



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
31.01.2007 Bulletin 2007/05

(51) Int Cl.:
F01N 7/08 (2006.01) F01N 7/18 (2006.01)
F01N 7/14 (2006.01)

(21) Application number: **06009760.7**

(22) Date of filing: **11.05.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **28.07.2005 JP 2005219326**

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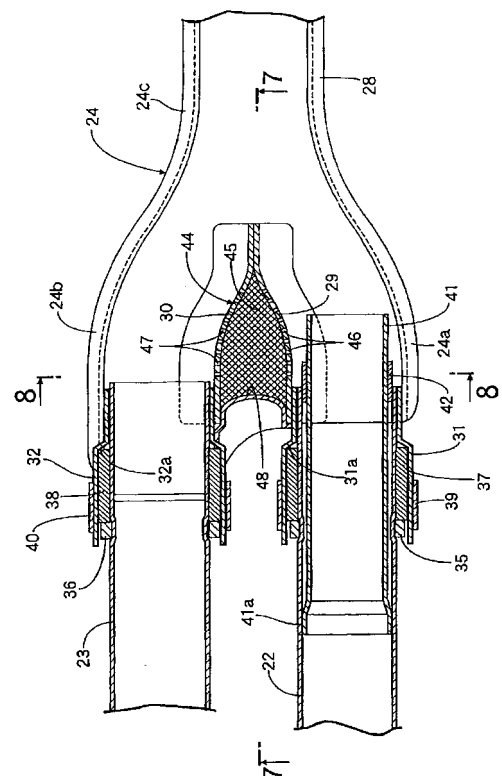
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(54) **Exhaust system for motorcycle multiple cylinder engines**

(57) In an exhaust system for motorcycle multiple cylinder engines in which the downstream end of a choke pipe 41 connected to the downstream end of at least one of a plurality of exhaust pipes 22, 23 is inserted into at least one of a plurality of individual pipe portions 24a, 24b of a confluence exhaust pipe 24, the dimensional accuracy of the choke pipe 41 can be improved regardless of the exhaust pipes 22, 23 and the design of the choke pipe 41 alone can be changed, thereby making it possible to enhance the degree of design freedom.

The choke pipe 41 which is separate from the exhaust pipes 22 and 23 is fixed to the downstream end of at least one exhaust pipe 22.

FIG. 6



Description

[0001] The present invention relates to an exhaust system for motorcycle multiple cylinder engines, which comprises: a plurality of exhaust pipes whose upstream ends are connected to the engine body of a multiple cylinder engine; a confluence exhaust pipe comprising a plurality of individual pipe portions for connecting the downstream end portions of the exhaust pipes independently and a confluence pipe portion for combining the downstream end portions of the individual pipe portions; and an exhaust muffler connected to the downstream end of the confluence pipe portion, and the downstream end of a choke pipe connected to the downstream end portion of at least one of the exhaust pipes is inserted into at least one of the individual pipe portions.

[0002] An exhaust system for motorcycle multiple cylinder engines which improves the output characteristics at low- to medium-speed ranges of an engine by connecting a plurality of exhaust pipes extending from a multiple cylinder engine to a confluence exhaust pipe and inserting a choke pipe connected to the downstream end of one of the exhaust pipes into the confluence exhaust pipe is known by Patent Document 1, for example.

[Patent Document 1] JP-A No. 99628/1987

[0003] In the prior art exhaust system, the choke pipe which is integrated with one of the exhaust pipes by processing one exhaust pipe to narrow down its downstream end portion and inserted into the confluence exhaust pipe is welded to the confluence exhaust pipe.

[0004] The length of the choke pipe has an influence upon the output characteristics of the engine severely. High dimensional accuracy is required for the length of the choke pipe and a high degree of design freedom is required for the choke pipe to enable the change of its design easily according to the motion characteristics of a motorcycle.

[0005] Since the choke pipe is integrated with the exhaust pipe in the prior art exhaust system, it is difficult to enhance dimensional accuracy with the choke pipe alone.

When the design of the choke pipe is to be changed, it is necessary to re-design all of the exhaust pipes and therefore, the degree of design freedom is not high.

[0006] It is an object of the present invention which has been made in view of the situation to provide an exhaust system for motorcycle multiple cylinder engines, which enables the dimensional accuracy of a choke pipe to be improved regardless of an exhaust pipe and the change of the design of the choke pipe alone so as to increase the degree of design freedom.

