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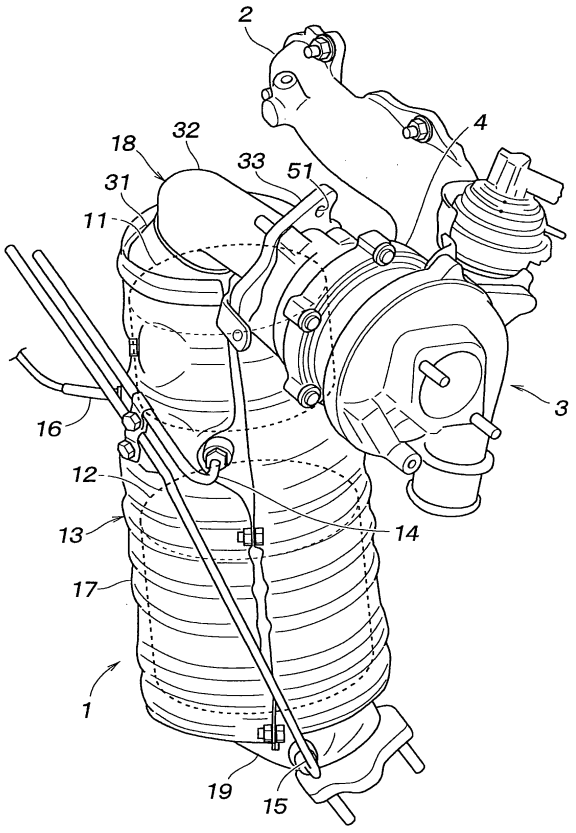
(54) Hoist arrangement for an exhaust gas purifying device

(57) The hoist arrangement for an exhaust gas purifying device (1) of the present invention allows the exhaust gas purifying device to be hoisted for the convenience of assembling or repairing the associated vehicle without risking the mechanical integrity of the device, without adding to the heat mass of the device and without increasing the number of component parts or the required amount of work. The exhaust gas purifying device comprises a main body (17) receiving an exhaust gas purifying element (11, 12) therein and oriented substantially vertically for a down flow, an inlet portion (18) provided in an upper end of the main body, an outlet portion (19) provided in a lower end of the main body and a flange member attached to the inlet end of the inlet portion for joining the exhaust gas purifying device to another exhaust device (3) provided immediately upstream of the exhaust gas purifying device, and a hoist point in such a form as a hoist hole (51) is formed in the flange member.

Fig.1



EP 2 042 700 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a hoist arrangement for hoisting, hanging or suspending an exhaust gas purifying device of an internal combustion engine of a motor vehicle during use, assembly or repair.

BACKGROUND OF THE INVENTION

[0002] A motor vehicle powered by an internal combustion engine is typically fitted with an exhaust gas purifying device for removing carbon monoxide, hydrocarbons or other undesirable substances by using a catalyst. In particular, a motor vehicle powered by a diesel engine is often fitted with an exhaust gas purifying device that is incorporated with a DPF (diesel particulate filter). See Japanese patent laid open publication numbers 2006-17018 and 2006-336506, for instance.

[0003] Particularly when the exhaust gas purifying device is incorporated with a DPF, the weight thereof becomes so great that a substantial effort is required for a worker employed for assembling or repairing the vehicle. Therefore, it has been practiced to provide a hoist point on the exhaust gas purifying device to suspend it with a hoist to facilitate the assembly or repair work.

[0004] An exhaust gas purifying device typically consists of a cylindrical canister fitted with a conical portion on each axial end, and is oriented substantially vertically so that the exhaust gas may flow downwardly through the exhaust gas purifying device. Therefore, it is conceivable to provide a hoist point in the upper conical portion which is located at the upper end of the exhaust gas purifying device.

[0005] The canister for the exhaust gas purifying device is desired to be provided with as small a mass possible for the performance thereof, and the conical portions are therefore typically formed by stamp forming relatively thin sheet metal. When a hoist point is to be provided on the upper conical portion, while it is convenient that the hoist point is provided in a substantially uppermost point of the exhaust gas purifying device, a stay has to be welded to the thin sheet metal of the upper conical portion, and a considerable difficulty is involved in ensuring a required mechanical strength of the welded part.

[0006] This problem may be circumvented by increasing the thickness of the sheet metal of the conical portion, but the resulting increase in the heat mass creates the problem of impairing the performance of the exhaust gas purifying device. Also, the use of a stay means a need for an additional component and an additional welding work.

BRIEF SUMMARY OF THE INVENTION

[0007] In view of such problems of the prior art, a primary object of the present invention is to provide a hoist arrangement for an exhaust gas purifying device that is free from the problem associated with ensuring a mechanical integrity.

[0008] A second object of the present invention is to provide a hoist arrangement for an exhaust gas purifying device that does not adds to the heat mass of the device.

