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(54) Exhaust gas arrangement for motor cycle.

(57) The present invention relates to an exhaust gas arrangement for a motorcycle having an engine, particularly multiple cylinder engine, and an exhaust pipe assembly comprising at least a front exhaust pipe extending from the engine to an exhaust chamber and a rear exhaust pipe extending from said exhaust chamber to discharge exhaust gas therefrom, and an oxygen sensor for detecting the oxygen contents of the exhaust gas, wherein the oxygen sensor is disposed at the exhaust gas chamber extending upwardly and/or laterally therefrom.

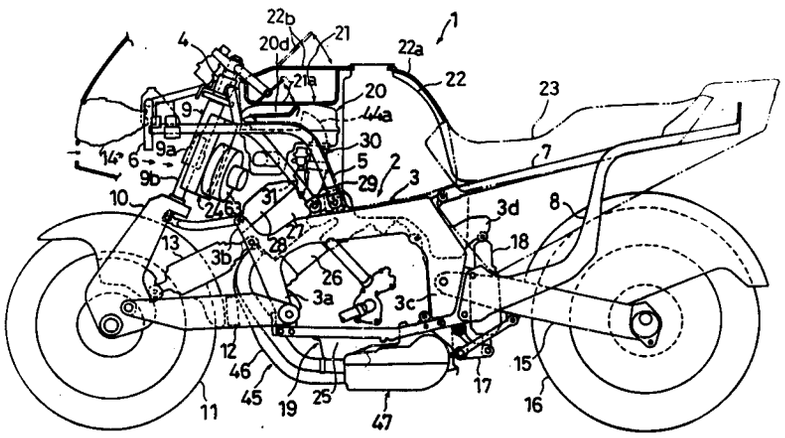

Fig.1

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The present invention relates to an exhaust gas arrangement for a motorcycle having an engine, particularly multiple cylinder engine, and an exhaust pipe assembly comprising at least a front exhaust pipe extending from the engine to an exhaust chamber and a rear exhaust pipe extending from said exhaust gas chamber to discharge exhaust gas therefrom, and an oxygen sensor for detecting the oxygen contents of the exhaust gas. More specifically, the present invention is directed to a structure for disposing the oxygen sensor in an exhaust system used in such a motorcycle. Moreover, the installation of the O_2 sensor should be such that the damage of the oxygen sensor by flying stones etc. during running and interference with the penetration of rain water etc. should be avoided.

There is a known exhaust system for a motorcycle having a structure in which a common, large exhaust chamber is connected to a plurality of exhaust pipes leading from an engine (see, for example, Japanese Published Unexamined patent Application No. Hei-2-78716). In a recent exhaust system for a motorcycle, an O_2 sensor is provided for detecting the combustion condition of an engine (see, for example, Japanese Published Unexamined Patent Application No. Sho-58-152115).

The oxygen sensor is adapted to detect the concentration of oxygen in an exhaust gas within the exhaust pipe. According to the detection signal from the sensor, the period of time through which the fuel injection valve is maintained in an open position is determined, namely the amount of the fuel to be injected is determined, so as to make the air fuel ratio (A/F) as close to a theoretical value as possible.

In the above construction, the oxygen sensor is mounted on the exhaust pipe located beneath the engine. By this, the place at which the oxygen concentration of an exhaust gas is to be detected is made as close to the engine as possible so as to improve the accuracy in amount of the fuel to be injected.

When the oxygen sensor is mounted on an outer surface of the exhaust pipe beneath the engine as described above, the position of the oxygen sensor is close to the road surface on which the motorcycle runs. Therefore, water or mud splashed by the wheels during running is apt to hit on the sensor. There is, thus, a danger of causing damage of the oxygen sensor.

In some cases, the O_2 sensor is mounted to an upper surface of an exhaust pipe located beneath the engine. Thus, in the case of an exhaust system of the above-described motorcycle provided with an O_2 sensor, the O_2 sensor is damaged by flying stones, etc., and is penetrated with rain water, etc. Further, depending upon the position at which the O_2 sensor is disposed, there is a possibility that the O_2 sensor will be contacted with the ground when the automobile is slanted and, hence, the banking angle becomes small.

Accordingly, the present invention aims to improve an exhaust gas arrangement as indicated above in such a manner that the oxygen sensor is disposed shielded and protected against environmental influences interfering with the oxygen sensor and implying the risk of damaging same, for example, by flying stones, penetrating rain water etc. Moreover, the new exhaust gas arrangement should not affect the banking angle of the motorcycle.

According to the present invention, the above objective is performed by disposing the oxygen sensor at the exhaust gas chamber such that the O_2 sensor extends upwardly and/or laterally from said exhaust gas chamber.

According to a preferred embodiment of the present invention, the oxygen sensor is disposed at an upper portion of the exhaust gas chamber, specifically at an upper case of said chamber made of sheet metal.

According to yet other preferred embodiments of the present invention, the oxygen sensor is disposed at a depressed area of the upper case of the exhaust gas chamber, and/or at the rear end thereof downstream of a catalyst and is disposed obliquely upward.

According to another preferred embodiment, a front exhaust pipe is detachably connected to the exhaust gas chamber while the other front exhaust pipes of a multi cylinder internal combustion engine integrally joined with the exhaust gas chamber which, in turn, is suspendedly secured to a lower bottom portion of the internal combustion engine.

According to a yet further preferred embodiment of the present invention, there is a provided a sensor protecting shielding arrangement preferably established by a cowling extending from the bottom frame downwardly to shield the oxygen sensor from the side and from below, while according to a further modification, there is a front plate arrangement with a first protector plate projecting from the exhaust chamber and a second protector plate which projects from the frame body or defines a part of the cowling to establish a labyrinth arrangement with the first protector plate to protect the oxygen sensor. Further preferred embodiments of the present invention are laid down in the other sub-claims.

In the following, the present invention is explained in greater detail by means of several embodiments thereof in conjunction with the accompanying drawings wherein:

Figure 1 is a motorcycle embodying a first embodiment of the exhaust gas arrangement ac-

cording to the present invention,

Figure 2 is an elevational view of the exhaust gas arrangement according to the present invention showing the disposition structure of the oxygen sensor in conjunction with the exhaust gas system of Figure 1,

Figure 3 is a sectional side view of the exhaust gas arrangement of Figure 2,

Figure 4 is a planned view of the exhaust gas arrangement of Figures 2 and 3,

Figure 5 is a side view of the exhaust gas structure according to Figures 1 to 4,

Figure 6 is another embodiment of the exhaust gas structure, specifically of an oxygen sensor protecting arrangement of the present invention,

Figure 7 is a partial planned view of Figure 6,

Figure 8 is a sectional view along line 3-3 in Figure 2,

Figure 9 is a view corresponding to Figure 7 but showing yet another embodiment of the oxygen sensor protecting arrangement of the present invention,

Figure 10 is a view corresponding to Figure 1 for the other embodiment of the exhaust gas arrangement, specifically of the oxygen sensor protecting assembly as shown in Figure 9, and

Figure 11 is a view corresponding to Figure 8 for the further embodiment of the present invention as shown in Figures 9 and 10.

Referring to Figures 1 to 5, designated as 1 is a motorcycle carrying an engine according to the present embodiment. The motorcycle 1 has a body frame composed of a pair of left and right main frames 3 each of which is in an inverted U-shaped form when viewed from the side and which are connected by a cross pipe, a head bracket 5 connected by a cross pipe, a head bracket 5 connected to an upper surface of an upper portion of each main frame 3, a lamp stay 6 provided in forwardly extended portions of the head brackets 5 for supporting a front lamp 14, a seat rail 7 connected to an upper rear end of each main frame 3, and a seat stay 8 by which the seat rail 7 is connected to a rear arm bracket 3c provided in a rear portion of the main frame 3.