[0007] To attain the object, the invention set forth in Claim 1 is an exhaust system for motorcycle multiple cylinder engines, comprising: a plurality of exhaust pipes whose upstream ends are connected to the engine body of a multiple cylinder engine; a confluence exhaust pipe comprising a plurality of individual pipe portions for connecting the downstream ends of the exhaust pipes inde-

pendently and a confluence pipe portion for combining the downstream ends of the individual pipe portions; and an exhaust muffler connected to the downstream end of the confluence pipe portion, the downstream end of a choke pipe connected to the downstream end of at least one of the exhaust pipes is inserted into at least one of the individual pipe portions, wherein

the choke pipe separate from the exhaust pipes is fixed to the downstream end of at least one exhaust pipe.

[0008] In addition to the configuration of the present invention according to Claim 1, the invention set forth in Claim 2 is an exhaust system for motorcycle multiple cylinder engines, wherein sound absorbing means is attached to the confluence exhaust pipe near the downstream end of the choke pipe.

[0009] In addition to the configuration of the present invention according to Claim 1 or 2, the invention set forth in Claim 3 is an exhaust system for motorcycle multiple cylinder engines, wherein the upstream end of the choke pipe is fixed to the downstream end portion of the shortest exhaust pipe out of the plurality of exhaust pipes which differ from each other in length and whose upstream ends are connected to the engine body having a pair of banks forming a V- shape, and the downstream end of the choke pipe is inserted into the shortest individual pipe portion out of the plurality of individual pipe portions and situated behind the downstream end of the exhaust pipe other than the shortest exhaust pipe in the front-and-rear direction of the motorcycle.

[0010] In addition to the configuration of the present invention according to Claim 3, the invention set forth in Claim 4 is an exhaust system for motorcycle multiple cylinder engines, wherein the downstream ends of the exhaust pipes whose upstream ends are connected to exhaust ports formed in the side faces on the opposite sides of the banks arranged in the front-and-rear direction of the motorcycle are interposed between the exhaust ports of the banks below the engine body, the confluence exhaust pipe is connected to the downstream ends of the exhaust pipes below the engine body, and a catalyst is put in an exhaust passage on the downstream side of the confluence exhaust pipe.

[0011] According to the invention set forth in Claim 1, since the choke pipe is separate from the plurality of exhaust pipes and fixed to the downstream end of at least one of the exhaust pipes, the dimensional accuracy of the choke pipe can be improved regardless of the exhaust pipes and the design of the choke pipe alone can be changed, thereby making it possible to increase the degree of design freedom.

[0012] According to the invention set forth in Claim 2, since the degree of shape freedom of the choke pipe is high, the sound absorbing means can be attached to the confluence exhaust pipe near the downstream end of the choke pipe and the excellent sound absorbing effect of the sound absorbing means can be obtained by suitably determining the downstream end position of the choke pipe.

[0013] According to the invention set forth in Claim 3, although the shapes and lengths of the exhaust pipes in particular are restricted by the installation space and layout of the multi cylinder engine which is a V-type multiple cylinder engine mounted on the motorcycle, the output characteristics at middle- to low-speed ranges of the engine can be improved by fixing the choke pipe to the downstream end of the shortest exhaust pipe, thereby making it possible to easily change the output characteristics of the engine.

[0014] According to the invention set forth in Claim 4, the purification performance of the catalyst on the downstream side of the confluence exhaust pipe can be stabilized by making the lengths of the exhaust pipes from the pair of banks to the confluence exhaust pipe as small as possible and reducing a temperature difference between exhaust gases merging in the confluence exhaust pipe. In addition, the temperature of the exhaust gas in contact with the catalyst can be made uniform by securing the distance from the exhaust pipes to the catalyst, and a reduction in the purification efficiency of the catalyst can be suppressed.

[0015]

Fig. 1 is a side view of a motorcycle.

Fig. 2 is a front view of an engine and an exhaust system when seen from the direction shown by an arrow 2 in Fig. 1.

Fig. 3 is a view when seen from the direction shown by an arrow 3 in Fig. 2.

Fig. 4 is a plan view of part of the exhaust system without showing the engine when seen from the direction shown by an arrow 4 in Fig. 3.

Fig. 5 is an enlarged view of a part shown by an arrow 5 in Fig. 3 of the exhaust system.

Fig. 6 is an enlarged sectional view cut on line 6-6 in Fig. 5.

