



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.04.2012 Bulletin 2012/14

(51) Int Cl.:
F01N 13/00 (2010.01)

(21) Application number: **11183086.5**

(22) Date of filing: **28.09.2011**

(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
Designated Extension States:
BA ME

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(30) Priority: **04.10.2010 JP 2010224780**

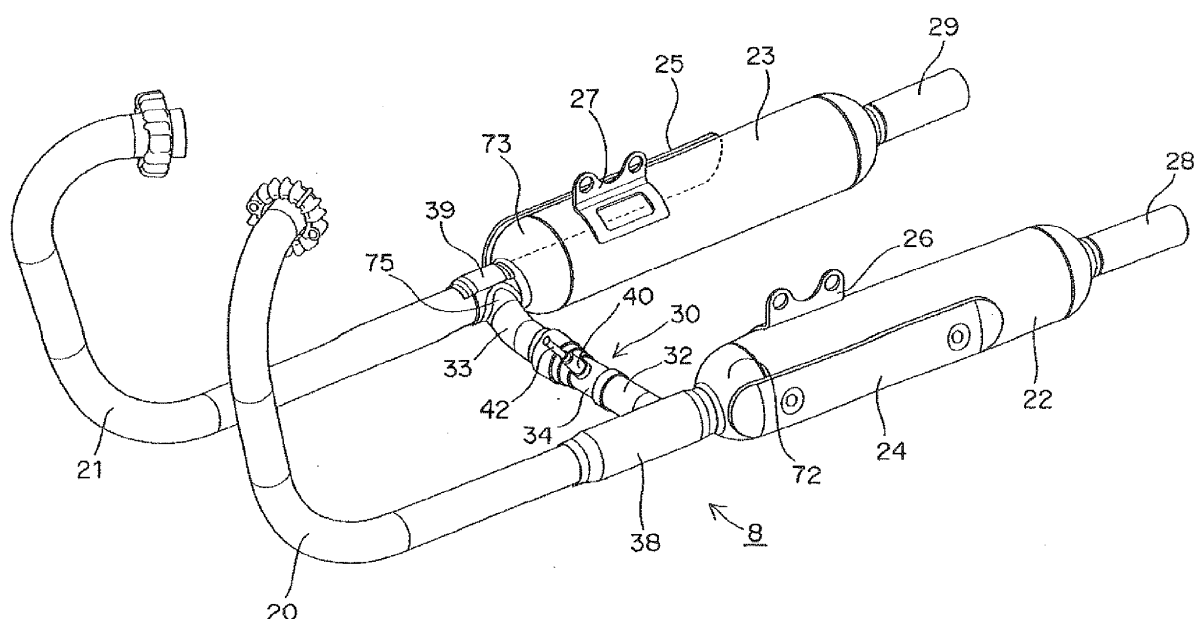
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(54) **Exhaust apparatus for motorcycle**

(57) The present invention provides an exhaust apparatus for a motorcycle being characterized in that the number of components can be reduced, that the exhaust sensor thereof can be protected effectively against external forces and that the external appearance of the vehicle can be maintained. In the exhaust apparatus in

which an exhaust muffler is connected to each of the exhaust downstream ends of a left exhaust pipe and a right exhaust pipe connected to the exhaust ports of the engine, an exhaust sensor for detecting the oxygen concentration in exhaust gas is disposed on an exhaust communication pipe providing communication between the left exhaust pipe and the right exhaust pipe.

Fig.3



Description

TECHNICAL FIELD

[0001] The present invention relates to an exhaust apparatus for a motorcycle equipped with an exhaust sensor for detecting the oxygen concentration in exhaust gas.

BACKGROUND ART

[0002] For example, as an exhaust apparatus for a motorcycle with a multi-cylinder engine, an exhaust apparatus is known that is equipped with two exhaust pipes connected to respective cylinders, exhaust mufflers respectively connected to the exhaust pipes, and an exhaust communication pipe providing communication between the two exhaust pipes (for example, refer to Patent document 1). Since the cylinders are different from each other in explosion timing, the exhaust communication pipe is provided to reduce back pressure by dividing the flow of exhaust gas from each cylinder into two exhaust routes and to improve the output of the engine.

[0003] In the exhaust apparatus disclosed in Patent document 1, the two exhaust pipes are an upper exhaust pipe and a lower exhaust pipe and communicate with each other via the exhaust communication pipe. An exhaust sensor is disposed at a position on each of the upper exhaust pipe and the lower exhaust pipe on the downstream side of the exhaust communication pipe.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0004]

Patent document 1: Japanese Patent Application Laid-Open Publication No. 2006-112239

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] Although it is preferable that the exhaust sensor is disposed on each of the upper exhaust pipe and the lower exhaust pipe to perform appropriate fuel supply control for each cylinder, the number of the exhaust sensors to be disposed increases, and the cost rises.

[0006] Furthermore, since the exhaust sensor is disposed on the upper face or the side face of each of the upper exhaust pipe and the lower exhaust pipe, there is a danger that external forces may be applied to the exhaust sensor. Moreover, since the exhaust sensor is seen from the outside, there is a problem that the external appearance of the vehicle becomes undesirable.

[0007] Accordingly, in order to solve the technical problems encountered in the conventional exhaust appara-

tus, the present invention provides an exhaust apparatus for a motorcycle being characterized in that the number of components can be reduced, that the exhaust sensor thereof can be protected effectively against external forces and that the desirable external appearance of the vehicle can be maintained.

MEANS FOR SOLVING THE PROBLEM

[0008] In order to solve the above-mentioned technical problems, the present invention provides an exhaust apparatus for a motorcycle described below.

[0009] More specifically, the exhaust apparatus according to claim 1 of the present invention, exhaust mufflers of which are respectively connected to the exhaust downstream ends of a left exhaust pipe and a right exhaust pipe connected to the exhaust ports of an engine, is characterized in that an exhaust sensor for detecting the oxygen concentration in exhaust gas is disposed on an exhaust communication pipe providing communication between the left exhaust pipe and the right exhaust pipe.