The main frame 3 has a front portion provided with a front bracket 3a to which a front arm 12 is vertically pivotally supported. The front arm 12 is in an h-shaped form when viewed in the plane (see Fig. 4 and has rear end portions pivotally supported by the front bracket 3a and front end portions to which a front wheel bracket 10 is rotatably supported by means of a ball joint (not shown). A front wheel 11 is supported in the lower end of the bracket 10. A lower portion of the front wheel bracket 10 and an upper end of the front bracket 3a are connected with each other by a front cushion 13. The front wheel bracket 10 is leftwardly and rightwardly steerably supported to the head pipe 4 through a steering shaft 9. The shaft 9 is constructed from an upper pipe 9a supported by the head pipe 4 and a lower pipe 9b retractably received in the upper pipe 9a and fixedly secured to an upper portion of the front wheel bracket 10, and is oriented such that the upper the position thereof, the more becomes rearward the position, namely in a rearwardly inclined state.

At the rear arm bracket 3c a rear arm 15 is vertically pivotally supported. The rear arm 15 has a rear end rotatably supporting a rear wheel 16. A front portion of the rear arm 15 is linked with a lower end of the rear arm bracket 3c by a linking mechanism 17. The linking mechanism 17 is connected to a cushion bracket 3d of the rear arm bracket 3c by a rear cushion 18.

An engine unit 19 is suspendedly supported by the main frame 3. In a front upper portion of the engine unit 19 is provided with an air cleaner 20 and a glove compartment 21 in this order from the below. In a rear upper portion of the engine unit 19, there is mounted a fuel tank 22 behind which a seat 23 is provided. The glove compartment 21, fuel tank 22, etc. are surrounded by a tank cover 22a provided with a lid 22b at a position adjacent to the glove compartment 21. Another lid 21a is provided in the bottom of the glove compartment 21.

Disposed on the rear side of the steering shaft 9 is a radiator 24 which is oriented along the steering shaft 9, namely in a rearwardly inclined state, when viewed from the side. The radiator 24 has a rearwardly protruding curved element 24a on the right end of which a feed water box 24b is secured and on the left end of which an exhaust water box 24c is secured. A pair of left and right wind fans 63 are disposed on the backside of the radiator 24 and are oriented outwardly and toward the left and right, lower corner sides.

The engine unit 19 in this embodiment is of a water-cooled, four-cycle, parallel four-cylinder type which is constructed from a cylinder body 26, a cylinder head 27 and a head cover 28 superposed one over the other in a front upper portion of the crankcase 25. An intake manifold 29 is connected to a rear wall of the cylinder head 27. On an upstream end of the intake manifold 29, a throttle body 30 is connected such that it is oriented vertically as a whole. The air cleaner 20 is connected to the throttle body 30. Designated as 44a is an air introduction duct and as 31 a fuel injection valve.

The cylinder head 27 has a front wall to which four exhaust pipes 46a-46d of the exhaust device 45 are connected. Each of the exhaust pipes 46a-46d extends from a front portion of the crankcase 25 to a lower portion thereof and is connected to a common, exhaust chamber 47 disposed beneath

the crankcase 25. The exhaust chamber 47 is of a two-separated type which is composed of upper and lower cases 47a and 47b connected with each other by welding and which has a front opening closed by an end plate 50. The upper case 47a has a rear end portion in which an exhaust pipe 47e is integrally formed. To the end plate 50 are welded rear ends of the three exhaust pipes 46b-46d except of the left end exhaust pipe 46a. The left end exhaust pipe 46a is inserted into a joint 47c welded to the end plate 50 and is fixed there by means of a fixing band 48 wound therearound and fastened by a fixing bolt 48a. Thus, the left end exhaust pipe 46a is made detachable so that the exhaust device 45 can be easily mounted to the engine. Namely, the front arm 12 of the motorcycle of the present embodiment has an h-shaped form and the width a of the exhaust pipes 46a-46d is greater than the inside width b of the front arm 12. Therefore, the exhaust pipes as such will be interfered by the front arm so that the assembling work will be difficult to perform. When the left end exhaust pipe 46a is detached, on the other hand, the width of the exhaust pipes is smaller than the above-mentioned inside width, so that the assembling is easy to perform.

A columnar catalyst 52 is disposed within the exhaust chamber 47. The space between the catalyst 52 and the inside surface of the exhaust chamber 47 is closed by a partition 53. On an upper surface of the upper case 47a are fixedly secured a pair of left and right brackets 47d between which is disposed a boss member 51 into which a support bolt 55 is inserted and is fixed. the exhaust chamber 47 is suspendedly secured to the engine by fixing the boss member 51 to a mounting seat 25b of the crankcase 25 by means of a fastening bolt 54.

An O_2 sensor 49 is bolted on a rear end of the upper case 47a of the exhaust chamber 47. The O_2 sensor 49 is located downstream of the catalyst 52 and is oriented obliquely upward. When viewed in the plan, the lower region of the O_2 sensor is covered with the lower case 47b.

The function and effect of the present embodiment will be explained next.

Since, in the system of the present embodiment, the O_2 sensor 49 is disposed on part of the upper case 47a, the lower case 47b can serve to function as a protector for the O_2 sensor 49. Namely, flying stones from the road and rain water hit the lower case 47b and seldom arrive at the O_2 sensor. Thus, the damage of the O_2 sensor by flying stones and penetration of rain water thereinto can be prevented.

Further, as shown in Fig. 1, since the O_2 sensor 49 of this embodiment is located outside of the banking angle θ, even when the automobile is slanted to the maximum degree, the O_2 sensor 49 is not brought into contact with the road surface. Thus, the provision of the O_2 sensor 49 does not render the banking angle small. Moreover, since the O_2 sensor 49 extends upwardly obliquely, the wiring work therefor may be easily performed.

In addition, since the O_2 sensor 49 is disposed on the upper case 47a, even when the exhaust chamber drops during the inspection and maintenance of the exhaust device 45, the O_2 sensor 49 will not be damaged.

In the above embodiment, the O_2 sensor 49 is disposed at a position downstream of the catalyst 52. However, the O_2 sensor may be disposed at a position upstream of the catalyst 52 as shown in the two-dotted line in Figures 2 and 3.

Thus it is preferred that an O_2 sensor 49 is disposed on an exhaust device 45 of a motorcycle in which exhaust pipes 46a-46d leading from an engine are connected to an exhaust chamber 47 disposed beneath a crankcase 25, the O_2 sensor is mounted on an upper portion of the exhaust chamber 47.

According to the O_2 sensor disposition structure of the present invention, since the O_2 sensor is disposed on an upper portion of the exhaust chamber, the lower portion of the exhaust chamber can serve to function as a protector for the O_2 sensor. Namely, since the flying stones are mainly flown upward from the ground at which the rear wheel is contacted and since the portion beneath the O_2 sensor is covered with the lower side of the exhaust chamber, the flying stones, etc. are intercepted thereby. As a result, the O_2 sensor is prevented from being hit with the flying stones, etc. and penetrated with rain water, etc.

In the preceding embodiment, the lower case 47b of the exhaust chamber 47 is substantially served as a protecting member for the oxygen sensor 49.

In the following, another embodiment will be explained in greater detail, wherein another sensor protecting arrangement is provided as follows:

Figure 6 discloses a first embodiment of said further embodiment using a shielding arrangement for the oxygen sensor 49 which is established by a cowling 60 to provide a side protecting member of the oxygen sensor 49. First of all, said embodiment is explained pointing to Figures 6 to 8. As shown in the Figures of this embodiment, again the reference numeral 3 depicts a body frame of the motorcycle 1. The body frame supports the four-cycle engine 19. An arrow Fr points to the front side of the engine 19. Also in this case an exhaust pipe 46 is composed of four front exhaust pipes 46a to 46d extending from the respective cylinders. Each of the front exhaust pipes 46a to 46d extends downward from the corresponding cylinder and is then

turned rearwardly, as in the preceding embodiment. The turned ends of the front exhaust pipes 46a to 46d are joined to the exhaust chamber 47 to which the rear pipe 47f is connected. The rear pipe 47f extends rearwardly and has a rear end connected to a silencer (not shown). The exhaust chamber 47 passes rearwardly beneath an oil pan 61 which constitutes a bottom of the engine 19. The exhaust chamber 47 is made by press forming and is shaped from an upper, inverted bowl-like plate 62 and a lower bowl-like plate 64 which are vertically faced with and bonded to each other in the form of bean-jam-filled wafers with the bonding portion being welded to establish the upper and lower cases 47a, 47b. The exhaust chamber 47 comprises pairs of front and rear partitioning plates 65 welded to the middle portions of the inner surface of the exhaust chamber at the upper and bottom portions thereof, one behind the other in the travelling direction of the motorcycle 1. The partitioning plates 65 sub-divide the exhaust chamber 47 into front and rear chambers 67, 68, the front chamber 67 is in communication with the front exhaust pipes 46a to 46d while the rear chamber 68 is communicated to the rear exhaust pipe 47f.

