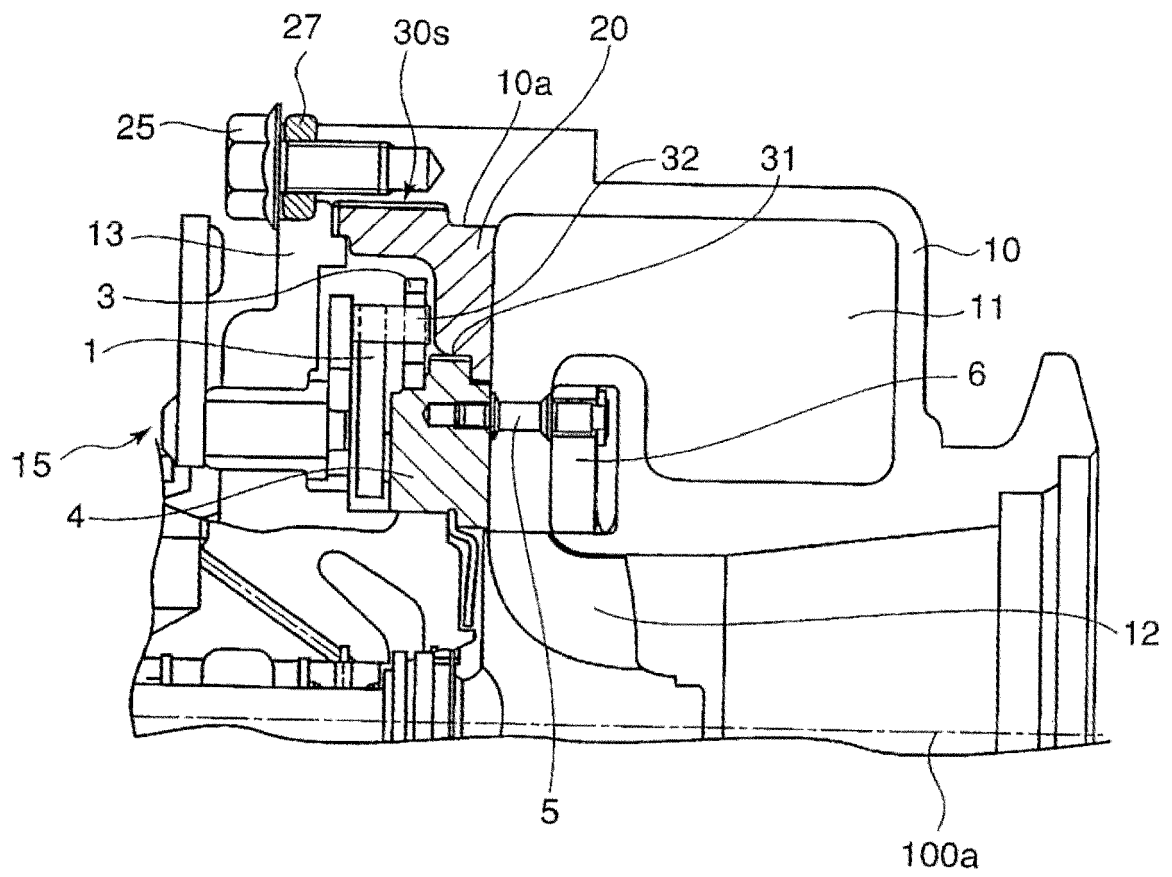


FIG.7

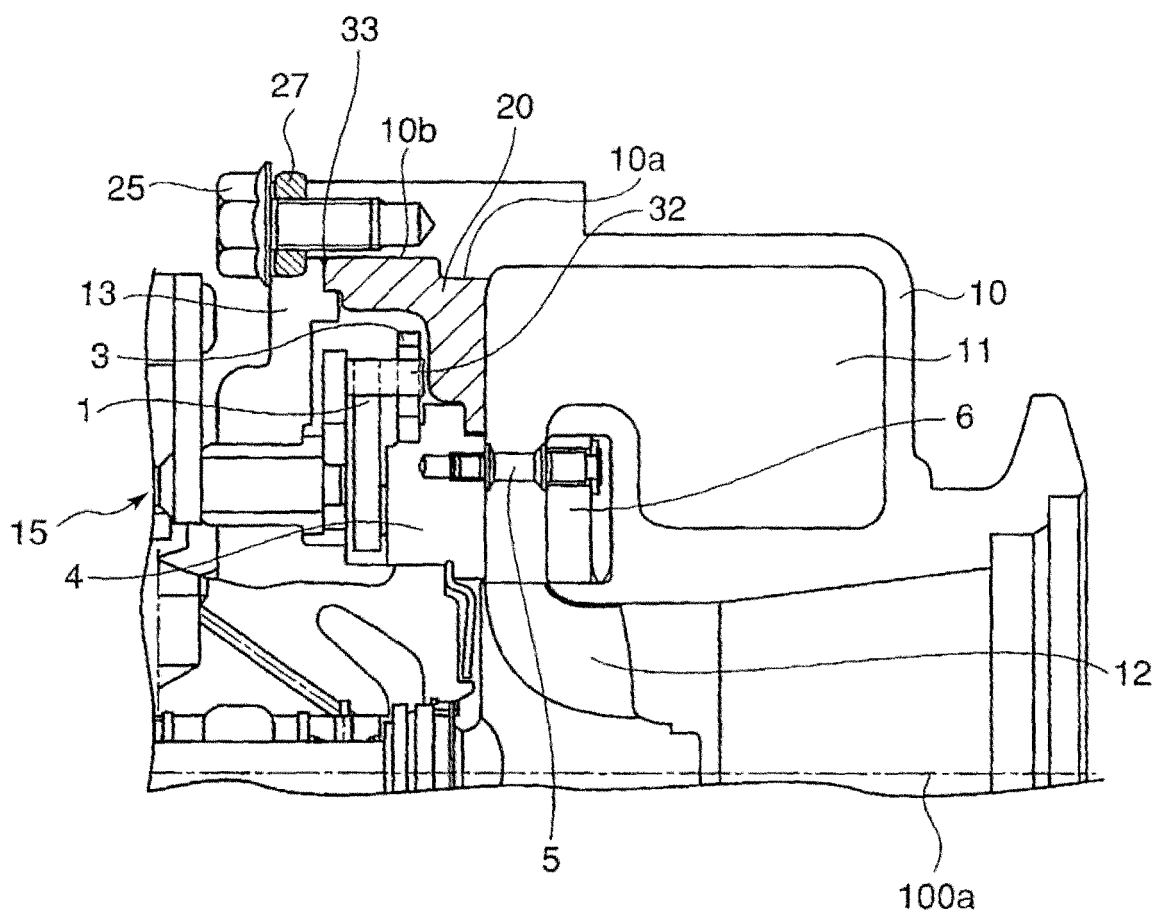