[0010] The exhaust apparatus according to claim 2 of the present invention is characterized in that the exhaust communication pipe is connected at the exhaust communication sections of the exhaust pipes positioned in the vicinities of the exhaust downstream ends of the exhaust pipes and on the exhaust upstream sides from the exhaust downstream ends.

[0011] The exhaust apparatus according to claim 3 of the present invention is characterized in that the exhaust sensor is disposed so as to extend forward in the longitudinal direction of the vehicle and obliquely upward.

[0012] The exhaust apparatus according to claim 4 of the present invention is characterized in that the exhaust communication pipe is configured so that the cross-sectional area of the exhaust passage in the exhaust communication pipe is approximately uniform.

[0013] The exhaust apparatus according to claim 5 of the present invention is characterized in that the fringe section of the exhaust passage cross-section of the sensor mounting section on the exhaust communication pipe on which the exhaust sensor is disposed is formed of a flat section for mounting the exhaust sensor, a circular section constituting the main portion of the fringe section by virtue of the wall of the exhaust communication pipe, and an extending section disposed to connect the flat section to the circular section and protruding outward from the circular section.

[0014] The exhaust apparatus according to claim 6 of the present invention is characterized in that the exhaust communication section has an approximately circular exhaust passage hole having a pipe wall, part of which on the exhaust downstream side extends in an approximately crescent shape.

[0015] The exhaust apparatus according to claim 7 of the present invention is characterized in that the exhaust communication pipe is formed of a left communication

pipe to be connected to the left exhaust pipe, a right communication pipe to be connected to the right exhaust pipe, and a connection adaptor to be connected to the left communication pipe and the right communication pipe, and that the exhaust sensor is disposed in the connection adaptor.

EFFECT OF THE INVENTION

[0016] With the present invention according to claim 1, since the oxygen concentration in the exhaust gas discharged from both the left exhaust pipe and the right exhaust pipe can be detected using the exhaust sensor disposed on the exhaust communication pipe, an effect is obtained that the number of components can be decreased and the cost can be reduced. Furthermore, since the exhaust sensor is disposed between the left exhaust pipe and the right exhaust pipe, that is, at an approximately central position in the width direction of the vehicle, an effect is obtained that the exhaust sensor can be protected effectively against external forces, and another effect is obtained that the external appearance of the vehicle can be maintained properly.

[0017] With the present invention according to claim 2, since the exhaust communication pipe is positioned close to the catalyst disposed inside each of the exhaust mufflers and the distance between the exhaust sensor and the catalyst can be shortened, an effect is obtained that fuel supply control can be carried out more properly.

[0018] With the present invention according to claim 3, an effect is obtained that water can be prevented from intruding into the exhaust sensor, and another effect is obtained that the wiring length of the harness for connecting the exhaust sensor to the ECU of the vehicle can be shortened.

[0019] With the present invention according to claim 4, an effect is obtained that the rise in back pressure is suppressed and the output of the engine is not reduced.

[0020] With the present invention according to claim 5, since the cross-sectional area of the exhaust passage at the sensor mounting section of the exhaust communication pipe is made approximately the same as that of the exhaust passage at the other part of the exhaust communication pipe, an effect is obtained that the rise in back pressure is suppressed and the output of the engine is not reduced.

[0021] With the present invention according to claim 6, entire circumference welding can be carried out between a connection cover and each of the exhaust pipes while the exhaust communication pipe is positioned close to the connection cover. As a result, since the distance between the exhaust sensor and the catalyst disposed inside each of the exhaust mufflers can be shortened, an effect is obtained that fuel supply control can be carried out more properly.

[0022] With the present invention according to claim 7, an effect is obtained that the positioning adjustment of the exhaust communication pipe in the exhaust appa-

ratus can be carried out easily,

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a left side view of a motorcycle to which the present invention is applied;

FIG. 2 is a perspective view showing part of the exhaust apparatus of the motorcycle shown in FIG. 1 as viewed from the right rear side of the vehicle body;

FIG. 3 is a perspective view showing the exhaust apparatus of the motorcycle shown in FIG. 1 as viewed from the left front side of the vehicle body;

FIG. 4 is a plan view showing the exhaust apparatus of the motorcycle shown in FIG. 1;

FIG. 5 is a front view showing the left exhaust pipe and part of the exhaust communication pipe of the motorcycle shown in FIG. 1 as viewed from the front of the vehicle;

FIG. 6 is a left side view showing the right exhaust pipe and the other part of the exhaust communication pipe of the motorcycle shown in FIG. 1;

FIG. 7 is a left side sectional view showing the right exhaust pipe before the exhaust communication pipe is connected thereto; and

FIG. 8 is a sectional view showing an exhaust gas sensor mounting section taken on line VIII-VIII of FIG. 5.

MODES FOR CARRYING OUT THE INVENTION

[0024] An exhaust apparatus 8 of a motorcycle 1 according to a preferred embodiment of the present invention will be described below referring to the accompanying drawings. In the present invention, "right" is the right side as viewed toward the front of the vehicle body, and "left" is the left side as viewed toward the front of the vehicle body.

(Configuration of the motorcycle)

[0025] FIG. 1 is a left side view of the motorcycle 1 to which the present invention is applied. Furthermore, FIG. 2 is a perspective view showing part of the exhaust apparatus 8 of the motorcycle 1 shown in FIG. 1 as viewed from the right rear side of the vehicle body. In FIG. 1, a vehicle body frame 2 is approximately formed into a parallelogram as viewed from the side and is integrally equipped with a rear frame extending rearward. A front fork 5 is supported on the head pipe 3 formed on the front upper end section of the vehicle body frame 2, a handle bar 6 is provided on the upper end section of the front fork 5, and a front wheel 7 is supported at the lower end section of the front fork 5.