A cylindrical body 69 is provided to extend through the partitioning plates 67, 68 and is supported by welding thereof. Within the cylindrical body 69 the catalyst 52 is secured. A sealing material 66 is disposed between the inside of the cylindrical body 69 and the outersurface of the catalyst 52.

The flow of exhaust gas 70 from the engine 90 passes successively through the front exhaust pipes 46a to 46d, the front chamber 67, catalyst 52 and rear chamber 68 of the exhaust chamber 47 and the rear exhaust pipe 47f to be discharged rearwardly from the motorcycle body. In this case, the catalyst 52 serves to purify the exhaust gas 70 passing therethrough.

A boss 49a is welded to a front right portion of the exhaust chamber 47 and inserted through the wall of same. The oxygen sensor 49 is detachably secured to the boss 49a by screws from the outer surface of the exhaust chamber 47. The oxygen sensor 49 is covered overhead with a side portion of the oil pan 62 and has a detecting portion 49b positioned adjacent to the front chamber 67.

The oxygen sensor 52 detects the oxygen concentration of the exhaust gas 70 and the exhaust chamber 47. The detection signal determines the opening time of the fuel injection valve (not shown here) of the engine 19, i.e. the amount of fuel to be injected.

In this embodiment it is preferred that the oxygen sensor 49 is located as upstream to the flow of exhaust gas 70 as possible and close to the engine 19. One might consider mounting the oxygen sensor to one of the front exhaust pipes 46a to 46d. But, since the oxygen concentrations in the front exhaust pipes 47a to 47d differ from each other, it is more appropriate to mount the oxygen sensor 49 to the exhaust chamber 47 wherein the concentration of oxygen from the front exhaust pipes 46a to 46d is equalised.

A temperature sensor for detecting the temperature of the exhaust gas 70 is of a thermo couple type and designated with the reference numerals 72. The exhaust gas temperature sensor 72 is detachably mounted to a rear portion of the exhaust chamber 47 and has a detecting portion 72a disposed adjacent to the rear chamber 68. The detecting portion 72a is located downstream and in the vicinity of the catalyst 52 to detect the temperature of the exhaust gas 70 so as to indirectly detect the temperature of the catalyst 52. Feet rests are designated with the reference numeral 73.

As shown for example in Figure 6, a pair of cowlings 60 is provided and designed to cover the body frame 3, the engine 19, the exhaust device 45 and the oxygen sensor 49 from left and right sides. Each of the cowlings 60 is supported by the body frame 3, and constitutes part of the body 3. The right cowling 60 has a lower portion which covers the lower side of the oxygen cylinder 49 and, thus, serves to function as a protecting member for the oxygen sensor 49.

In the aforeindicated case, the oxygen sensor 21 is disposed in a narrow space defined by the oil pan 61 and the cowling 60 and is mounted on the exhaust chamber 47 with the detecting portion 52a being lowered forwardly. Further, the longitudinal direction of the oxygen sensor 49 is oriented along the inside face of the cowling 60 corresponding to the oxygen sensor 49. By this construction, the outer edge of the oxygen sensor 49 is oriented obliquely upwardly to enable easy wiring of the oxygen sensor 49.

Since, as described above, the oxygen sensor 49 is required to be disposed in the narrow space between the oil pan 61 and the cowling 60, the boss 52a to which the oxygen sensor 49 is fixed by screws is mounted on the portion at which the upper plate 62 and the lower plate 64 are joined bestride both plates 62, 64.

A first protector plate 74 formed by press forming is provided on the right side of the outer surface of the exhaust chamber 47 near the front portion of the oxygen sensor 49. The first protector plate 74 covers a front side of the oxygen sensor 49. Accordingly, the first protector plate 74 serves as a protecting member for the oxygen sensor 49. The first protector plate 74 has a base portion welded across the upper and lower plates 621, 64 so that the bonding force between the upper and lower plates 62, 64 (upper case 47a, lower case

47b) is improved.

A second protector plate 75 is integrally formed on an inside phase of the cowling 60 and protruded into a space between the oxygen sensor 49 and the first protector plate 74. The second protector plate 75 covers a front side of the oxygen sensor 49 and, thus, serves to function as a protecting member for the oxygen sensor 49.

The passage leading to the oxygen sensor 49 from a portion in front of same is in the form of a labyrinth formed by the first and second protector plates 74, 75.

As a result of the above construction, since the oxygen sensor is mounted on an outer surface of the exhaust chamber 47, the oxygen sensor 49 is located close to the road surface during running of the motorcycle leading water and the like to splash during running and to adhere to the oxygen sensor 49. However, since, in the above described embodiment, there exists the oil pan 61 covering the upper side of the oxygen sensor 49, the lower portion of the cowling 60, covering the lower side of the oxygen sensor 49 and the first and second protector plates 74, 75, covering the front side thereof, the above mentioned collision is surely prevented by these parts so that damage of the oxygen sensor 49 can be prevented.

Further, since the cowling 60 establishes a high rigidity and the second protector plate 75 is mounted on the cowling 60, having a high rigidity, the mounting of the protector plates 62, 64 provides a sufficient strength to further surely prevent the above mentioned collision with water, stones or the like.

Moreover, since the passage between the first and second protector plates 62, 64 is in the shape of a labyrinth, the above mentioned collision is further surely prevented.

Figures 9 to 11 show still another embodiment wherein the second protector plate 75 is welded to the body frame 3 having a high rigidity. The further structure and function are the same as in the above described embodiments indicated in Figures 6 to 8 and, therefore, the common parts are allotted with same reference numerals in the drawings and in view of the description references made to the above explanation.

Thus, according to the present invention, since the oxygen sensor is disposed on an upper portion of the exhaust chamber, the lower portion of the exhaust chamber can serve to function as a protector for the oxygen sensor and can prevent same from being damaged by flying stones, penetration of rain water etc. Moreover, according to a further development of said sensor protecting arrangement, a protecting member is provided for covering the lower side and front side of the oxygen sensor, more specifically said protecting member comprising lower parts of the cowling and/or side plate arrangement further protecting the oxygen sensor.

Claims

1. Exhaust gas arrangement for a motorcycle having an engine (19), particularly multiple cylinder engine, and an exhaust pipe assembly comprising at least a front exhaust pipe (46a, 46d) extending from the engine (19) to an exhaust chamber (47) and a rear exhaust pipe extending from said exhaust chamber (47) to discharge exhaust gas therefrom, and an oxygen sensor (49) for detecting the oxygen contents of the exhaust gas,

   characterised in that

   the oxygen sensor (49) is disposed at the exhaust gas chamber (47) extending upwardly and/or laterally therefrom.

2. Exhaust gas arrangement as claimed in Claim 1, **characterised in that**, the oxygen sensor (49) is disposed at an upper position of the exhaust chamber (47).

3. Exhaust gas arrangement as claimed in Claims 1 or 2, **characterised in that**, the exhaust gas chamber is composed of upper and lower cases (47a, 47b) made of steel metal and in that the oxygen sensor (49) is attached to the upper case (47a) of the exhaust gas chamber-(47).

4. Exhaust gas arrangement as claimed in one of the preceding Claims 1 to 3, **characterised in that**, a catalyst (52) is disposed within the exhaust chamber (47).

5. Exhaust gas arrangement as claimed in Claim 4, **characterised in that**, the oxygen sensor (49) is installed at a rear end of the upper case (47a) of the exhaust chamber (47) downstream of the catalyst (52) and is oriented obliquely upward.