Fig. 7 is a sectional view cut on line 7-7 in Fig. 6.

Fig. 8 is a sectional view cut on line 8-8 in Fig. 6.

Fig. 9 is an enlarged sectional view cut on line 9-9 in Fig. 5.

Fig. 10 is a sectional view cut on line 10-10 in Fig. 5.

Fig. 11 is a diagram showing the output characteristics of the engine.

[0016] A preferred embodiment of the present invention will be described hereunder with reference to the accompanying drawings.

[0017] Figs. 1 to 11 show an embodiment of the present invention. Fig. 1 is a side view of a motorcycle, Fig. 2 is a front view of an engine and an exhaust system when seen from the direction shown by an arrow 2 in Fig. 1, Fig. 3 is a view when seen from the direction shown by an arrow 3 in Fig. 2, Fig. 4 is a partial plan view of the exhaust system without showing the engine when seen from the direction shown by an arrow 4 in Fig. 3, Fig. 5 is an enlarged view of a portion shown by an arrow 5 in Fig. 3 of the exhaust system, Fig. 6 is an enlarged sec-

tional view cut on line 6-6 in Fig. 5, Fig. 7 is a sectional view cut on line 7-7 in Fig. 6, Fig. 8 is a sectional view cut on line 8-8 in Fig. 6, Fig. 9 is an enlarged sectional view cut on line 9-9 in Fig. 5, Fig. 10 is a sectional view cut on line 10-10 in Fig. 5, and Fig. 11 is a diagram of the output characteristics of the engine.

[0018] In Fig. 1, front forks 16 for journaling the front wheel WF are supported to the front end of the body frame 15 of this motorcycle in such a manner that it can be steered, and the front portion of a swing arm 17 for journaling the rear wheel WR at the back is supported to the intermediate portion of the body frame 15 in such a manner that it can swing in the vertical direction. The engine body 18 of a V-type multiple cylinder engine E is interposed between the front wheel WF and the rear wheel WR and put on the body frame 15, and power from the multiple cylinder engine E is transmitted to the rear wheel WR by a shaft drive type transmission gear (not shown) partially stored in the swing arm 17.

[0019] In Fig. 2 and Fig. 3, the engine body 18 is a two cylinder V-type engine comprising a pair of first and second banks BA and BB in the front-and-rear direction of the motorcycle, and an exhaust system 21 is connected to exhaust ports 20A and 20B formed in the side faces on the opposite sides of the cylinder heads 19A and 19B of the banks BA and BB.

[0020] The exhaust system 21 comprises a pair of first and second exhaust pipes 22 and 23 whose upstream ends are connected to the exhaust ports 20A and 20B of the cylinder heads 19A and 19B of the engine body 18, a confluence exhaust pipe 24 consisting of a pair of two individual pipe portions 24a and 24b for connecting the downstream end portions of the first and second exhaust pipes 22 and 23 and a confluence pipe portion 24c for combining the downstream ends of the individual pipe portions 24a and 24b, a catalyst converter 25 connected to the downstream end of the confluence pipe portion 24c of the confluence exhaust pipe 24, and an exhaust muffler 26 connected to the downstream end of the catalyst converter 25.

[0021] Also referring to Fig. 4, the first exhaust pipe 22 whose upstream end is connected to the exhaust port 20A on the front side face of the cylinder head 19A of the first bank BA on the front side out of the banks BA and BB of the engine body 18 extends downward from the exhaust port 20A in front of the engine body 18 and then backward on the right side and below the engine body 18 when you look forward in the front-and-rear direction of the motorcycle.

[0022] The second exhaust pipe 23 whose upstream end is connected to the exhaust port 20B on the rear side face of the cylinder head 19B of the second bank BB on the rear side out of the banks BA and BB of the engine body 18 is curved toward the right side of the engine body 18 from the exhaust port 20B and extends downward on the right side of the engine body 18 and then backward below the engine body 18 when you look forward in the front-and-rear direction of the motorcycle.

[0023] Thus, the downstream ends of the first and second exhaust pipes 22 and 23 are interposed between the exhaust ports 20A and 20B of the banks BA and BB below the engine body 18. That is, as shown in Fig. 3, the downstream ends of the first and second exhaust pipes 22 and 23 are interposed between the plumb lines LA and LB hanging down from the centers of the opening ends of the exhaust ports 20A and 20B in the side view.