FIG.8

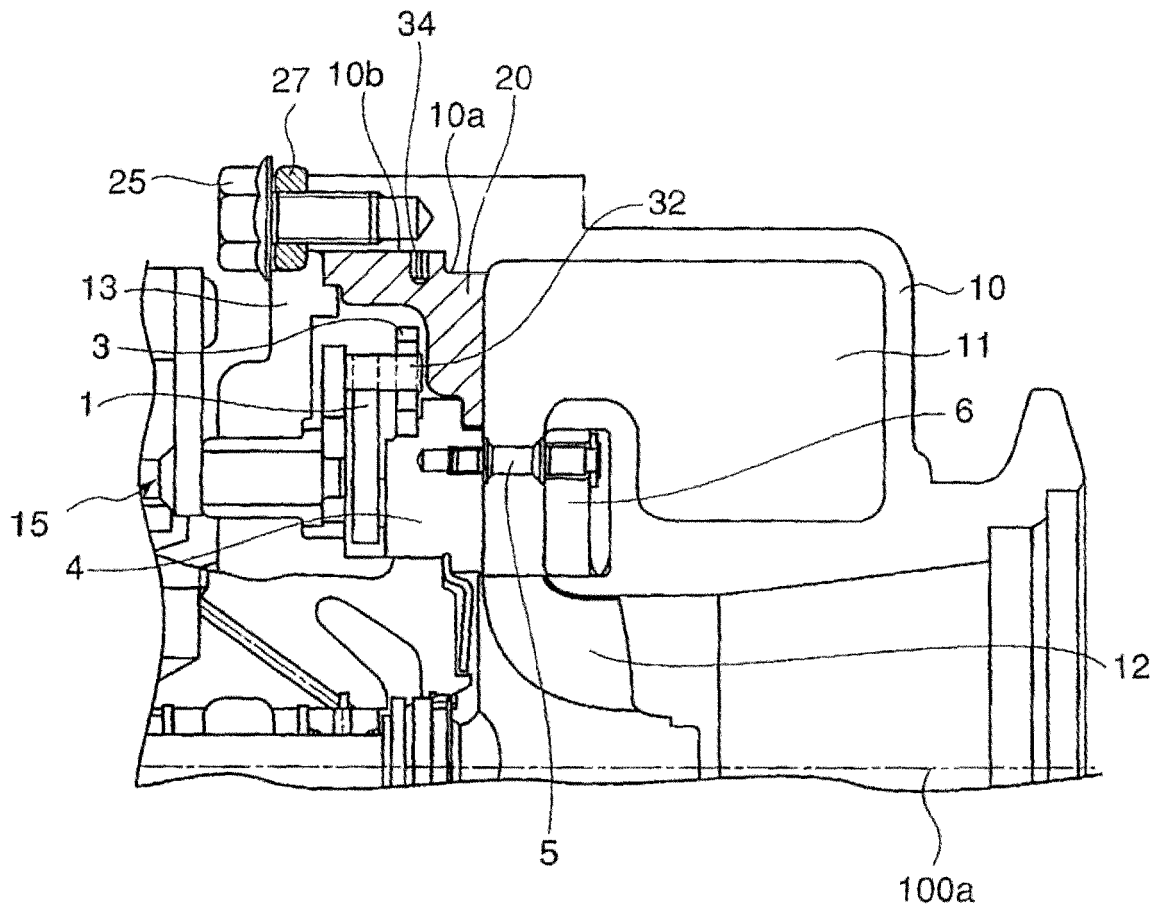


FIG.9

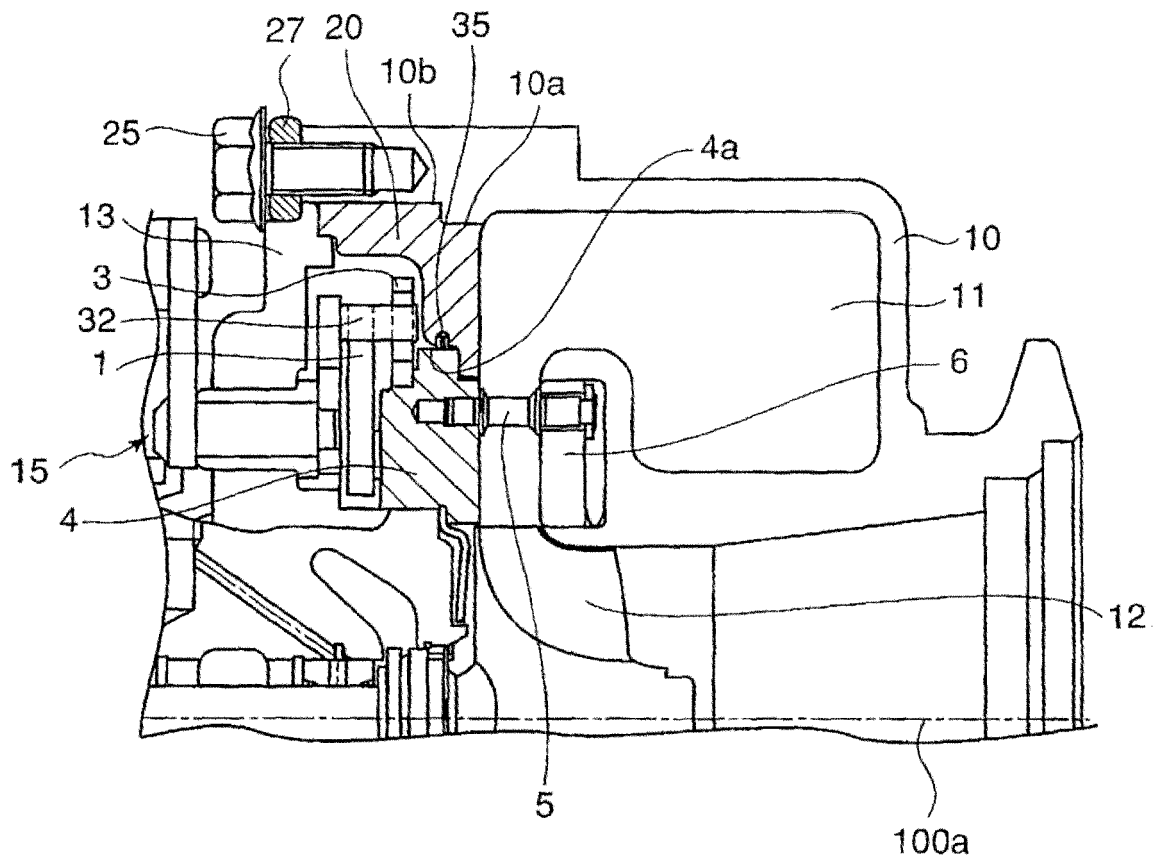