6. Exhaust gas arrangement as claimed in Claim 4, **characterised in that**, the oxygen sensor (49) is installed at an upper side front portion of the upper case (47a) of the exhaust chamber (47) upstream of the catalyst (52) and is oriented obliquely upward.

7. Exhaust gas arrangement for a motorcycle having a four cylinder engine, comprising four front exhaust pipes (46a-46d) joining to the exhaust chamber (47), **characterised in that**,

a laterally disposed front exhaust pipe (46a) is detachably connected to the exhaust chamber (47) while the other front exhaust pipes (46b-46d) are integral with the exhaust (42) chamber which is suspendedly secured to the lower bottom portion of the engine (19).

8. Exhaust gas arrangement for a motorcycle as claimed in at least one of the preceding Claims 1 to 7, **characterised in that**, the oxygen sensor (49) is disposed inwardly of a vertical plane drawn from a side end of the exhaust chamber (47).

9. Exhaust gas arrangement as claimed in at least one of the preceding Claims 1 to 8, **characterised in that**, the oxygen sensor (49) is installed at a depressed area of the upper case (47a) of the exhaust chamber (47).

10. Exhaust gas arrangement as claimed in at least one of the preceding Claims 1 to 9, **characterised in that**, a sensor protecting arrangement is provided shielding the oxygen sensor (49).

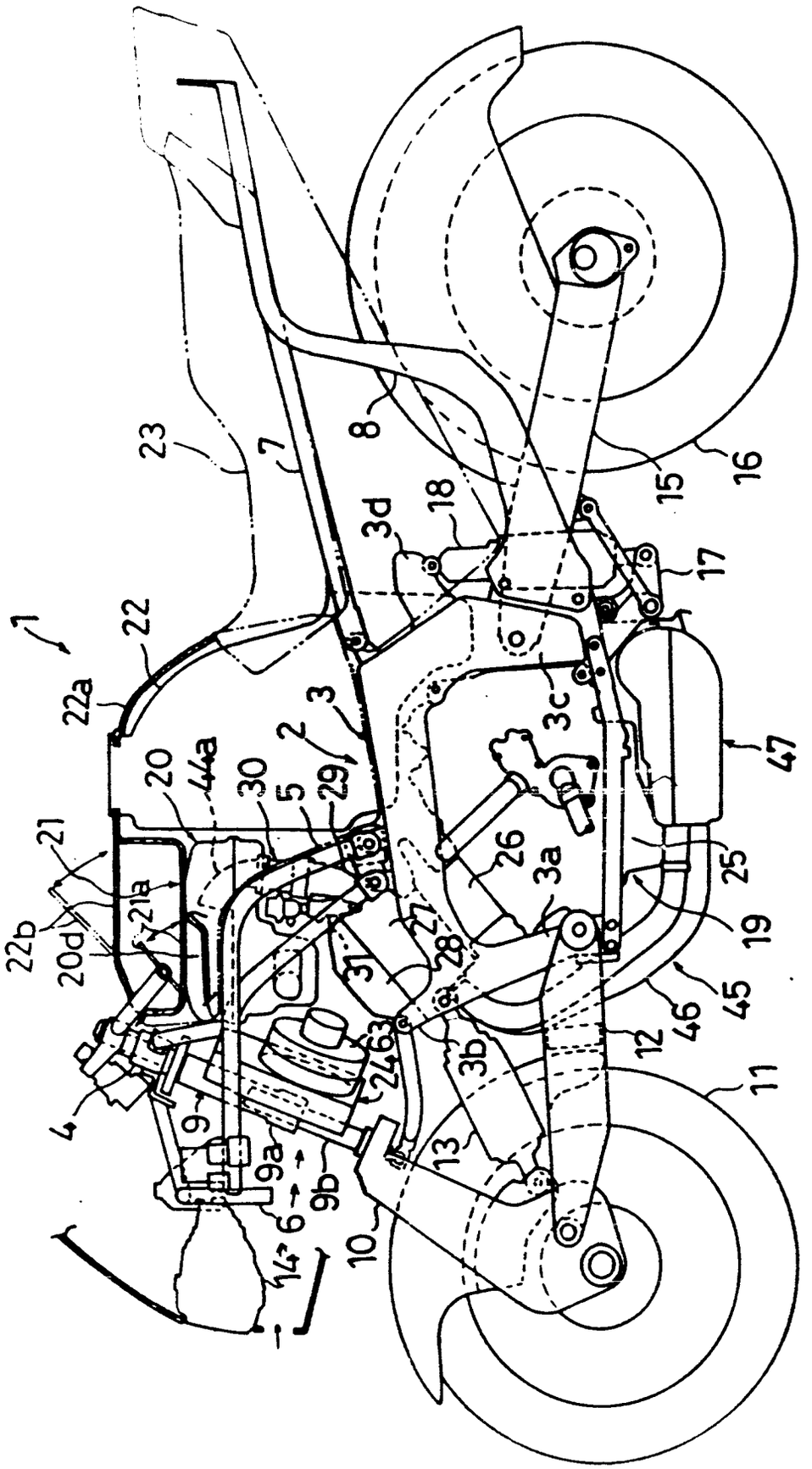
11. Exhaust gas arrangement as claimed in at least one of the preceding Claims 1 to 10, **characterised in that**, the sensor protecting arrangement comprises a cowling extending from the bottom frame downwardly, shielding the oxygen sensor (49) from the side and from below, and/or a front plate assembly shielding the oxygen sensor to the front.

12. Exhaust gas arrangement as claimed in at Claim 10, **characterised in that**, the front plate arrangement comprises a first protector plate (74) projecting from the exhaust chamber (42) and integrally connecting the upper and lower cases (47a, 47b) thereof.

13. Exhaust gas arrangement as claimed in Claims 11 or 12, **characterised in that**, the protector plate arrangement comprises a second protector plate (75) which projects from the frame body (3), protruding integrally from the cowling (60) and defining a labyrinth arrangement with the first protector plate (74).

14. Exhaust gas arrangement as claimed in at least of the preceding Claims 1 to 13, **characterised in that**, the exhaust chamber (47) comprises a generally V-shaped cross-section disposed closely adjacent to an oil pan (61) disposed above, said oil pan (61) having a bottom contour adapted to the upper side of the exhaust chamber (47) while the oxygen sensor (49)
protrudes substantially laterally inclined upwardly from a connecting area between the upper and lower cases (47a, 47b) of the exhaust chamber (47).

15. Exhaust gas arrangement as claimed in at least one of the preceding Claims 1 to 14, **characterised in that,** an upper side of the oxygen sensor (49) is protected by an oil pan (61) of the engine (19).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15
16
17
18
19
20
20d
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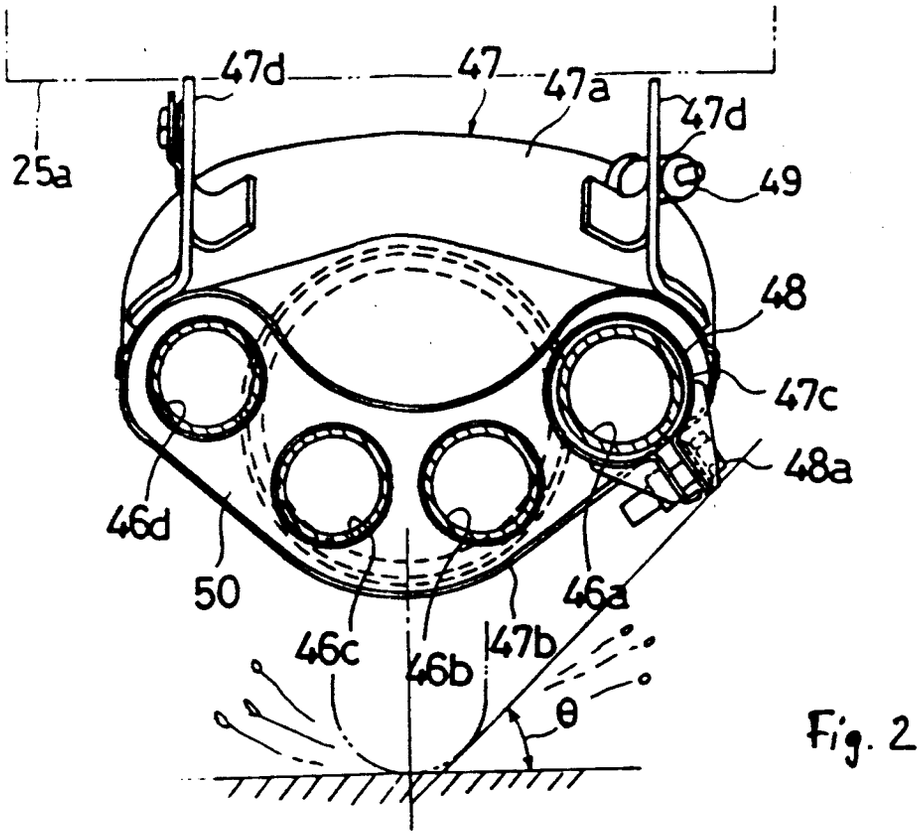
Fig. 1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θ

