



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
06.11.2013 Bulletin 2013/45

(51) Int Cl.:
F01N 13/08 (2010.01) E02F 9/00 (2006.01)

(21) Application number: **10861253.2**

(86) International application number:
PCT/KR2010/009362

(22) Date of filing: **27.12.2010**

(87) International publication number:
WO 2012/091188 (05.07.2012 Gazette 2012/27)

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

(72) Inventor: **JANG, Jin-Ho**
Changwon-si
Gyeongsangnam-do 645-773 (KR)

(71) Applicant: **Volvo Construction Equipment AB**
631 85 Eskilstuna (SE)

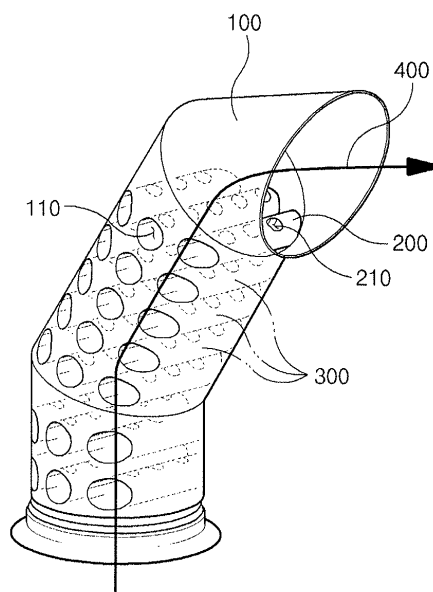
(74) Representative: **Zimmermann, Tankred Klaus et al**
Schoppe, Zimmermann, Stöckeler & Zinkler
Patentanwälte
Postfach 246
82043 Pullach bei München (DE)

(54) **EXHAUST GAS TREATMENT DEVICE FOR CONSTRUCTION MACHINE**

(57) An exhaust gas treatment apparatus for a construction machine is provided, which is connected to a diesel particulate filter trap (DPF) to discharge exhaust gas from an engine to outside through the DPF. The exhaust gas treatment apparatus for a construction machine includes a tail pipe main body provided with a plurality of ventilation holes penetratingly formed on the tail pipe main body to allow the outside air to pass through

the ventilation holes, and installed on an outlet of the DPF; an exhaust heat dissipation unit provided with a plurality of tubes which respectively communicate with the ventilation holes, and are installed in a horizontal direction of the tail pipe main body; and a plurality of exhaust holes located in a longitudinal direction of the tubes and penetratingly formed in an exhaust gas discharge direction.

[Fig. 2]



Description

TECHNICAL FIELD

[0001] The present invention relates to an exhaust gas treatment apparatus for a construction machine. More particularly, the present invention relates to an exhaust gas treatment apparatus for a construction machine, which is connected to a diesel particulate filter trap (DPF) to discharge exhaust gas from an engine to outside through the DPF, and can lower the temperature of the exhaust gas that is discharged in the air using heat exchange effects between the high-temperature exhaust gas and tubes for guiding external air, that has exhaust holes in an exhaust direction so that the tubes communicate with ventilation holes formed on a tail pipe main body.

BACKGROUND ART

[0002] A tail pipe is a pipe which is located in the rear of a heavy equipment muffler to guide exhaust gas, which has substantially stabilized pressure as passing through several partitions, to be discharged in the air. Fig. 1 is a perspective view illustrating a tail pipe in the related art. As shown in Fig. 1, the shape of the tail pipe in the related art is limited in temperature reduction of hot air from a DPF. That is, due to the structural problem of the tail pipe, the exhaust gas is discharged in the air in a state where heat of the exhaust gas is not efficiently reduced. The DPF is a device which can reduce smoke levels by 80% or more by capturing particulate matters discharged from a diesel engine with a filter to burn the captured particulate matters and then capturing particulate matters again to continue using the captured particulate matters. Heat that is generated from the DPF is discharged to outside through the tail pipe. In the tail pipe structure in the related art, outer flow of the exhaust gas on the inner surface of the tail pipe can exchange heat with the outside air that is inhaled from a pipe inlet to achieve the effect of temperature reduction, but the center portion of the main flow of the exhaust gas is discharged in the air without exchanging heat with the outside air. In the case of a construction machine, e.g., an excavator, which frequently works in a forest area or in an airtight space, the high-temperature exhaust gas may cause fires or burns to occur. Accordingly, there is a need for temperature reduction of the exhaust gas for safety at work.