FIG. 10 B

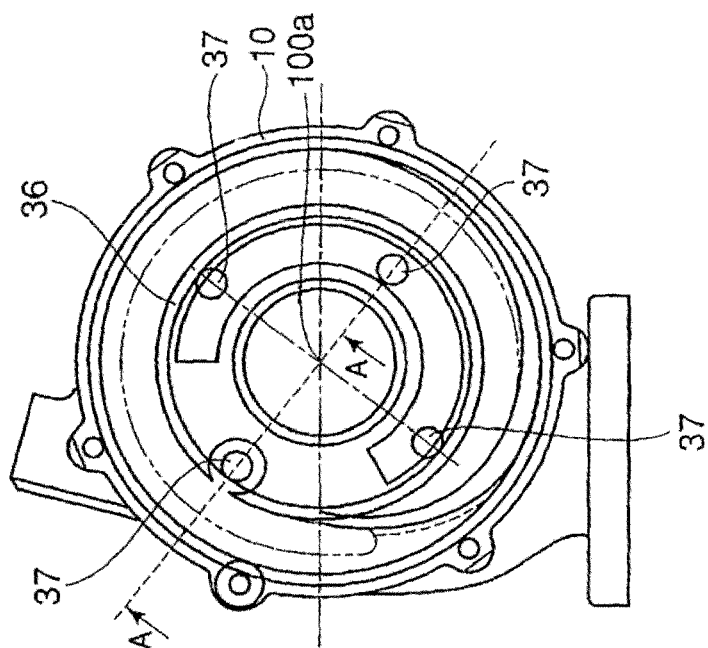


FIG. 10 A