Fig. 2

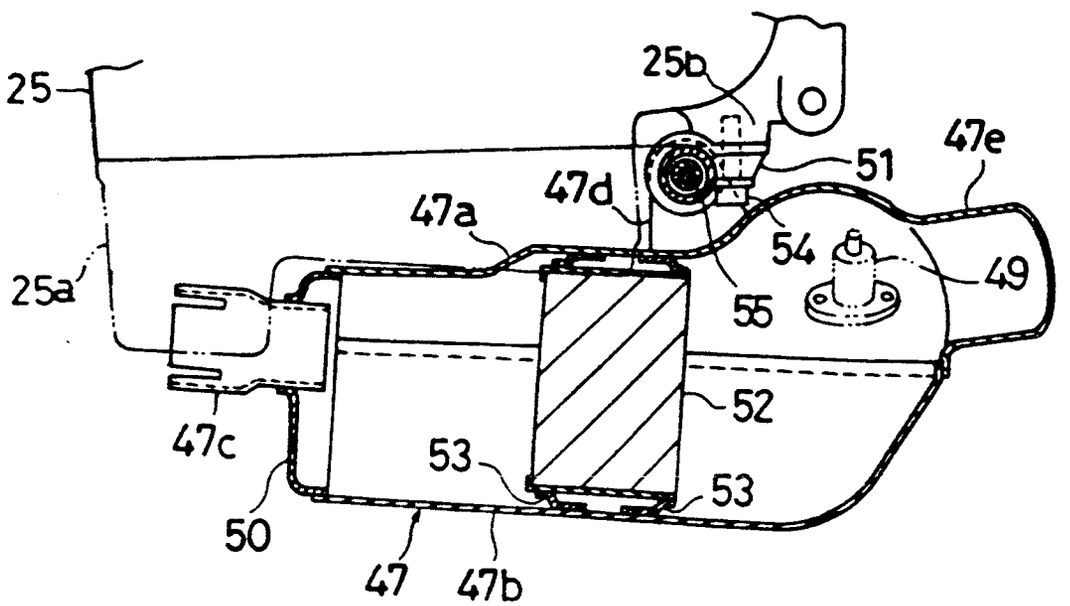
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Fig. 3

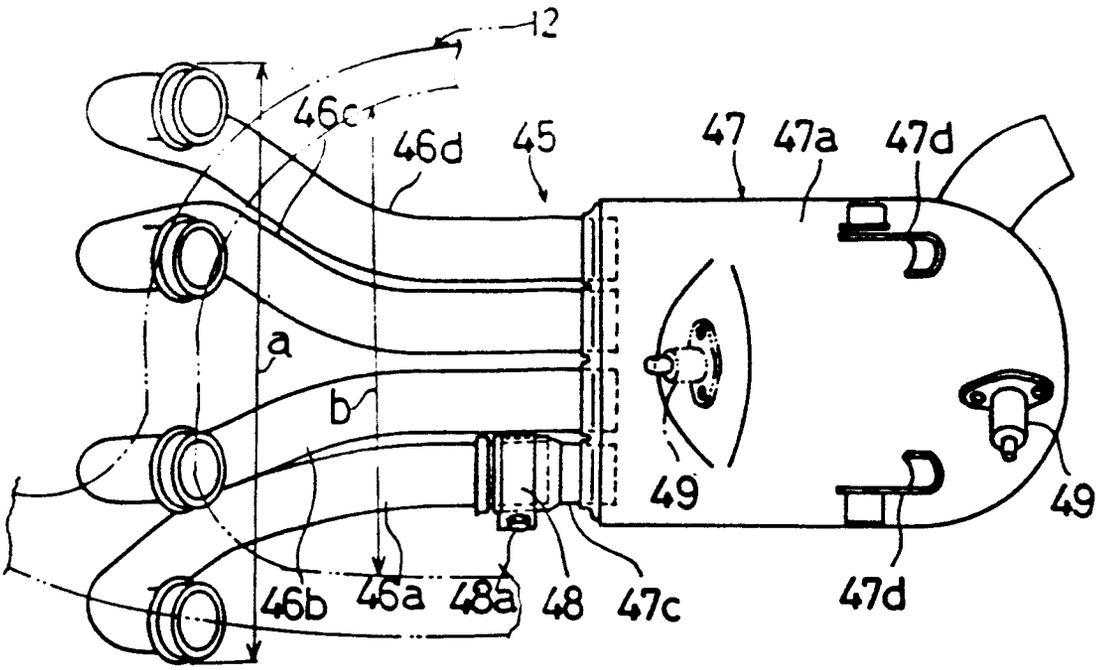
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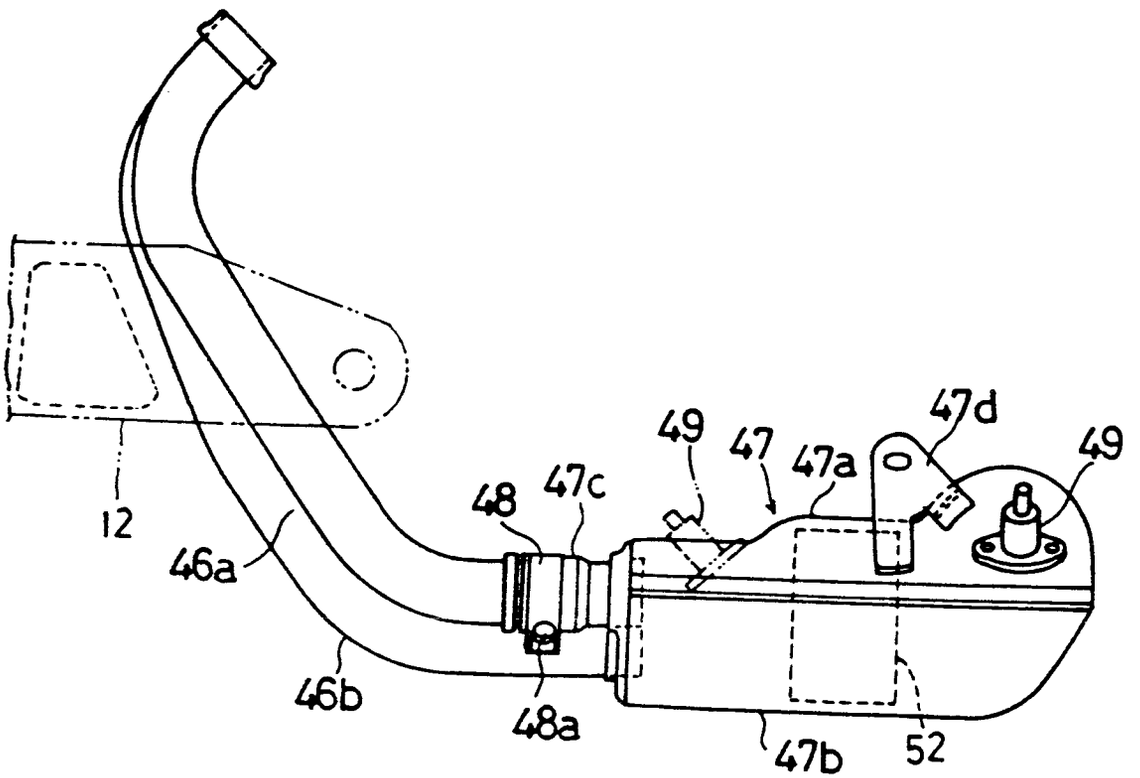
Fig. 4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52