DISCLOSURE

TECHNICAL PROBLEM

[0003] Therefore, the present invention has been made to solve the above-mentioned problems occurring in the related art, and one subject to be achieved by the present invention is to prepare a tail pipe which can efficiently lower the maximum temperature of an exhaust

gas by making the exhaust gas discharged from the tail pipe exchange heat with outside air over the whole area in the tail pipe.

5 TECHNICAL SOLUTION

[0004] In accordance with an aspect of the present invention, an exhaust gas treatment apparatus for a construction machine, which is connected to a diesel particulate filter trap (DPF) to discharge exhaust gas from an engine to outside through the DPF, includes a tail pipe main body provided with a plurality of ventilation holes penetratingly formed on the tail pipe main body to allow the outside air to pass through the ventilation holes, and installed on an outlet of the DPF; an exhaust heat dissipation unit provided with a plurality of tubes which respectively communicate with the ventilation holes, and are installed in a horizontal direction of the tail pipe main body; and a plurality of exhaust holes located in a longitudinal direction of the tubes and penetratingly formed in an exhaust gas discharge direction.

[0005] Vertical cross-sections of the tail pipe main body and the tube may be in a circular shape. It is preferable that three or five exhaust holes are provided in the longitudinal direction of the tubes and in the exhaust gas discharge direction. It is preferable that three tubes are provided in the horizontal direction on the same surface of the tail pipe main body.

30 ADVANTAGEOUS EFFECT

[0006] According to the present invention, since the exhaust gas discharged from the tail pipe exchanges heat with the outside air over the whole area in the tail pipe, the maximum temperature of the exhaust gas can be efficiently lowered, and accidents, which may occur due to the high temperature of the exhaust gas during working, can be prevented from occurring.

40 BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The above objects, other features and advantages of the present invention will become more apparent by describing the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a tail pipe in the related art;

Fig. 2 is a perspective view of a tail pipe according to an embodiment of the present invention;

Fig. 3 is a conceptual view explaining temperature reduction effects of exhaust gas according to the present invention; and

Figs. 4a and 4b are front and side views of a tail pipe according to an embodiment of the present invention.

BEST MODE

[0008] Now, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0009] Fig. 2 is a perspective view of a tail pipe according to an embodiment of the present invention.

[0010] Referring to Fig. 2, a tail pipe includes a tail pipe main body 100 provided with a plurality of ventilation holes 110 penetratingly formed on the tail pipe main body 100 to allow the outside air to pass through the ventilation holes 110, and installed on an outlet of a DPF; an exhaust heat dissipation unit 300 provided with a plurality of tubes 200 which respectively communicate with the ventilation holes 110, and are installed in a horizontal direction of the tail pipe main body 100; and a plurality of exhaust holes 210 located in a longitudinal direction of the tubes 200 and penetratingly formed in an exhaust gas discharge direction.

[0011] Since the tubes 200 are installed to communicate with the ventilation holes 110 of the tail pipe main body 100, outside air can easily enter into the tubes 200. The air that has entered into the tubes 200 is mixed with high-temperature exhaust gas through the plurality of exhaust holes which are penetratingly formed in an exhaust direction 400 to be discharged to the outside. The ventilation holes 110 are penetratingly formed on the tail pipe main body 100 to inhale the outside air therethrough.

[0012] Since the plurality of ventilation holes 110 are provided as shown in Fig. 2, the outside air can be smoothly inhaled into the tail pipe main body 100. Although the ventilation holes 110 are penetratingly formed in a line along the side surface of the tail pipe main body 100 as shown in Fig. 2, they may be formed in any form which can effectively inhale the outside air, e.g., in a zig-zag form.