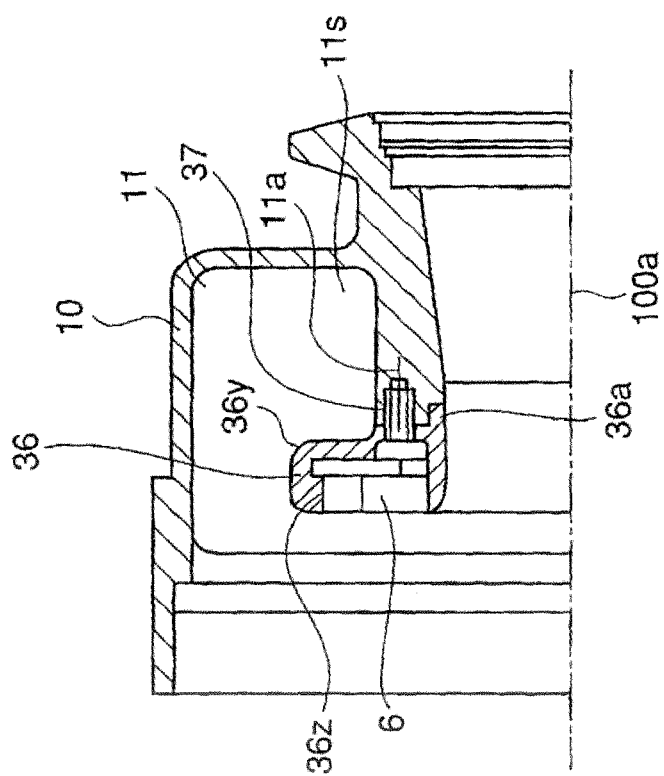


FIG. 11

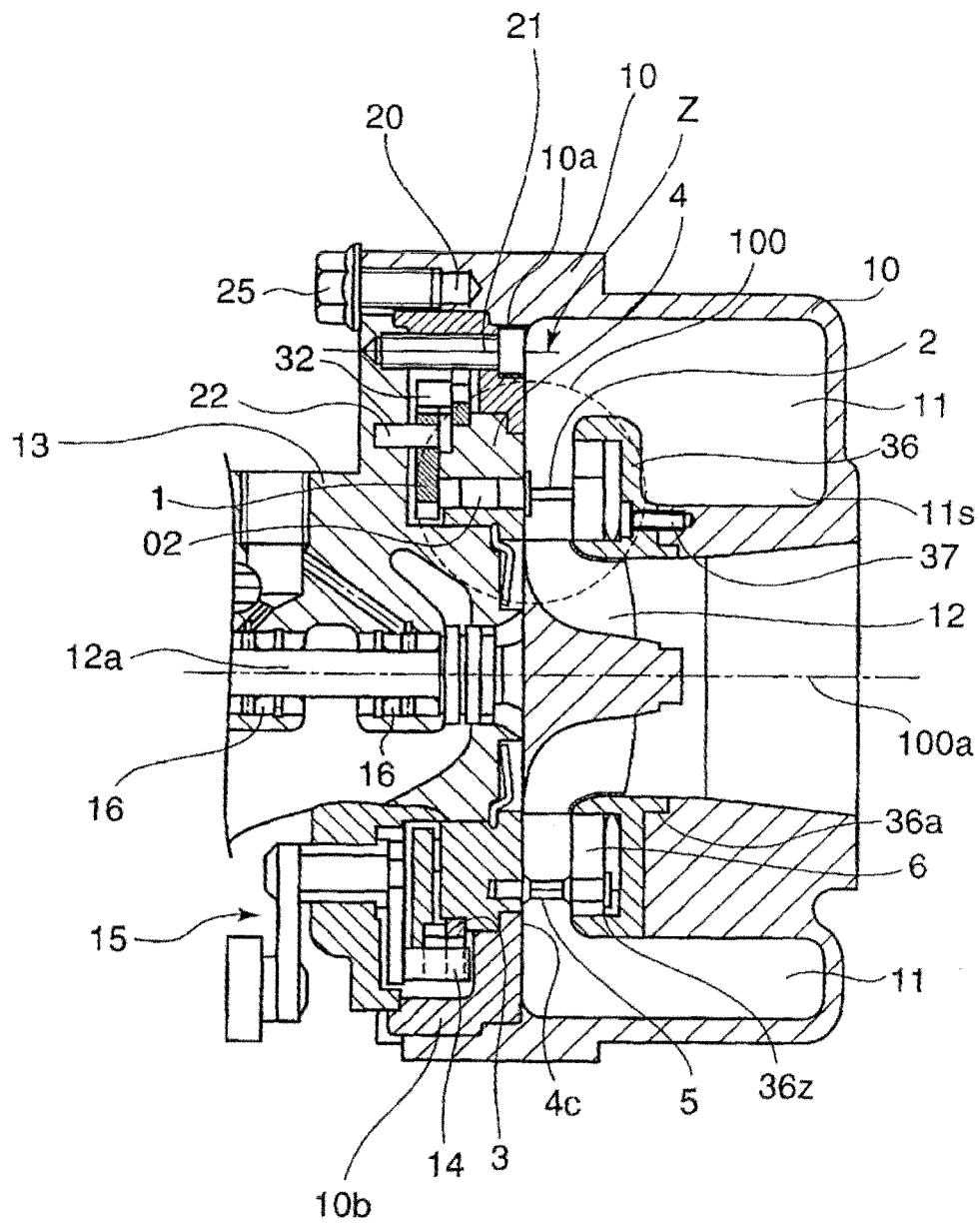