Fig. 5

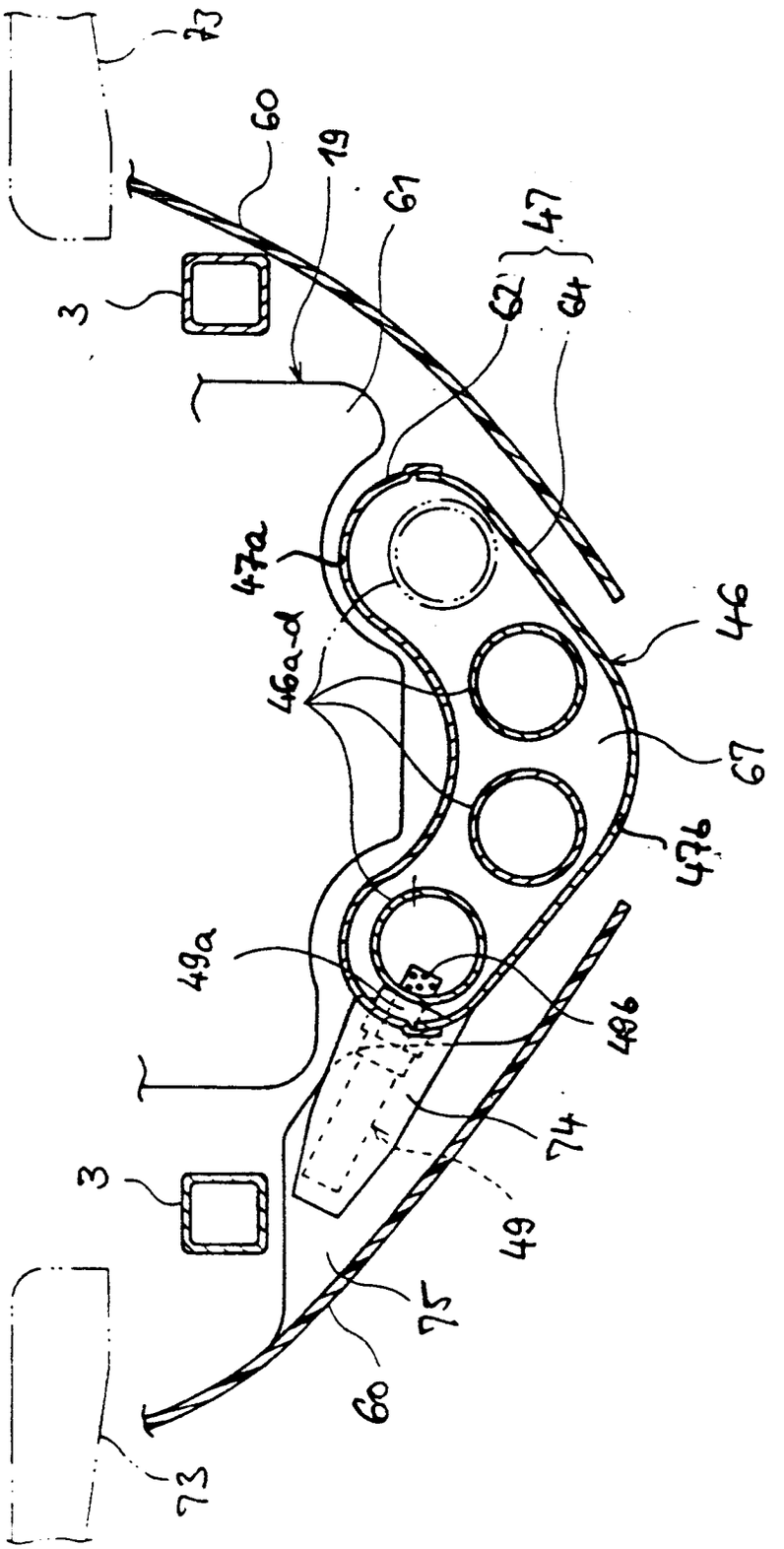

Fig. 6

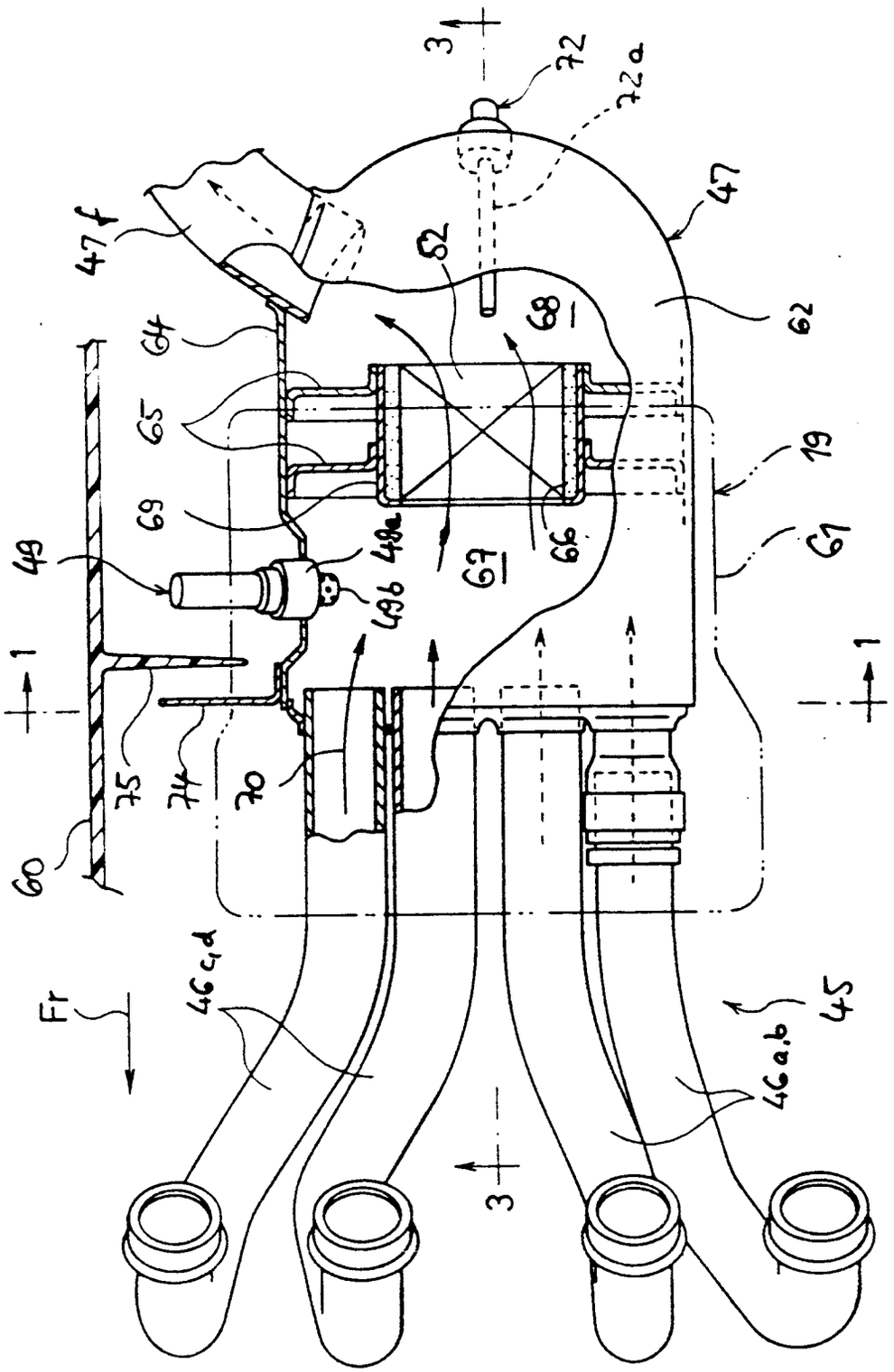
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Fig. 7