[0013] The tubes 200 located inside the tail pipe main body 100 are designed so that the tubes 200 can be installed to communicate with the ventilation holes 110 of the tail pipe main body 100 and the outside air can pass through the tubes 200. Since the tubes 200 have the plurality of exhaust holes 210, the air inhaled from the outside can be discharged through the exhaust holes 210 penetratingly formed in the exhaust direction 400. In this case, the air inhaled from the outside is mixed with the high-temperature exhaust gas to reduce the temperature of the exhaust gas.

[0014] Fig. 3 is a conceptual view explaining the temperature reduction effects of the exhaust gas according to the present invention.

[0015] Long arrows in a direction that is vertical to the tube 200 indicate high-temperature exhaust gas that flows at high speed, and arrows that come into the tube 200 indicate low-temperature outside air that flows at low speed. Since the tubes 200 are installed to communicate with the tail pipe main body 100 that is provided with the plurality of ventilation holes 110, the high-temperature exhaust gas is not discharged to the outside as it is, but

is mixed with the outside air to lower the temperature of the exhaust gas. The outside air, which is inhaled into the tubes 200, is mixed with the exhaust gas through the exhaust holes 210 which are penetratingly formed in the exhaust gas discharge direction 400 that is the longitudinal direction of the tubes 200, and the mixed gas is discharged in the air. If the high-temperature exhaust gas, which is discharged from the DPF, passes through the tubes 200 at high speed, minimum pressure is formed in the exhaust holes 210 which are penetratingly formed on the tubes 200, and due to this, negative pressure is formed to inhale the outside air. The air that comes from the outside not only is mixed with the high-temperature exhaust gas that is discharged from the DPF but also transfers heat to the tubes 200, and thus the temperature of the exhaust gas is reduced.

[0016] Figs. 4a and 4b are front and side views of a tail pipe according to an embodiment of the present invention.

[0017] Vertical cross-sections of the tail pipe main body 100 and the tube 200 may be in various shapes and may not be specially limited. However, they are normally in a circular shape. It is preferable that three or five exhaust holes 210 are provided in the longitudinal direction of the tubes 200 that is the exhaust gas discharge direction. If the number of exhaust holes is too small or too large, it may be inappropriate to inhale the outside air and to mix the inhaled air with the exhaust gas. It is preferable that three tubes 200 are provided in the horizontal direction on the same surface of the tail pipe main body 100. If the number of the tubes 200 is smaller than or larger than three, it may be inappropriate to inhale the outside air and to mix the inhaled air with the exhaust gas.

[0018] Although preferred embodiments of the present invention have been described for illustrative purposes, the present invention is not limited to the above-described embodiments, and those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims. Accordingly, the scope of the present invention is defined by the appended claims, and it will be understood that all technical features in the equivalent range fall within the scope of the present invention.

INDUSTRIAL APPLICABILITY

[0019] As apparent from the above description, the present invention can be used in the exhaust gas treatment apparatus for a construction machine that is installed in the DPF to discharge the exhaust gas, which flows from the engine to the DPF, to the outside.

Claims

1. An exhaust gas treatment apparatus for a construction machine, which is connected to a diesel partic-

ulate filter trap (DPF) to discharge exhaust gas from an engine to outside through the DPF, comprising:

- a tail pipe main body provided with a plurality of ventilation holes penetratingly formed on the tail pipe main body to allow the outside air to pass through the ventilation holes, and installed on an outlet of the DPF; 5
 - an exhaust heat dissipation unit provided with a plurality of tubes which respectively communicate with the ventilation holes, and are installed in a horizontal direction of the tail pipe main body; and 10
 - a plurality of exhaust holes located in a longitudinal direction of the tubes and penetratingly formed in an exhaust gas discharge direction. 15
2. The exhaust gas treatment apparatus for a construction machine according to claim 1, wherein vertical cross-sections of the tail pipe main body and the tube are in a circular shape. 20
3. The exhaust gas treatment apparatus for a construction machine according to claim 1, wherein three or five exhaust holes are provided in the longitudinal direction of the tubes and in the exhaust gas discharge direction. 25
4. The exhaust gas treatment apparatus for a construction machine according to claim 2, wherein three tubes are provided in the horizontal direction on the same surface of the tail pipe main body. 30