[0009] A third object of the present invention is to provide a hoist arrangement for an exhaust gas purifying device that does not unduly increase the number of component parts or the required amount of work.

[0010] The present invention resolves such problems of the prior art by providing a hoist arrangement for an exhaust gas purifying device of an automotive internal combustion engine, wherein the exhaust gas purifying device comprises a main body receiving an exhaust gas purifying element therein and oriented substantially vertically for a down flow, an inlet portion provided in an upper end of the main body, an outlet portion provided in a lower end of the main body and a flange member attached to the inlet end of the inlet portion for joining the exhaust gas purifying device to another exhaust device provided immediately upstream of the exhaust gas purifying device, characterized by that: a hoist point is formed in the flange member.

[0011] As the flange member may be given with a higher rigidity than the surrounding part of the exhaust gas purifying device and is firmly and evenly joined to the inlet end of the inlet portion, the load transmitted to the flange member can be evenly distributed over the entire circumference of the inlet portion that defines a closed cross section, and no localized stress is produced in the inlet portion of the exhaust gas purifying device. Therefore, even when the entire casing of the exhaust gas purifying device may be made of stamp formed thin metal sheet for minimizing the heat mass of the device, the mechanical integrity of the device may be ensured with a high reliability. The other exhaust device may also consist of any part of the exhaust system of the engine.

[0012] Most conveniently, the hoist point may include a hoist hole passed through the flange member as it does no add to the number of component parts. If desired, the hoist point may also consist of a hook member or other protruding member screwed into or otherwise secured to the flange member.

[0013] When the inlet portion includes an elbow shaped section interposed between the flange member and an upper end of the main body, and the inlet end of the inlet portion has an axial line extending laterally, the flange member being attached to the inlet end of the inlet portion such that a major plane of the flange member extends substantially vertically and perpendicularly to the axial line of the inlet end of the inlet portion, the load acting on the flange member applies substantially no bending stress to the flange member so that the flange member may consist of a relatively thin plate member. In particular, if the hoist point is located on an upper part of the flange that substantially lies on a vertical line pass-

ing through a gravitational center of the exhaust gas purifying device, the exhaust gas purifying device may be suspended in a highly stable manner. Furthermore, because the other exhaust device required to be connected to the flange member will be located on a lateral side of the flange member, the hoist member for engaging the hoist point may be readily joined to the hoist point without being hindered by the other exhaust device, and the repair or assembly work may be facilitated.

[0014] According to a preferred embodiment of the present invention, the inlet portion is made of stamp formed metal sheet and includes a tubular portion at the inlet end thereof, and the flange member comprises a plate member having an opening which the inlet end of the inlet portion is fitted into and welded to. In this case, the welding may consist of filet welding performed both along the outer periphery of the tubular portion and along the inner periphery of the opening in the flange member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Now the present invention is described in the following with reference to the appended drawings, in which:

Figure 1 is a perspective view of an exhaust gas purifying device embodying the present invention;
Figure 2 is a front view of the exhaust gas purifying device of the present invention;
Figure 3 is a side view of the exhaust gas purifying device of the present invention;
Figure 4 is a sectional view of the upper cone portion;
Figure 5 is a sectional view taken along line V-V of Figure 4; and
Figure 6 is a fragmentary view partly in section showing a modified embodiment of the hoist point.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Figure 1 is a perspective view of an exhaust gas purifying device embodying the present invention. This exhaust gas purifying device 1 is intended to be used in association with an automotive diesel engine, and is typically mounted in a vertical orientation so as to conduct exhaust gas in a downward direction. The exhaust gas emitted from the exhaust ports of a cylinder head not shown in the drawings is passed through an exhaust manifold 2 and a turbine section 4 of a turbocharger 3, and conducted downward through the exhaust gas purifying device 1. The exhaust gas expelled from the lower end of the exhaust gas purifying device 1 is passed into an exhaust pipe (now shown in the drawings) which extends to a rear end of the vehicle after being passed under the diesel engine.

[0017] The exhaust gas purifying device 1 includes a pair of purifying elements 11 and 12 placed one after the other in a casing 13 or a canister. The upstream and downstream purifying elements 11 and 12 consist of a DOC (diesel oxidation catalyst) and a DPF (diesel particulate filter), respectively, and it is arranged such that the PM (particulate material) captured by the DPF is removed by combustion in a continuous manner (CR-DPF).

[0018] Pipes 14 and 15 are connected to a part of the casing 13 intermediate between the two purifying elements 11 and 12 and a part of the casing 13 downstream of the downstream purifying element 12 so that the pressure difference between the upstream end and downstream end of the downstream purifying element 12 may be measured and the accumulation of particulate material in the DPF may be estimated from the measured pressure difference. A temperature sensor 16 is provided between the two purifying elements 11 and 12 so that the increase in the exhaust gas temperature owing to the oxidization reaction at the oxidization catalyst forming the purifying elements 11 may be detected.