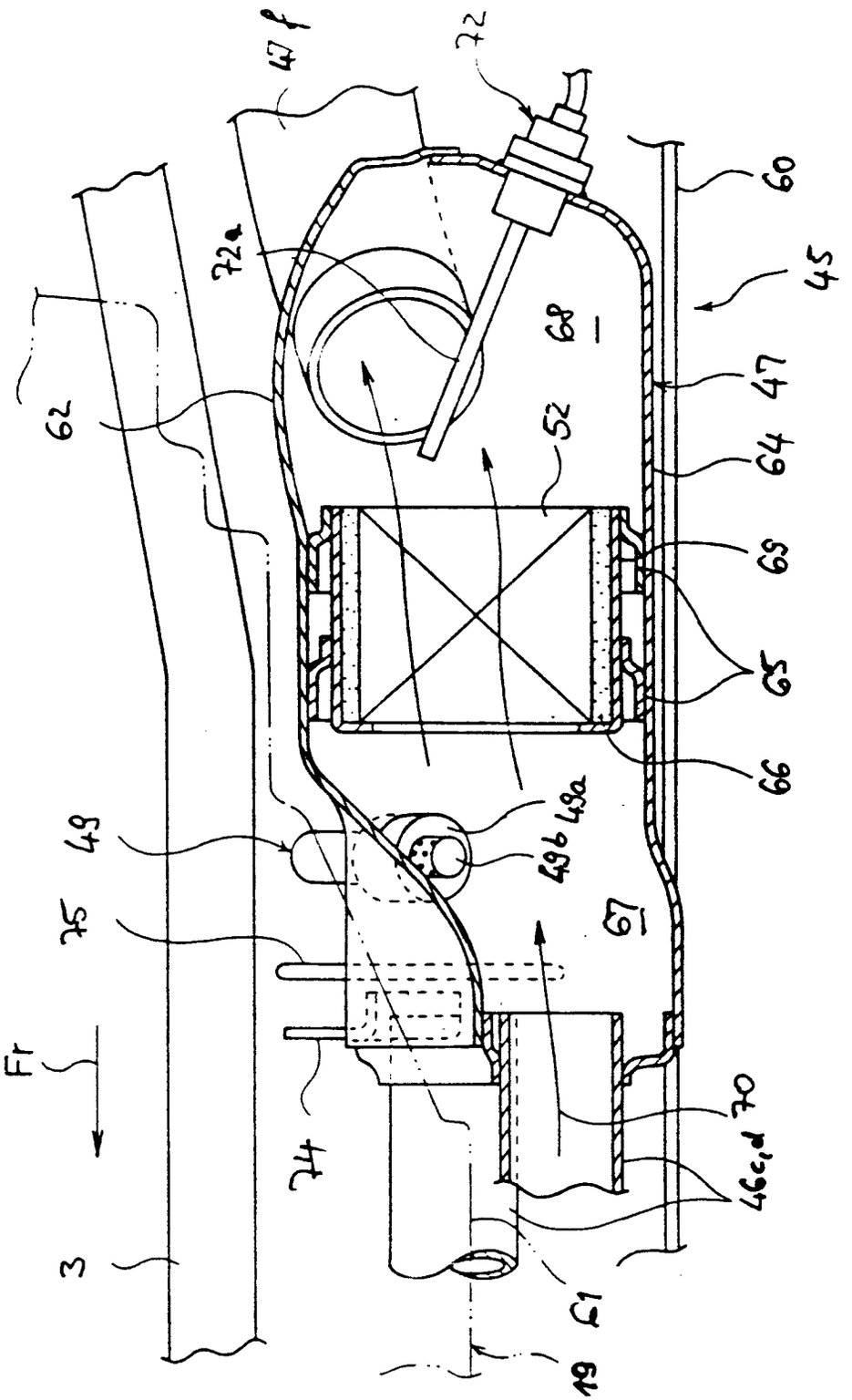
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Fig. 8

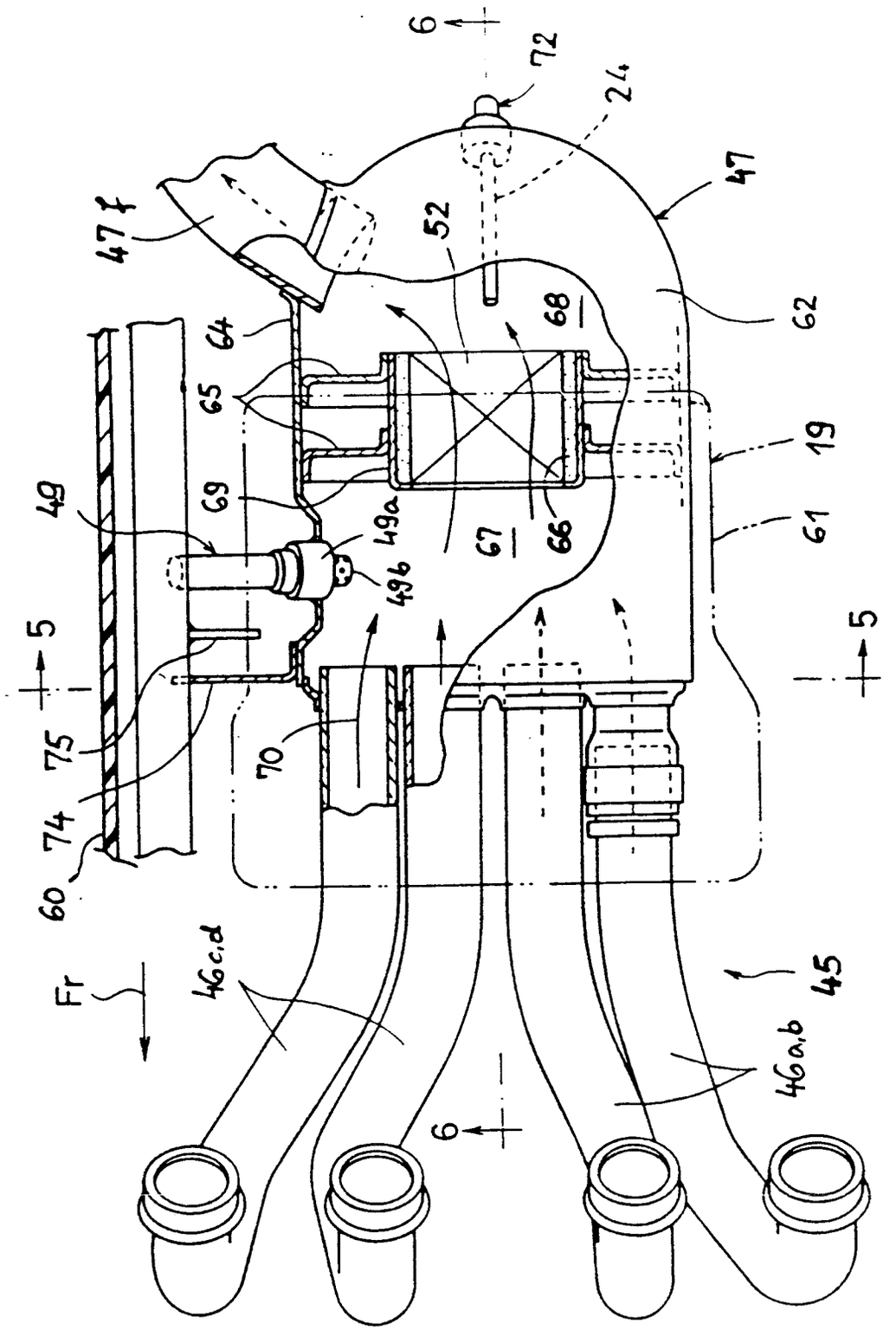
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Fig. 9