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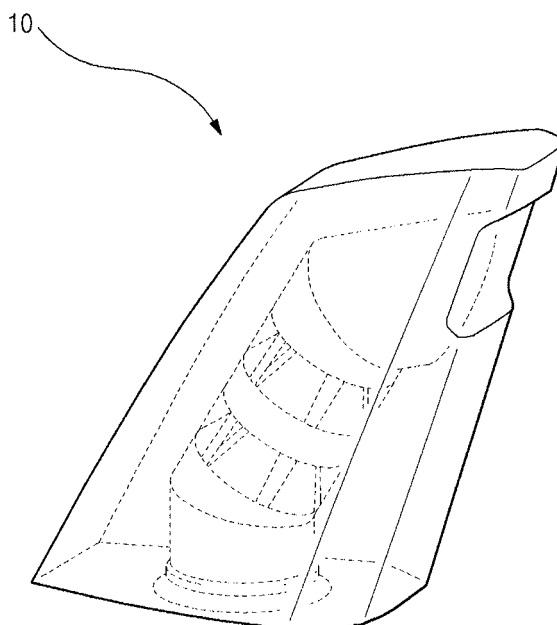
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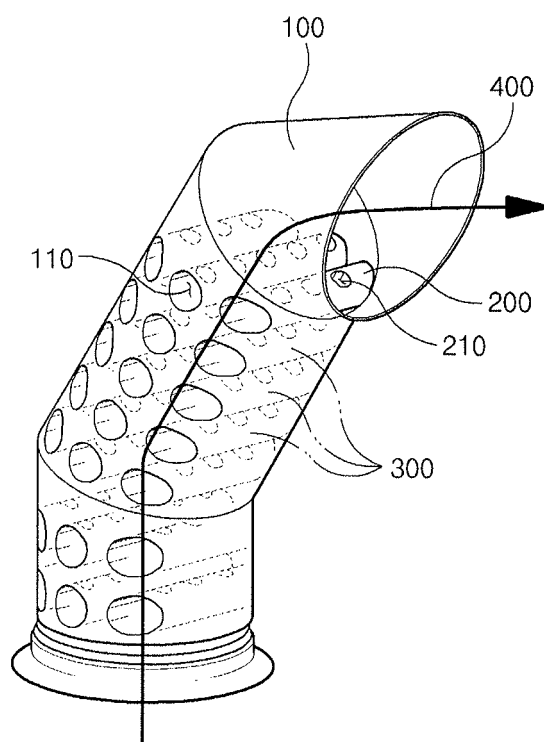
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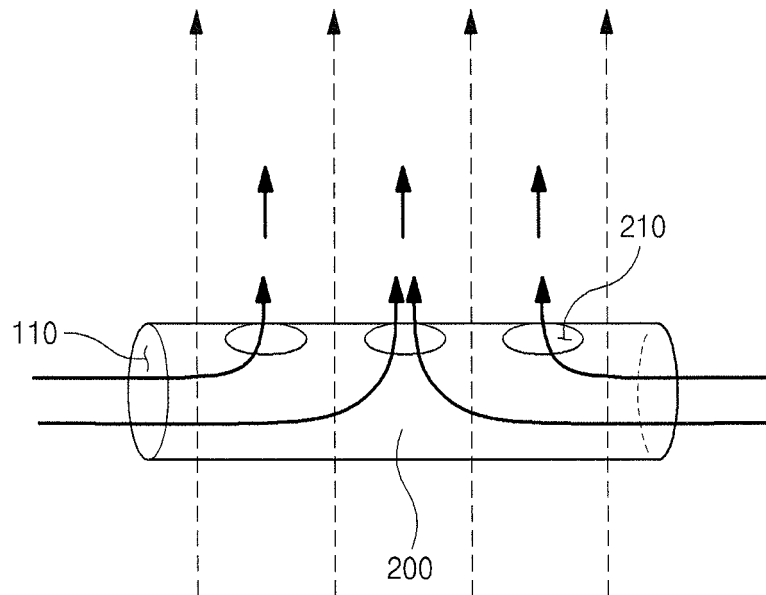
[Fig. 1]