[0024] The confluence exhaust pipe 24 is connected to the downstream ends of the first and second exhaust pipes 22 and 23 below the engine body 18. In addition, the length of the first exhaust pipe 22 is set smaller than the length of the second exhaust pipe 23.

[0025] In Fig. 5 and Fig. 6, the confluence exhaust pipe 24 is composed of a pair of half members 27 and 28 interconnected to each other and a pair of side wall forming members 29 and 30 interposed between the half members 27 and 28. It comprises the first and second individual pipe portions 24a and 24b having the side wall forming members 29 and 30 as the inner side walls and the confluence pipe portion 24c for interconnecting the downstream ends of the first and second individual pipe portions 24a and 24b and is formed substantially like letter Y. In addition, the length of the first individual pipe portion 24a is set smaller than the length of the second individual pipe portion 24b, first and second mouth pieces 31 and 32 which are formed cylindrical and have a pair of slits 33 and 34 for enabling expansion are fixed to the upstream ends of the first and second individual pipe portions 24a and 24b, and annular step portions 31a and 32a facing a side opposite to the confluence exhaust pipe 24 are formed on the inner walls of the first and second mouth pieces 31 and 32, respectively.

[0026] Ring stoppers 35 and 36 are fixed on the outer walls near the downstream ends of the first and second exhaust pipes 22 and 23, respectively, the downstream end portion of the first exhaust pipe 22 fitted with an annular gasket 37 is fitted into the first mouth piece 31 together with the stopper 35 and the gasket 37 while the gasket 37 is sandwiched between the step portion 31a and the stopper 35, and the downstream end of the first exhaust pipe 22 is connected to the first individual pipe portion 24a of the confluence exhaust pipe 24 by fastening the first mouth piece 31 with a fastening band 39 wound thereround. The downstream end portion of the second exhaust pipe 23 whose outer wall is fitted with an annular gasket 38 is fitted into the second mouth piece 32 together with the stopper 36 and the gasket 38 while the gasket 38 is sandwiched between the step portion 32a and the stopper 36, and the downstream end of the second exhaust pipe 23 is connected to the second individual pipe portion 24b of the confluence exhaust pipe 24 by fastening the second mouth piece 32 with a fastening band 40 wound thereround.

[0027] The upstream end of a choke pipe 41 which is separate from the first exhaust pipe 22 is fixed to the downstream end portion of at least one of the first and second exhaust pipes 22 and 23, i.e., the downstream

end portion of the first exhaust pipe 22 which is shorter pipe out of the first and second exhaust pipes 22 and 23 in this embodiment. The downstream end of the choke pipe 41 projecting from the downstream end of the first exhaust pipe 22 is inserted into at least one of the first and second individual pipe portions 24a and 24b of the confluence exhaust pipe 24. In this embodiment, the downstream end of the choke pipe 41 is inserted into the first individual pipe portion 24a which is shorter than the second individual pipe portion 24b.

[0028] The choke pipe 41 has a diameter expanded portion 41 a at the upstream end so that it is formed cylindrical with a step, and the diameter expanded portion 41 a inserted from the downstream end of the first exhaust pipe 22 to the first exhaust pipe 22 is fixed in the inner wall near the downstream end of the first exhaust pipe 22 by welding or the like. In addition, the choke pipe 41 is fixed in the first exhaust pipe 22 in such a manner that part of it projects from the downstream end of the first exhaust pipe 22.

[0029] A cylindrical collar 42 for projecting the choke pipe 41 is fixed to the inner wall at the downstream end of the first exhaust pipe 22 by welding or the like in such a manner that part of it projects from the first exhaust pipe 22, and the outer wall of the choke pipe 41 is fixed to the inner wall of the collar 42 by welding or the like.

[0030] Thus, part projecting from the downstream end of the first exhaust pipe 22 of the choke pipe 41 is inserted into the first individual pipe portion 24a. In addition, the downstream end of the choke pipe 41 is located behind the downstream end of the second exhaust pipe 23 connected to the second individual pipe portion 24b.

[0031] With reference to Fig. 7 and Fig. 8, first sound absorbing means 44 is attached to the confluence exhaust pipe 24 near the downstream end of the choke pipe 41. The first sound absorbing means 44 is constructed by charging, for example, a stainless steel sound absorbing material 45 which allows the circulation of an exhaust gas from the individual pipe portions 24a and 24b into the space between the first and second individual pipe portions 24a and 24b.