[0026] At the rear lower end section of the vehicle body frame 2, the front end section of the swing arm 10 is supported so as to be swingable in the up-down direction

via an arm support shaft, and a rear wheel 11 is supported at the rear end section of the swing arm 10. A rear suspension 13 is disposed between the frontward portion of the swing arm 10 and the rear upper end section of the vehicle body frame 2 so as to be contractible and extensible, thereby elastically supporting the swing arm 10.

[0027] A fuel tank 15, a seat 16 and a rear seat are installed on the vehicle body frame 2 in this order from the front. Various electric components and other components are disposed under the seat 16 and the rear seat. An engine (for example, a parallel two-cylinder engine) 18 is mounted inside the vehicle body frame 2.

(Configuration of the exhaust apparatus)

[0028] FIG. 3 is a perspective view showing the exhaust apparatus 8 of the motorcycle 1 shown in FIG. 1 as viewed from the left front side of the vehicle body. FIG. 4 is a plan view showing the exhaust apparatus 8 of the motorcycle 1 shown in FIG. 1. Each of a left exhaust pipe 20 and a right exhaust pipe 21 is connected to the front exhaust connection port of the cylinder head of each cylinder. For example, the left exhaust pipe 20 communicates with a first cylinder, and the right exhaust pipe 21 communicates with a second cylinder. Each of the left exhaust pipe 20 and the right exhaust pipe 21 is curved and bent downward from the cylinder head, extends rearward under the crankcase 19 of the engine 18, and further extends rearward through the vicinity of the front section of the swing arm 10.

[0029] A left exhaust muffler 22 and a right exhaust muffler 23 extending rearward in the longitudinal direction of the vehicle are connected to the rear ends of the left exhaust pipe 20 and the right exhaust pipe 21, respectively. Tail pipes 28 and 29 are provided at the rear ends of the left exhaust muffler 22 and the right exhaust muffler 23, respectively. Mounting brackets 26 and 27 for mounting the left exhaust muffler 22 and right exhaust muffler 23 on the rear frame of the vehicle body frame 2 are formed on the left exhaust muffler 22 and right exhaust muffler 23, respectively. Furthermore, protective members 24 and 25 for protecting the exhaust mufflers 22 and 23 against external damage are mounted on the left exhaust muffler 22 and the right exhaust muffler 23, respectively.

[0030] The left exhaust pipe 20 and the right exhaust pipe 21 are connected to each other via an exhaust communication pipe 30 so as to internally communicate with each other. The exhaust communication pipe 30 is connected to the left exhaust pipe 20 and the right exhaust pipe 21 by welding at the exhaust communication sections of the exhaust pipes positioned in the vicinities of the exhaust downstream ends of the exhaust pipes and on the exhaust upstream sides from the exhaust downstream ends. The structure of the connection from the exhaust communication pipe 30 to the left exhaust pipe 20 and the right exhaust pipe 21 will be described below.

[0031] The exhaust communication pipe 30 is formed

of a left communication pipe 32 to be connected to the left exhaust pipe 20, a right communication pipe 33 to be connected to the right exhaust pipe 21, and a connection adaptor 34 to be connected to the left communication pipe 32 and the right communication pipe 33. While the left communication pipe 32 is fitted into the left connection section 52 of the connection adaptor 34, the entire circumference of the connection section therebetween is welded to connect the left communication pipe 32 to the connection adaptor 34. While the right communication pipe 33 is fitted into a stepped right connection section 54 of the connection adaptor 34 via a gasket, the connection section therebetween is fastened with a clamp band, whereby the right communication pipe 33 is detachably connected to the connection adaptor 34. However, the method and direction of the connection from the connection adaptor 34 to the left communication pipe 32 and the right communication pipe 33 are not limited to the above-mentioned method and direction, but known methods and directions can be applied appropriately.

[0032] Each of the left exhaust pipe 20 and the right exhaust pipe 21 has an exhaust passage hole 60 opening obliquely downward on the inner side in the width direction of the vehicle and at a slightly lower position. As shown in FIG. 7, the exhaust passage hole 60 is not a complete circle. For example, a crescent pipe wall portion 61 is provided at the rear end portion on the exhaust downstream side of each exhaust pipe. As shown in FIG. 7, the crescent pipe wall portion 61 is provided so that entire circumference welding can be carried out between the left exhaust pipe 20 and a bowl-shaped connection cover 72 and between the right exhaust pipe 21 and a bowl-shaped connection cover 73 while the exhaust communication pipe 30 is positioned as close as possible to the bowl-shaped connection covers 72 and 73. With this configuration, the exhaust communication pipe 30 is positioned close to the catalyst disposed inside each of the exhaust mufflers 22 and 23 and the distance between an exhaust sensor 40 and the catalyst can be shortened, whereby fuel supply control can be carried out more properly. However, the shape of the connection covers 72 and 73 is not limited to the bowl shape, but can be a nearly conical shape or the like.

[0033] A left connection joint 74 having a diameter larger than the diameter of the exhaust passage hole 60 formed in the left exhaust pipe 20 is connected to the left exhaust pipe 20 by entire circumference welding, and the left connection joint 74 extends obliquely downward to the central portion in the width direction of the vehicle. Similarly, a right connection joint 75 having a diameter larger than the diameter of the exhaust passage hole 60 formed in the right exhaust pipe 21 is connected to the right exhaust pipe 21 by entire circumference welding, and the right connection joint 75 extends obliquely downward to the central portion in the width direction of the vehicle. The central end section of the left connection joint 74 is connected to the left communication pipe 32 by entire circumference welding. The central end section

of the right connection joint 75 is connected to the right communication pipe 33 by entire circumference welding. As shown in FIG. 5, the left connection joint 74 is curved slightly, and the connection adaptor 34 extends as a straight pipe. Furthermore, the right connection joint 75 being curved slightly is connected to the connection adaptor 34. Hence, the exhaust communication pipe 30 has a nearly U shape as a whole, its central section being positioned slightly downward.