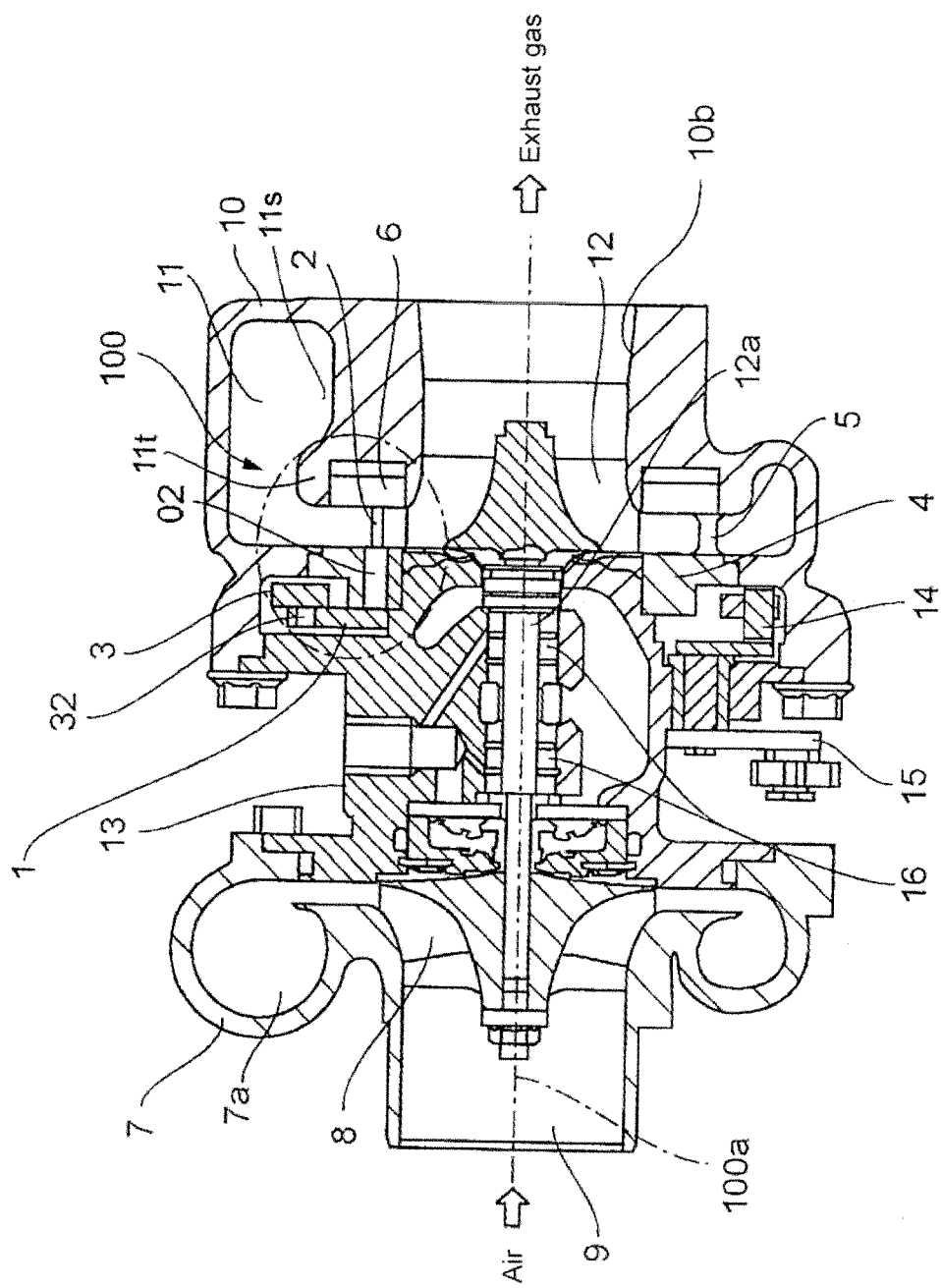


FIG.12



REFERENCES CITED IN THE DESCRIPTION

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- JP 2004132367 A [0003] [0012] [0013]