[0019] The casing 13 includes a substantially cylindrical main portion 17 receiving the two purifying elements 11 and 12 therein, an upper cone portion (inlet portion) 18 attached to the upper end of the main portion 17 for connection with the turbocharger in the upstream end thereof and a lower cone portion (outlet portion) 19 attached to the lower end of the main portion 17 for connection with an exhaust pipe in the downstream end thereof.

[0020] Figure 2 is a front view of the exhaust gas purifying device 1 shown in Figure 1, and Figure 3 is a side view of the exhaust gas purifying device 1 shown in Figure 1. Figure 4 is a sectional view of the upper cone portion, and Figure 5 is a sectional view taken along line V-V of Figure 4.

[0021] The upper cone portion 18 comprises a cone member 31 and a tubular member 32. A flange member 33 is attached to the upstream end of the tubular member 32. The tubular member 32 consists of an upper half 34 and a lower half 35. The cone member 31 and two halves 34 and 35 of the tubular member 32 are made of stamp formed steel sheet (which may be stainless steel), and are joined to one another by welding.

[0022] The cone member 31 is given with a progressively increasing diameter toward the main body 17 that receives the purifying elements 11 and 12, and is generally given with a somewhat distorted frusto-conical shape having an inlet end 37 and an outlet end 38 defining planes which are not parallel to each other.

[0023] The tubular member 32 has an inlet end 45 which opens out laterally and communicates with an outlet end of the turbocharger 3, and the flange member 33 is fitted over and welded to the inlet end of the tubular member 32 such that the major plane of the flange member 33 extends perpendicularly to the axial line of the inlet end 45 of the tubular member 32 and also vertically. The flange member 33 is provided with a plurality of mounting holes 44 through each of which is passed a stud bolt 42 extending from the mating surface of the turbocharger 3, and a nut 43 is threaded onto each stud

bolt 42 to securely attach the flange member 33 to the turbocharger 3.

[0024] The tubular member 32 is elbow-shaped, and has an outlet end 46 which is directed and opens out downward. The planes of the openings of the inlet end 45 and outlet end 46 are substantially perpendicular to each other. Thus, the exhaust gas emitted laterally (horizontally) from an exhaust outlet 47 provided in a housing 41 of the turbine section 4 of the turbocharger 3 is directed downward as it is passed through the tubular member 32 as indicated by the dotted arrow in Figure 5.

[0025] The two halves 34 and 35 are separated by a parting plane substantially in parallel with the plane of the opening of the outlet end 46. Therefore, the upper half 34 is formed by joining a trough shaped portion 34a having a semicircular cross section and a portion defined by a quarter of a sphere 34b to each other while the lower half 35 is formed by a trough shaped portion 35a having a semicircular cross section, a similar trough shaped portion 35b having an open bottom and a cylindrical portion 35c connected to the open bottom of the trough shaped portion 35b and having a track-shaped cross section. The last mentioned cylindrical portion 35c is connected to the cone member 31.

[0026] The upper half 34 is formed with a mounting hole 49 for an exhaust gas sensor (not shown in the drawings) for detecting the state of the exhaust gas of the diesel engine, such as a LAF (linear air fuel ratio) sensor for detecting the air to fuel ratio of the exhaust gas, and such a sensor may be secured in the mounting hole 49 with a forward end of the sensor projecting into an exhaust passage internally defined in the tubular member 32.

[0027] The inlet end 45 of the tubular member 32 is given with a circular cross section jointly by the trough shaped portions 34a and 35a of the upper and lower halves 34 and 35 each having a semicircular cross section, and is joined to the flange member 33 typically by fitting the inlet end 45 of the tubular member 32 into the central opening of the flange member 33 and fillet welding the two parts to each other. The tubular member 32 and flange member 33 are thus firmly and closely joined to each other over the entire circumference of the tubular member 32 so that a highly secure and air-tight joint between them can be achieved.

[0028] The flange member 33 is formed with three mounting holes 44 for receiving the stud bolts 42 for joining the exhaust gas purifying device 1 to the turbocharger 3. These mounting holes 44 are arranged concentrically with respect to the center of the inlet end 45 of the tubular member 32 in a circumferentially mutually spaced relationship. In the illustrated embodiment, three such mounting holes 44 are provided substantially at a regular interval or at apices of an equilateral (regular) triangle. The upper mounting hole 44 is provided at a point slightly offset from a vertical line (plumb line) passing through the center of the inlet end 45 of the tubular member 32.