[0034] Moreover, the outside portions of the left connection joint 74 and the right connection joint 75 are covered with a left protective cover 38 and a right protective cover 39, respectively. With this configuration, areas discolored (burnt) by heat in the vicinities of the portions of the exhaust pipes 20 and 21 to which the exhaust communication pipe 30 is connected can be covered so as not to be seen externally. In the case that the exposed portion of the left exhaust pipe 20 is longer than that of the right exhaust pipe 21, the left protective cover 38 can be configured so as to extend longer than the right protective cover 39 in the longitudinal direction of the vehicle.

[0035] Since the exhaust communication pipe 30 has a nearly U shape, the left exhaust pipe 20 and the right exhaust pipe 21 can be disposed upward. Still further, as shown in FIG. 5, the axial center B of the left exhaust muffler 22 is positioned higher in the height direction of the vehicle and deflected more outward in the width direction of the vehicle than the axial center A of the left exhaust pipe 20. Similarly, the axial center of the right exhaust muffler 23 is positioned higher in the height direction of the vehicle and deflected more outward in the width direction of the vehicle than the axial center of the right exhaust pipe 21. The bank angle of the vehicle can be obtained securely by disposing the left exhaust muffler 22 and the right exhaust muffler 23 upward. In addition, interference with the swing arm 10 can be prevented by disposing the left exhaust muffler 22 and the right exhaust muffler 23 outward in the width direction of the vehicle.

[0036] A mounting section for mounting the exhaust sensor 40 is formed on the exhaust communication pipe 30. For example, the mounting section may be formed on the connection adaptor 34. An internally threaded sensor mounting socket 50 for mounting the exhaust sensor 40 is disposed on the circumferential face of the connection adaptor 34, the circumferential face being provided forward in the longitudinal direction of the vehicle and directed obliquely upward, and the exhaust sensor 40 is threaded into the sensor mounting socket 50. As shown in FIG. 8, the fringe section of the exhaust passage cross-section of the sensor mounting socket 50 on which the exhaust sensor 40 is disposed is formed of a flat section 81 for mounting the exhaust sensor 40, a circular section 83 constituting the main portion of the fringe section by virtue of the wall of the exhaust communication pipe 30 and an extending section 82 disposed to connect the flat section 81 to the circular section 83 and protruding slightly outward from the circular section 83. In other words, the cross-sectional area of the exhaust passage in the

sensor mounting socket 50 is made approximately the same as the cross-sectional area of the exhaust passage in the other portion by protruding the flat section 81 for mounting the exhaust sensor 40 slightly outward. The rise in back pressure is suppressed and the output of the engine is prevented from lowering by making the cross-sectional area of the exhaust passage in the exhaust communication pipe 30 having the sensor mounting socket 50 approximately uniform.

[0037] As described above, the exhaust 40 mounted in the connection adaptor 34 of the exhaust communication pipe 30 is located at an approximately central position in the width direction of the vehicle and disposed so as to extend forward in the longitudinal direction of the vehicle and obliquely upward. The oxygen concentration in the exhaust gas discharged from both the left exhaust pipe 20 and the right exhaust pipe 21 can be detected using a single exhaust sensor, i.e., the exhaust sensor 40, by disposing the exhaust sensor 40 on the exhaust communication pipe 30 providing communication between the left exhaust pipe 20 and the right exhaust pipe 21. When the motorcycle 1 is viewed from its side, the exhaust sensor 40 is inconspicuous since it is hidden by the left exhaust pipe 20, the right exhaust pipe 21 and the rear frame of the vehicle body frame 2. For this reason, the exhaust sensor 40 does not spoil the appearance of the vehicle. In addition, the exhaust sensor 40 is prevented from making contact with the feet of the rider.

[0038] It is preferable that the exhaust sensor 40 is inclined forward in the longitudinal direction of the vehicle and obliquely upward with respect to the horizontal plane. Its inclination angle is, for example, approximately 45 degrees. Since the exhaust sensor 40 is mounted on the exhaust communication pipe 30 in a state of being directed forward in the longitudinal direction of the vehicle and obliquely upward, even if the steam inside the exhaust gas condensates into water, the water can be prevented from intruding into the exhaust sensor 40.

[0039] A harness 42 protruding from the exhaust sensor 40 mounted in the connection adaptor 34 of the exhaust communication pipe 30 extends forward in the longitudinal direction of the vehicle and obliquely upward and is connected to an ECU (electric control unit). With this configuration, the wiring length of the harness 42 for connecting the exhaust sensor 40 to the ECU can be shortened.

EXPLANATIONS OF LETTERS AND NUMERALS

[0040]

- 1: motorcycle
- 8: exhaust apparatus
- 20: left exhaust pipe
- 21: right exhaust pipe
- 22: left exhaust muffler
- 23: right exhaust muffler
- 30: exhaust communication pipe