[0032] That is, side wall forming members 29 and 30 forming the inner side walls of the first and second individual pipe portions 24a and 24b are composed of a porous board having a large number of pores 46 and 47, and the sound absorbing material 45 is charged into a sound absorbing chamber 48 formed between the half members 27 and 28 outside these side wall forming members 29 and 30 and between the side wall members 29 and 30.

[0033] In Fig. 9, second sound absorbing means 49 is attached to the intermediate portion of the confluence pipe portion 24c of the confluence exhaust pipe 24. The second sound absorbing means 49 is constructed by charging a stainless steel sound absorbing material 54 into an annular sound absorbing chamber 53 formed between a swollen portion 50 which is swollen outward in the radial direction and formed in the confluence pipe

portion 24c and a cylindrical member 51 which is fixed to the inner wall of the confluence pipe portion 24c, formed cylindrical and composed of a porous board having a large number of pores 52.

[0034] In Fig. 10, a sensor attachment pipe 55 for installing an unshown oxygen sensor is fixed in the upper portion of the confluence pipe portion 24c on the downstream side of the second sound absorbing means, and third sound absorbing means 56 is attached to the confluence pipe portion 24c below the sensor attachment pipe 55. The third sound absorbing means 56 is constructed by charging a stainless steel sound absorbing material 61 into a sound absorbing chamber 60 formed between a lower swollen portion 57 which swells outward in the radial direction and is formed below the confluence pipe portion 24c and a curved member 58 fixed to the inner wall of the confluence pipe portion 24c and composed of a porous board having a large number of pores 59 to have an arcuate section.

[0035] Returning to Fig. 9, the catalyst converter 25 has a casing 63 connected to the downstream end of the confluence pipe portion 24c of the confluence exhaust pipe 24, and a catalyst 64 is put in an exhaust passage 65 formed in the casing 63 through the confluence pipe portion 24c.

[0036] A description is subsequently given of the function of this embodiment. The choke pipe 41 which is separate from the first exhaust pipe 22 is fixed to the downstream end portion of the first exhaust pipe 22 out of the first and second exhaust pipes 22 and 23 in such a manner that part of it projects from the downstream end of the first exhaust pipe 22, and part projecting from the downstream end of the first exhaust pipe 22 is inserted into the shortest first individual pipe portion 24a out of the first and second individual pipe portion 24a and 24b which differ from each other in length and are provided in the confluence exhaust pipe 24a.

[0037] That is, as the choke pipe 41 is separate from the first exhaust pipe 22 and fixed to the downstream end portion of the first exhaust pipe 22, the dimensional accuracy of the choke pipe 41 can be enhanced regardless of the first exhaust pipe 22 and the design of the choke pipe 41 alone can be changed, thereby making it possible to enhance the degree of design freedom.

[0038] Since the first sound absorbing means 44 is attached to the confluence exhaust pipe 24 near the downstream end of the choke pipe 41 and the degree of shape freedom of the choke pipe 41 is high, the first sound absorbing means 44 can be attached to the confluence exhaust pipe 24 near the downstream end of the choke pipe 41 and the excellent sound absorbing effect of the first sound absorbing means 44 can be obtained by suitably determining the downstream end position of the choke pipe 41.

[0039] In addition, the upstream ends of the first and second exhaust pipes 22 and 23 which differ from each other in length are connected to the engine body 18 having a pair of banks BA and BB which form a V-shape, the

upstream end of the choke pipe 41 is fixed to the downstream end of the first exhaust pipe 22 which is shorter pipe out of both exhaust pipes 22 and 23, and the downstream end of the choke pipe 41 is situated behind the downstream end of the second exhaust pipe 23 in the front-and-rear direction of the motorcycle. Thereby, the shapes and lengths of the first and second exhaust pipes 22 and 23 in particular are restricted by the installation space and lay-out of the multiple cylinder engine E which is a V-type multiple cylinder engine mounted on the motorcycle. However, the choke pipe 41 is fixed to the downstream end of the shortest first exhaust pipe 22 to improve the output characteristics at medium- to low-speed ranges of the engine, thereby making it possible to change the output characteristics of the engine easily.

[0040] That is, the torque and output at medium- to low-speed ranges of the engine of a motorcycle in which the choke pipe 41 is fixed to the downstream end of the first exhaust pipe 22 can be increased as shown by solid line curves in Fig. 11 as compared with those of a motorcycle in which the choke pipe is not fixed to the downstream end of the first exhaust pipe 22 as shown by broken lines in Fig. 11.