[0029] The flange member 33 is provided with a vertically elongated (as seen in Figure 4) hoist hole 51 serving as a hoist point. The hoist hole 51 is provided in an upper part of the flange member 33 offset from the vertical line passing through the center of the inlet end 45 of the tubular member 32 to a side remote from the upper mounting hole 44. The position of the hoist hole 51 is selected so as to lie on a vertical line (plumb line) passing through the gravitational center of the exhaust gas purifying device 1. Thereby, when the exhaust gas purifying device 1 is hoisted at the hoist hole 51, the exhaust gas purifying device 1 can be suspended in a highly stable manner.

[0030] Thus, the exhaust gas purifying device 1 can be hoisted by engaging the hoist hole 51 of the flange member 33 with a hook 52 connected to an end of a chain 53 as illustrated in Figures 2 and 3. At this time, the flange member 33 is subjected to a load equal to the weight of the exhaust gas purifying device 1. However, the load that is transmitted from the flange member 33 to the tubular member 32 is evenly distributed over the entire circumference of the tubular member 32 which defines a closed cross section so that no localized stress is produced in the tubular member 32 and the integrity of the exhaust gas purifying device 1 is ensured with a high reliability.

[0031] Also, as best shown in Figure 1, the turbocharger 3 which is connected to the exhaust gas purifying device 1 is located on one side of the flange member 33 so that the hook may be engaged with the hoist hole 51 from above without being hindered by the turbocharger 3 and the efficiency of the assembly work and/or repair work can be improved.

[0032] In the forgoing embodiment, the hoist point consisted of the hole 51 formed in the flange member 33, but may also consist of any other feature such as a projection as long as it can be used for connecting a hoist member thereto. Figure 6 shows such an example in which the hoist point consists of a hoist hook 51' screwed into the flange 33.

[0033] Although the present invention has been described in terms of a preferred embodiment thereof, it is obvious to a person skilled in the art that various alterations and modifications are possible without departing from the scope of the present invention which is set forth in the appended claims.

[0034] The contents of the original Japanese patent application on which the Paris Convention priority claim is made for the present application are incorporated in this application by reference.

[0035] The hoist arrangement for an exhaust gas purifying device (1) of the present invention allows the exhaust gas purifying device to be hoisted for the convenience of assembling or repairing the associated vehicle without risking the mechanical integrity of the device, without adding to the heat mass of the device arid without increasing the number of component parts or the required amount of work. The exhaust gas purifying device comprises a main body (17) receiving an exhaust gas purifying element (11, 12) therein and oriented substantially

vertically for a down flow, an inlet portion (18) provided in an upper end of the main body, an outlet portion (19) provided in a lower end of the main body and a flange member attached to the inlet end of the inlet portion for joining the exhaust gas purifying device to another exhaust device (3) provided immediately upstream of the exhaust gas purifying device, and a hoist point in such a form as a hoist hole (51) is formed in the flange member.

Claims

1. A hoist arrangement for an exhaust gas purifying device (1) of an automotive internal combustion engine, wherein the exhaust gas purifying device comprises a main body (17) receiving an exhaust gas purifying element therein and oriented substantially vertically for a down flow, an inlet portion (18) provided in an upper end of the main body, an outlet portion (19) provided in a lower end of the main body and a flange member (33) attached to the inlet end of the inlet portion for joining the exhaust gas purifying device to another exhaust device (3) provided immediately upstream of the exhaust gas purifying device, **characterized by** that:

   a hoist point (51, 51') is formed in the flange member.

2. The hoist arrangement for an exhaust gas purifying device according to claim 1, wherein the hoist point includes a hoist hole (51) passed through the flange member.

3. The hoist arrangement for an exhaust gas purifying device according to claim 1, wherein the inlet portion includes an elbow shaped section (32) interposed between the flange member and an upper end of the main body, and the inlet end of the inlet portion has an axial line extending laterally, the flange member being attached to the inlet end of the inlet portion such that a major plane of the flange member extends substantially vertically and perpendicularly to the axial line of the inlet end of the inlet portion.

4. The hoist arrangement for an exhaust gas purifying device according to claim 4, wherein the hoist point is located on an upper part of the flange that substantially lies on a vertical line passing through a gravitational center of the exhaust gas purifying device.

5. The hoist arrangement for an exhaust gas purifying device according to claim 1, wherein the inlet portion is made of stamp formed metal sheet and includes a tubular portion at the inlet end thereof, and the flange member comprises a plate member having an opening which the inlet end of the inlet portion is fitted into and welded to.