40: exhaust sensor
 50: sensor mounting socket
 60: exhaust passage hole

Claims

1. An exhaust apparatus for a motorcycle, exhaust mufflers of which are respectively connected to the exhaust downstream ends of a left exhaust pipe and a right exhaust pipe connected to the exhaust ports of an engine, wherein
 an exhaust sensor for detecting the oxygen concentration in exhaust gas is disposed on an exhaust communication pipe providing communication between the left exhaust pipe and the right exhaust pipe. 5 10 15
2. The exhaust apparatus according to claim 1, wherein the exhaust communication pipe is connected at the exhaust communication sections of the exhaust pipes positioned in the vicinities of the exhaust downstream ends of the exhaust pipes and on the exhaust upstream sides from the exhaust downstream ends. 20 25
3. The exhaust apparatus according to claim 1 or 2, wherein the exhaust sensor is disposed so as to extend forward in the longitudinal direction of the vehicle and obliquely upward. 30
4. The exhaust apparatus according to any one of claims 1 to 3, wherein the exhaust communication pipe is configured so that the cross-sectional area of the exhaust passage in the exhaust communication pipe is approximately uniform. 35
5. The exhaust apparatus according to any one of claims 1 to 4, wherein the fringe section of the exhaust passage cross-section of the sensor mounting section on the exhaust communication pipe on which the exhaust sensor is disposed is formed of a flat section for mounting the exhaust sensor, a circular section constituting the main portion of the fringe section by virtue of the wall of the exhaust, communication pipe, and an extending section disposed to connect the flat section to the circular section and protruding outward from the circular section. 40 45
6. The exhaust apparatus according to any one of claims 1 to 5, wherein the exhaust communication section has an approximately circular exhaust passage hole having a pipe wall, part of which on the exhaust downstream side extends in an approximately crescent shape. 50 55
7. The exhaust apparatus according to any one of claims 1 to 6, wherein the exhaust communication pipe is formed of a left

communication pipe to be connected to the left exhaust pipe, a right communication pipe to be connected to the right exhaust pipe, and a connection adaptor to be connected to the left communication pipe and the right communication pipe, and the exhaust sensor is disposed in the connection adaptor.