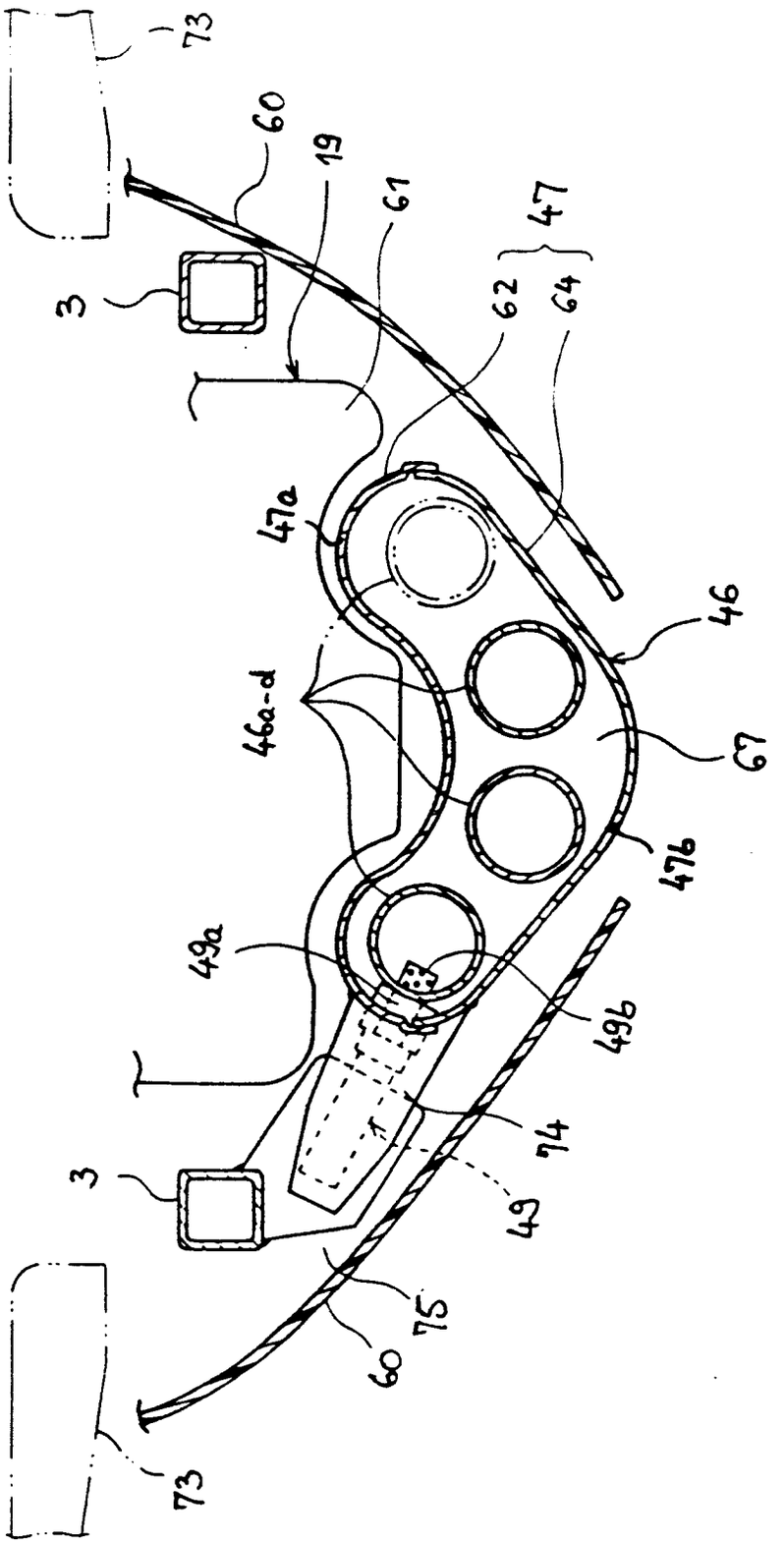

Fig. 10

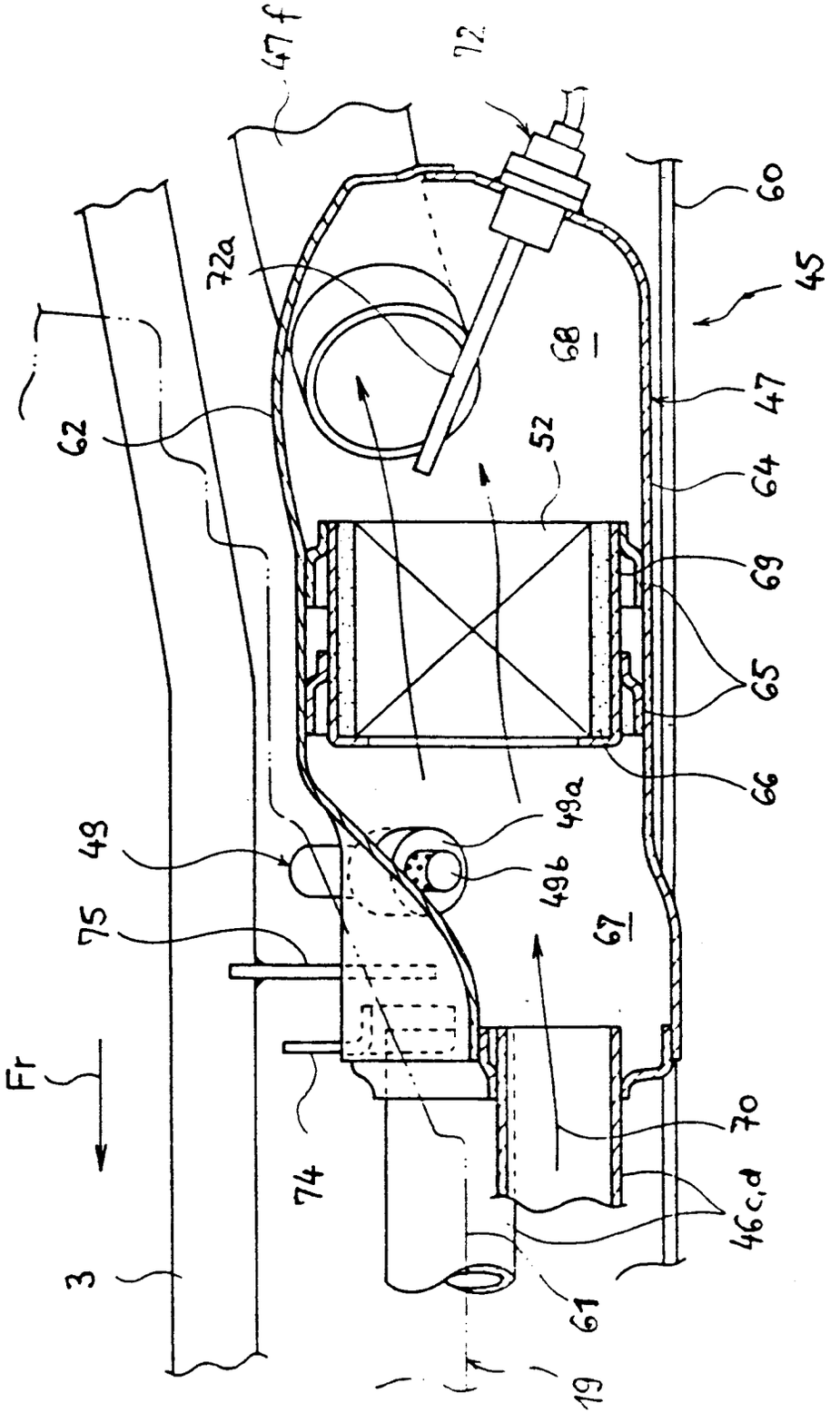
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Fig. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 2854

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN vol. 008, no. 210 (M-328)26 September 1984 & JP-A-59 099 021 (HONDA) 7 June 1984	1-3	F01N3/10 F01N7/08 F01N7/18
A	* abstract *	6	
A	PATENT ABSTRACTS OF JAPAN vol. 009, no. 142 (M-388)18 June 1985 & JP-A-60 022 017 (YAMAHA) 4 February 1985 * abstract *	4	
A	US-A-4 553 388 (HONDA) * column 6, line 21 - column 6, line 40; figures 4-7 *	1,10,12, 15	
A	PATENT ABSTRACTS OF JAPAN vol. 006, no. 056 (M-121)13 April 1982 & JP-A-56 167 811 (YAMAHA) 23 December 1981 * abstract *	14	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F01N
B60K
B62J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 APRIL 1992	KLINGER T.G.

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