Fig.1

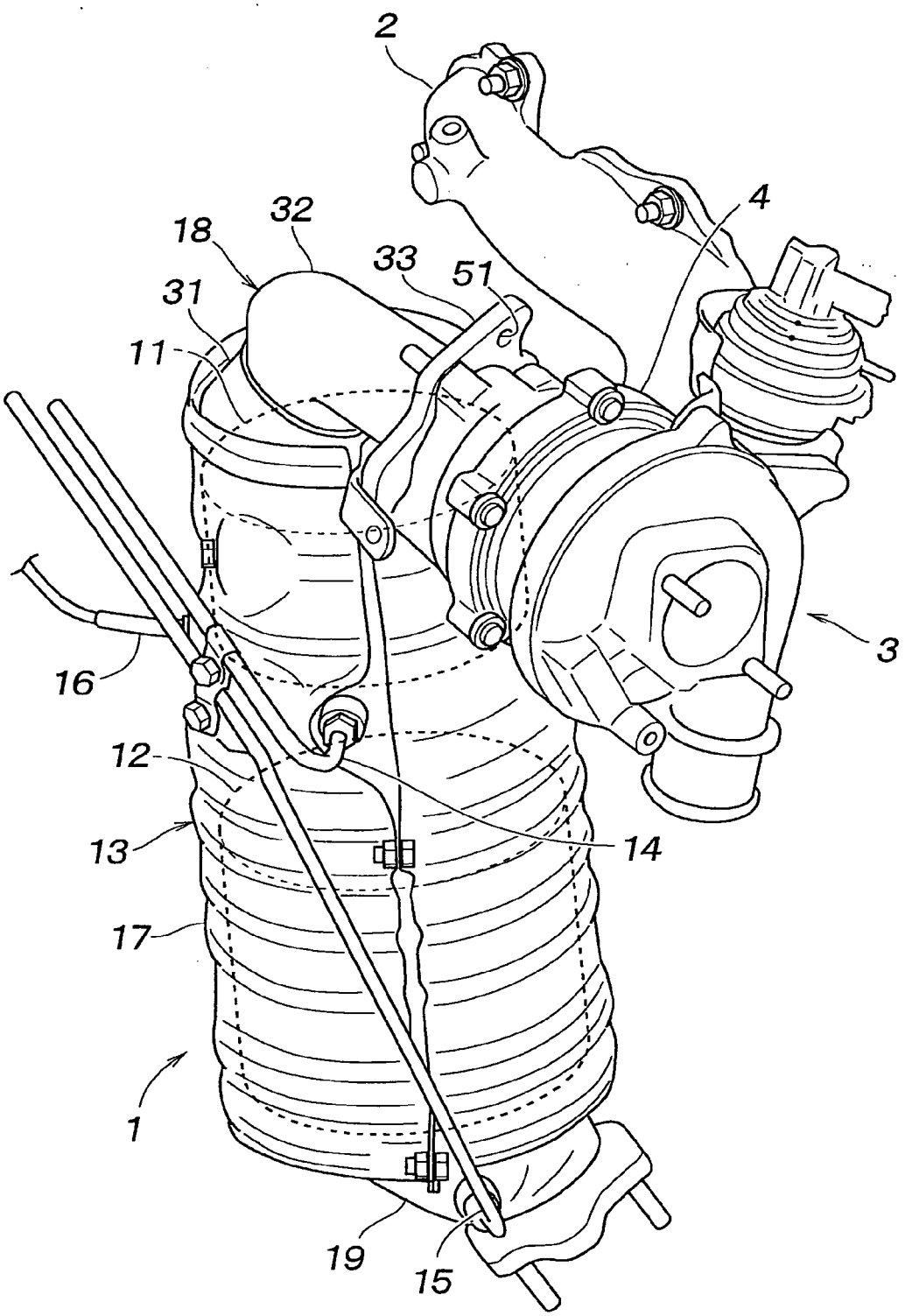


Fig.2

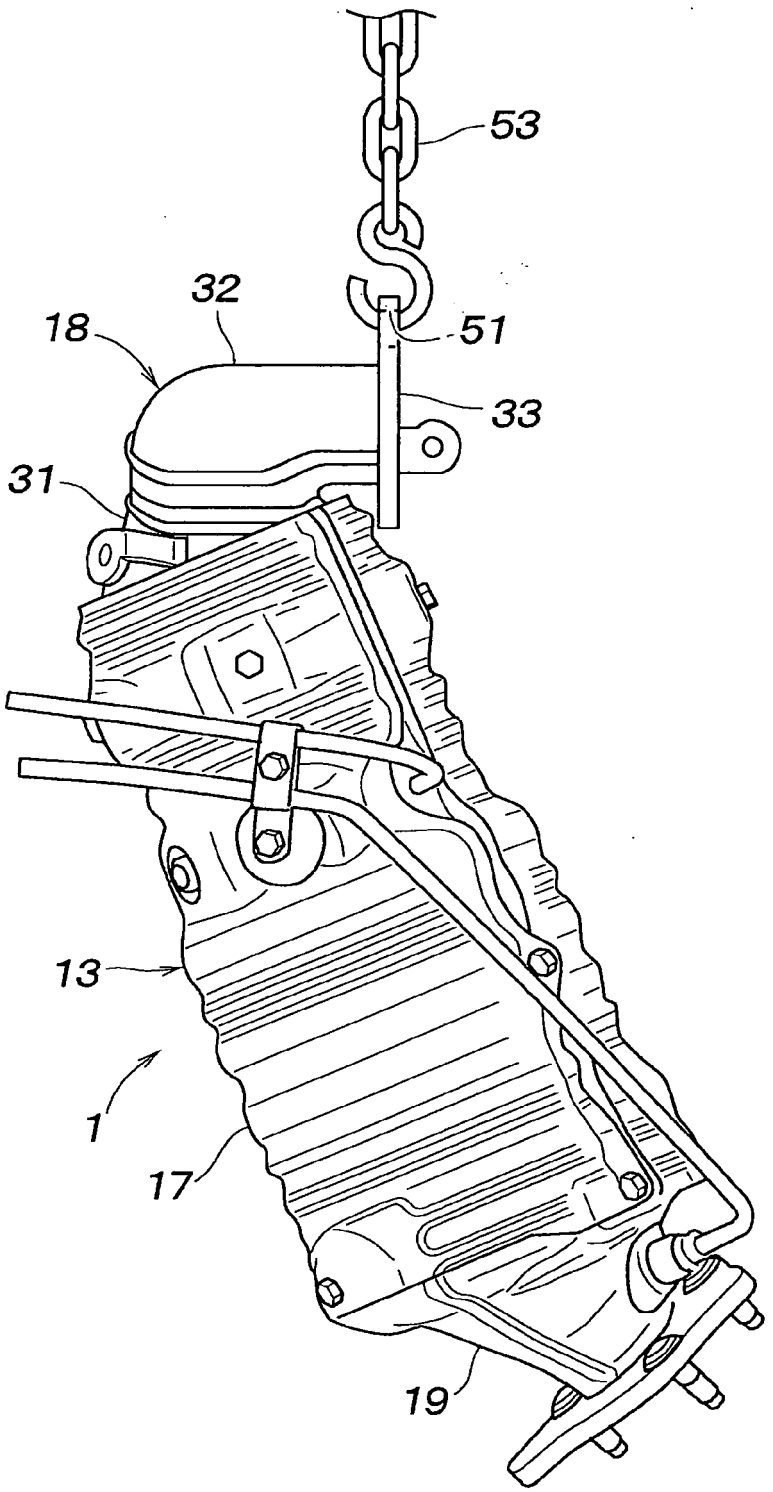


Fig.3

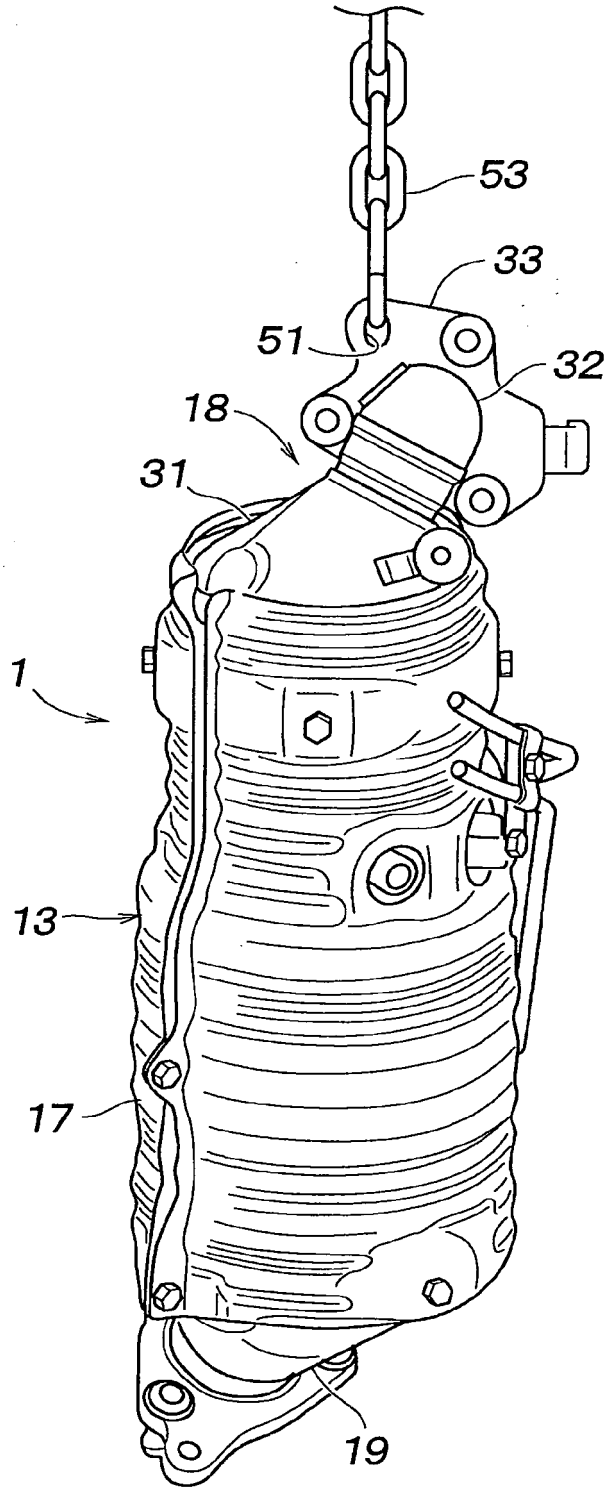


Fig.4