Fig. 1

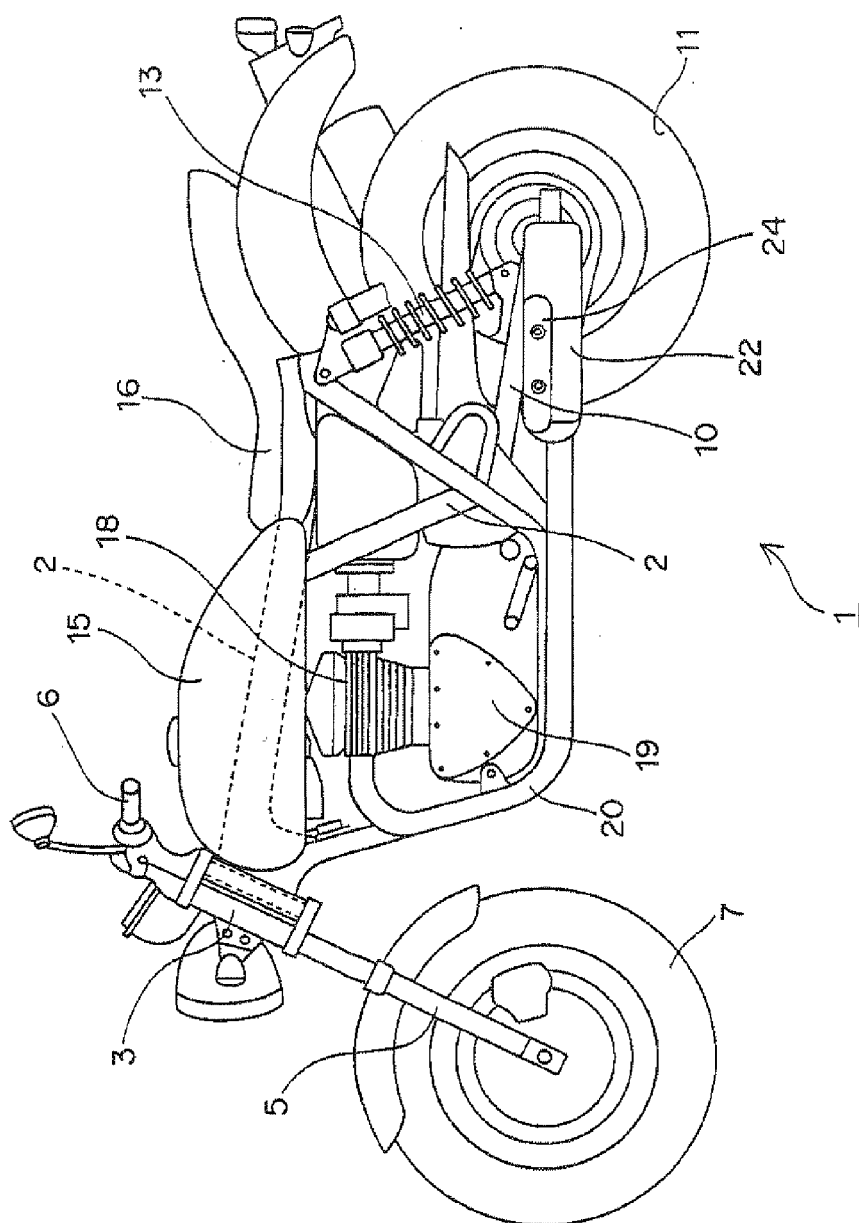


Fig.2

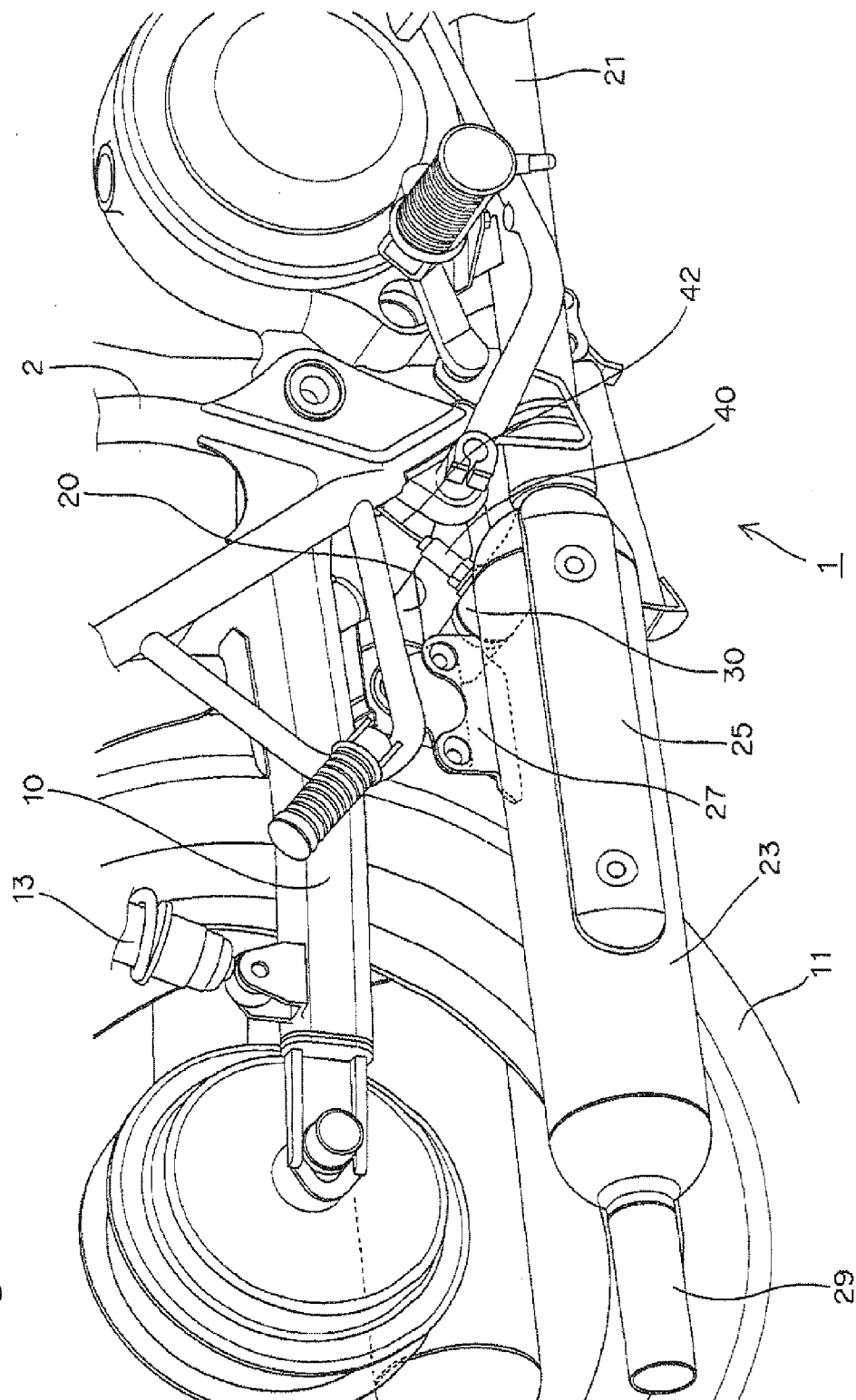