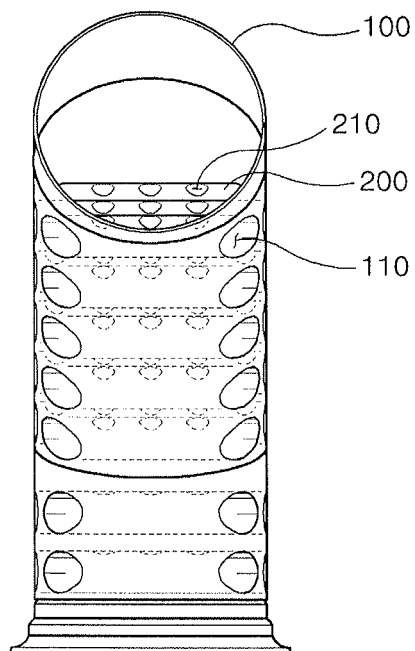
[Fig. 2]



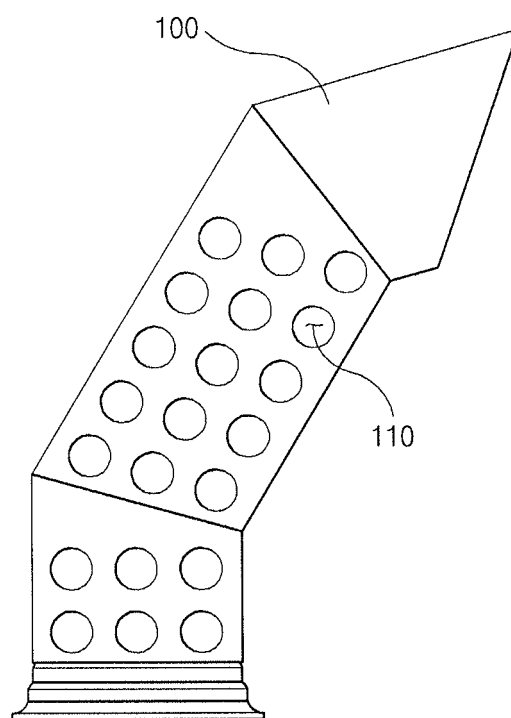
[Fig. 3]



[Fig. 4a]



[Fig. 4b]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2010/009362

A. CLASSIFICATION OF SUBJECT MATTER <i>F01N 13/08(2010.01)i, E02F 9/00(2006.01)i</i> According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F01N 13/08; F01N 3/24; F01N 1/08; F01N 11/00; F01N 7/08; F01N 3/20 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean Utility models and applications for Utility models: IPC as above Japanese Utility models and applications for Utility models: IPC as above Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS (KIPO internal) & Keywords: DPF, air, exhaust gas, tail pipe, and tube.		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2010-0086525 A (VOLVO CONSTRUCTION EQUIPMENT HOLDING SWEDEN AB) 02 August 2010 See figure 4; paragraphs [0030]-[0035]	1-4
A	JP 10-121945 A (NISSAN MOTOR CO., LTD.) 12 May 1998 See figure 2; paragraph [0018]	1-4
A	US 05413189A A (BROWNING et al.) 09 May 1995 See figures 1, 4; column 3, line 56-column 4, line 60	1-4
A	EP 1911944 A2 (INTERNATIONAL ENGINE INTELLECTUAL PROPERTY COMPANY, LLC.) 16 April 2008 See figures 2-4; paragraphs [0020]-[0023]	1-4
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 28 SEPTEMBER 2011 (28.09.2011)		Date of mailing of the international search report 28 SEPTEMBER 2011 (28.09.2011)
Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

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