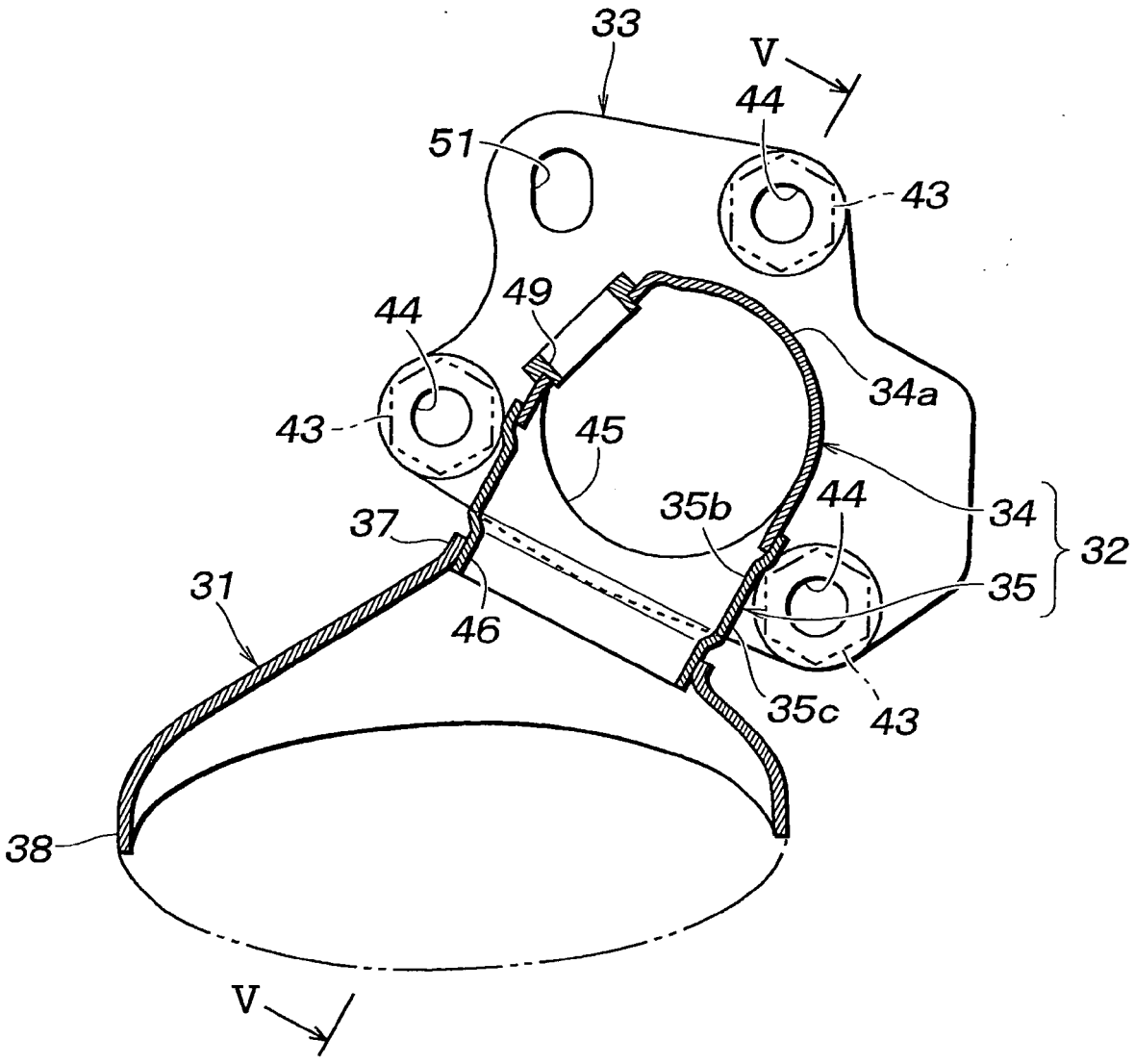


Fig.5

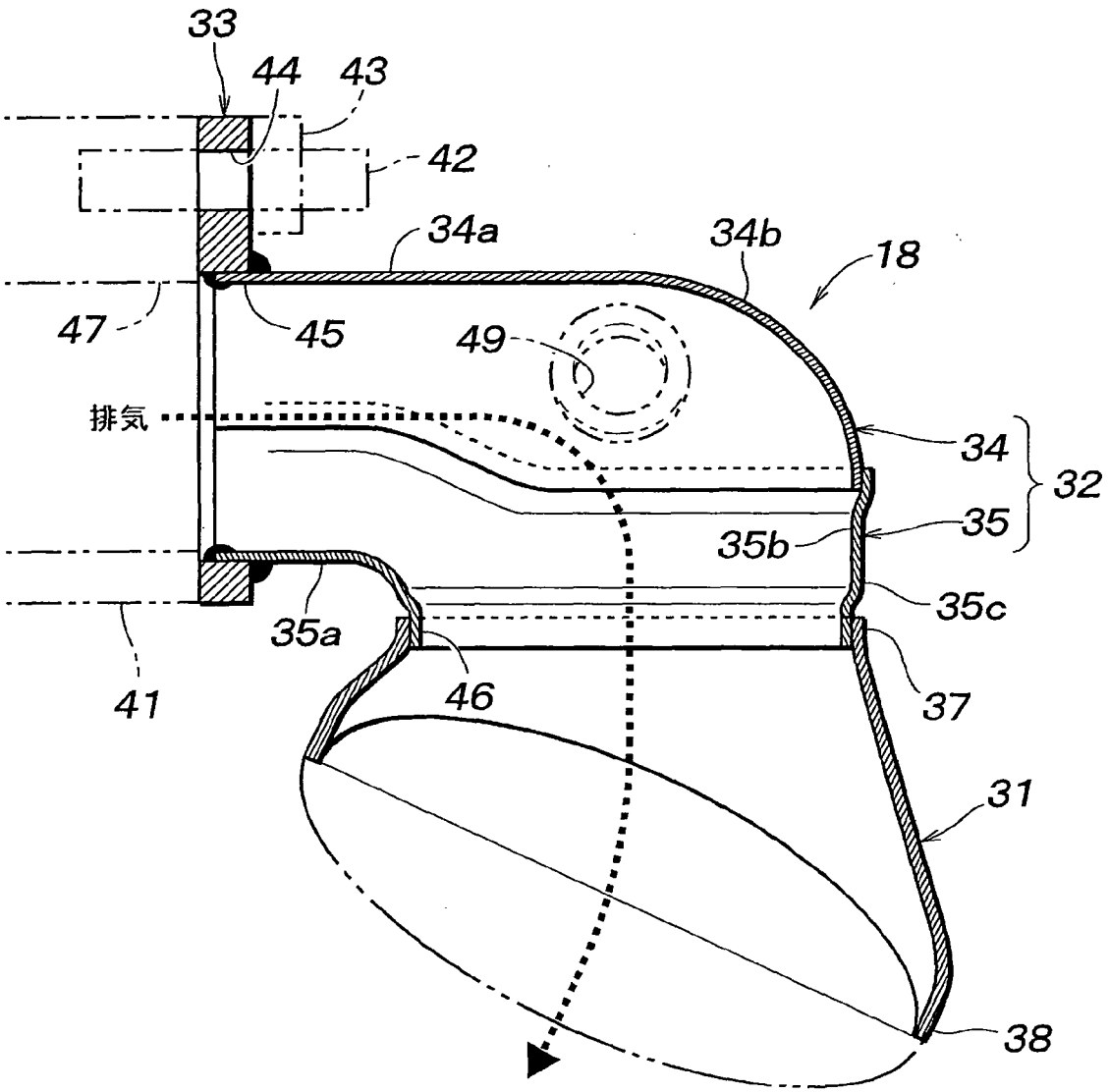
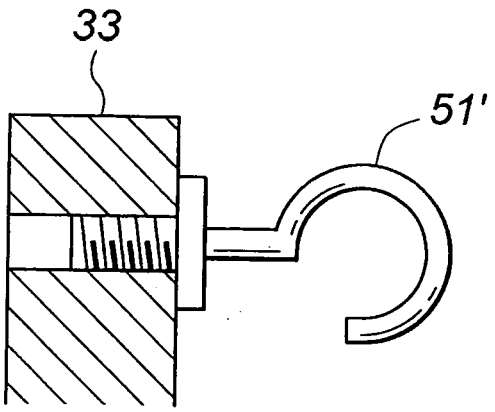


Fig.6



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EUROPEAN SEARCH REPORT

Application Number
EP 08 01 3558

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

F01N
B66C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 September 2008	Tatus, Walter

CATEGORY OF CITED DOCUMENTS

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