Fig.3

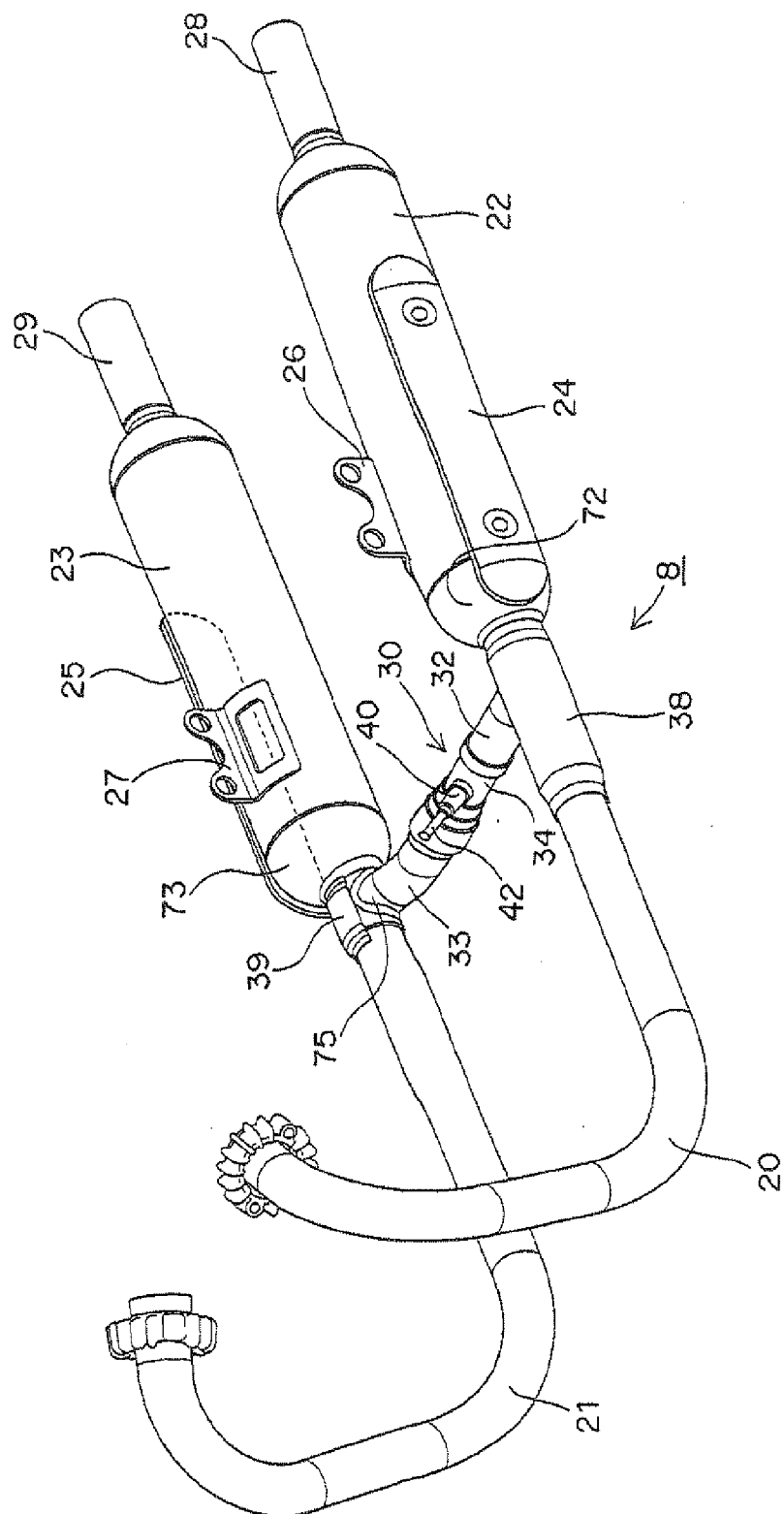
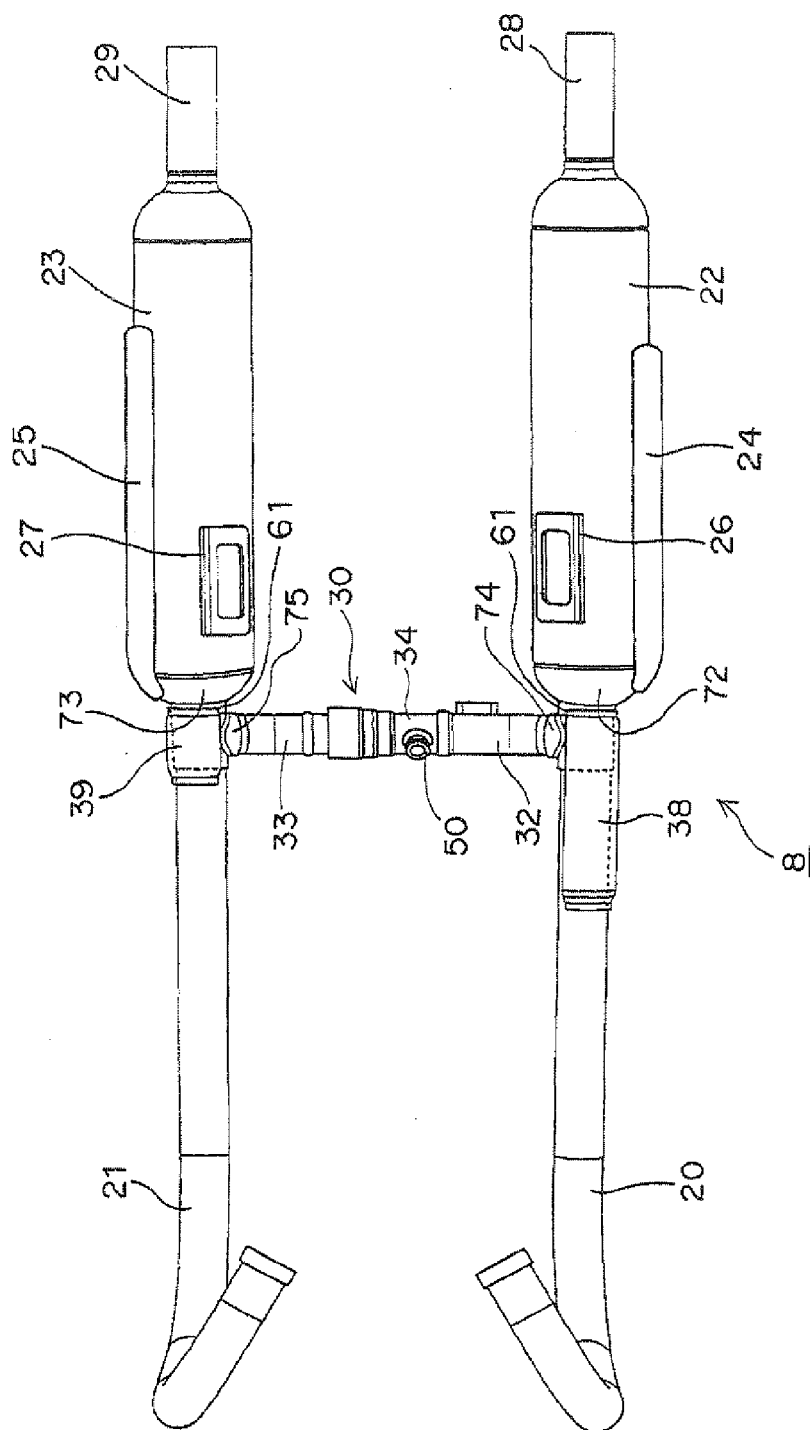


Fig. 4



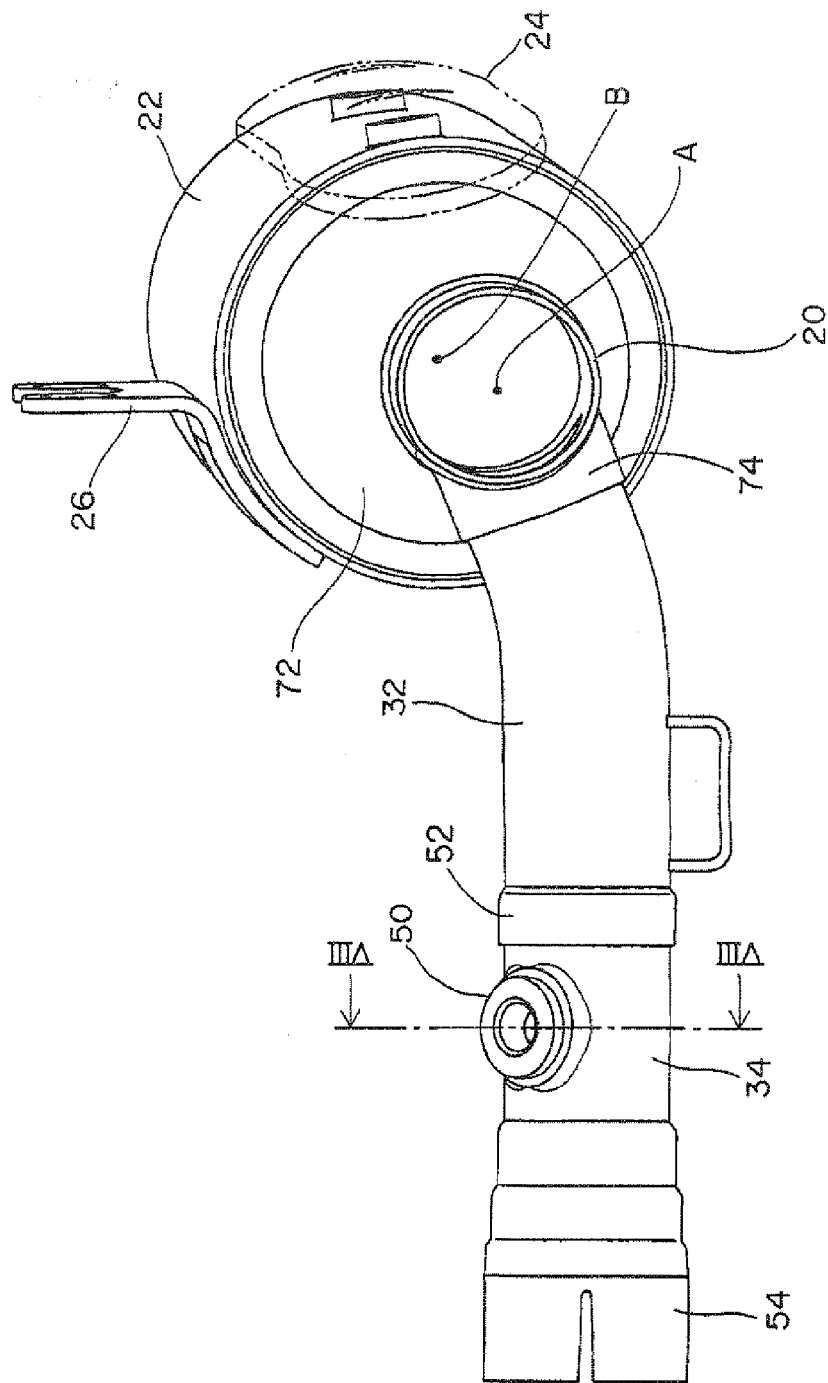


Fig. 5

Fig.6

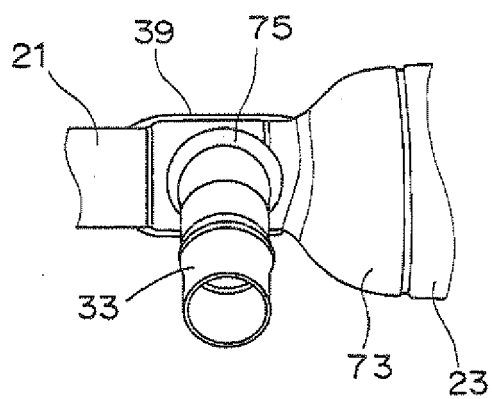


Fig.7

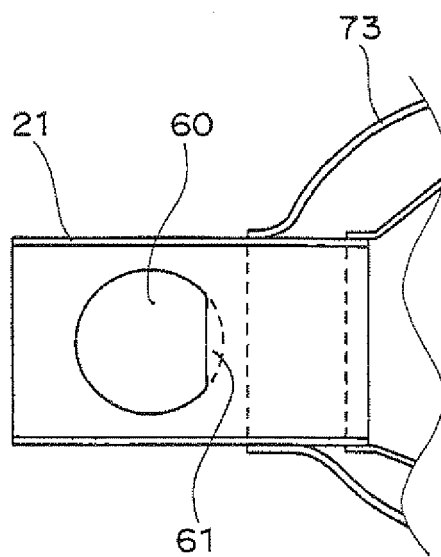
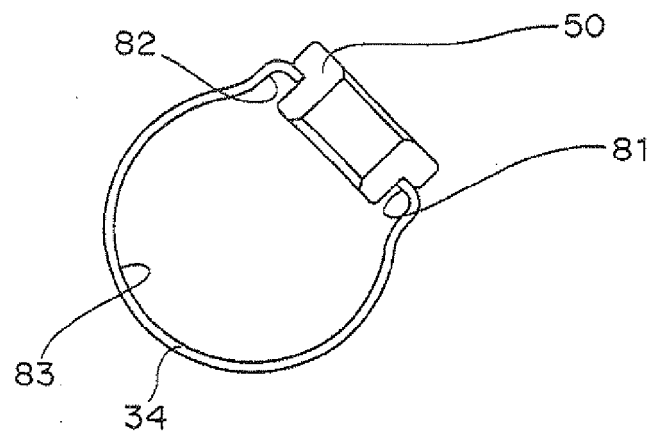


Fig.8





EUROPEAN SEARCH REPORT

Application Number
EP 11 18 3086

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2005 069208 A (KAWASAKI HEAVY IND LTD) 17 March 2005 (2005-03-17) * abstract; figures 1-6 * -----	1-7	INV. F01N13/00
X	JP 59 099021 A (HONDA MOTOR CO LTD) 7 June 1984 (1984-06-07) * abstract; figures 1-5 * -----	1-7	
A	JP 2006 112239 A (KAWASAKI HEAVY IND LTD) 27 April 2006 (2006-04-27) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F01N
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 January 2012	Examiner Tortosa Masiá, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 18 3086

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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12-01-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2005069208 A	17-03-2005	JP 4326287 B2 JP 2005069208 A	02-09-2009 17-03-2005
JP 59099021 A	07-06-1984	NONE	
JP 2006112239 A	27-04-2006	JP 4397784 B2 JP 2006112239 A	13-01-2010 27-04-2006

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006112239 A [0004]