[0041] Further, in the engine body 18, the downstream ends of the first and second exhaust pipes 22 and 23 whose upstream ends are connected to the exhaust ports 20A and 20B formed in the side faces on the opposite sides of the banks BA and BB arranged in the front-and-rear direction of the motorcycle are interposed between the exhaust ports 20A and 20B of the banks BA and BB below the engine body 18, the confluence exhaust pipe 24 is connected to the downstream ends of the first and second exhaust pipes 22 and 23 below the engine body 18, and the catalyst 64 is put in the exhaust passage 65 on the downstream side of the confluence exhaust pipe 24.

[0042] In this lay-out, the purification performance of the catalyst 64 on the downstream side of the confluence exhaust pipe 24 can be stabilized by making the lengths of the exhaust pipes 22 and 23 from the pair of banks BA and BB to the confluence exhaust pipe 24 as small as possible and reducing a temperature difference between exhaust gases merging in the confluence exhaust pipe 24. In addition, the temperature of the exhaust gas in contact with the catalyst 64 can be made uniform by securing the distance from the first and second exhaust pipes 22 and 23 to the catalyst 64, and a reduction in the purification efficiency of the catalyst 64 can be suppressed.

[0043] While the embodiment of the present invention has been described, it is to be understood that the present invention is not limited to the embodiment and various changes and that modifications maybe made in the invention without departing from the spirit and scope thereof.

[Description of Reference Numerals]

[0044]

18...engine body 5
 20A, 20B...exhaust port
 22, 23...exhaust pipe
 24...confluence exhaust pipe
 24a, 24b...individual pipe portion
 24c...confluence pipe portion 10
 26...exhaust muffler
 41...choke pipe
 44...sound absorbing means
 64...catalyst
 65...exhaust passage 15
 BA, BB ...bank
 E ...multiple cylinder engine

Claims

1. An exhaust system for motorcycle multiple cylinder engines, comprising: a plurality of exhaust pipes (22, 23) whose upstream ends are connected to an engine body (18) of a multiple cylinder engine (E); a confluence exhaust pipe (24) comprising a plurality of individual pipe portions (24a, 24b) for connecting the downstream ends of the exhaust pipes (22, 23) independently and a confluence pipe portion (24c) for combining the downstream ends of the individual pipe portions (24a, 24b); and an exhaust muffler (26) connected to the downstream end of the confluence pipe portion (24c), the downstream end of a choke pipe (41) connected to the downstream end of at least one of the exhaust pipes (22, 23) being inserted into at least one of the individual pipe portions (24a, 24b), wherein the choke pipe (41) separate from the exhaust pipes (22, 23) is fixed to the downstream end of at least one exhaust pipe (22). 20 25 30 35 40
2. The exhaust system for motorcycle multiple cylinder engines according to any of the preceding claims, wherein sound absorbing means (44) is attached to the confluence exhaust pipe (24) near the downstream end of the choke pipe (41). 45
3. The exhaust system for motorcycle multiple cylinder engines according to any of the preceding claims, wherein the upstream end of the choke pipe (41) is fixed to the downstream end portion of the shortest exhaust pipe (22) out of the plurality of exhaust pipes (22, 23) which differ from each other in length and whose upstream ends are connected to the engine body (18) having a pair of banks (BA, BB) forming a V-shape, and the downstream end of the choke pipe (41) is inserted into the shortest individual pipe portion (24a) out of the plurality of individual pipe por- 50 55

tions (24a, 24b) and situated behind the downstream end of the exhaust pipe (23) other than the shortest exhaust pipe (22) in the front-and-rear direction of the motorcycle.

4. The exhaust system for motorcycle multiple cylinder engines according to any of the preceding claims, wherein the downstream ends of the exhaust pipes (22, 23) whose upstream ends are connected to exhaust ports (20A, 20B) formed in the side faces on the opposite sides of the banks (BA, BB) arranged in the front-and-rear direction of the motorcycle are interposed between the exhaust ports (20A, 20B) of the banks (BA, BB) below the engine body (18), the confluence exhaust pipe (24) is connected to the downstream ends of the exhaust pipes (22, 23) below the engine body (18), and a catalyst (64) is put in an exhaust passage (65) on the downstream side of the confluence exhaust pipe (24).

FIG. 1

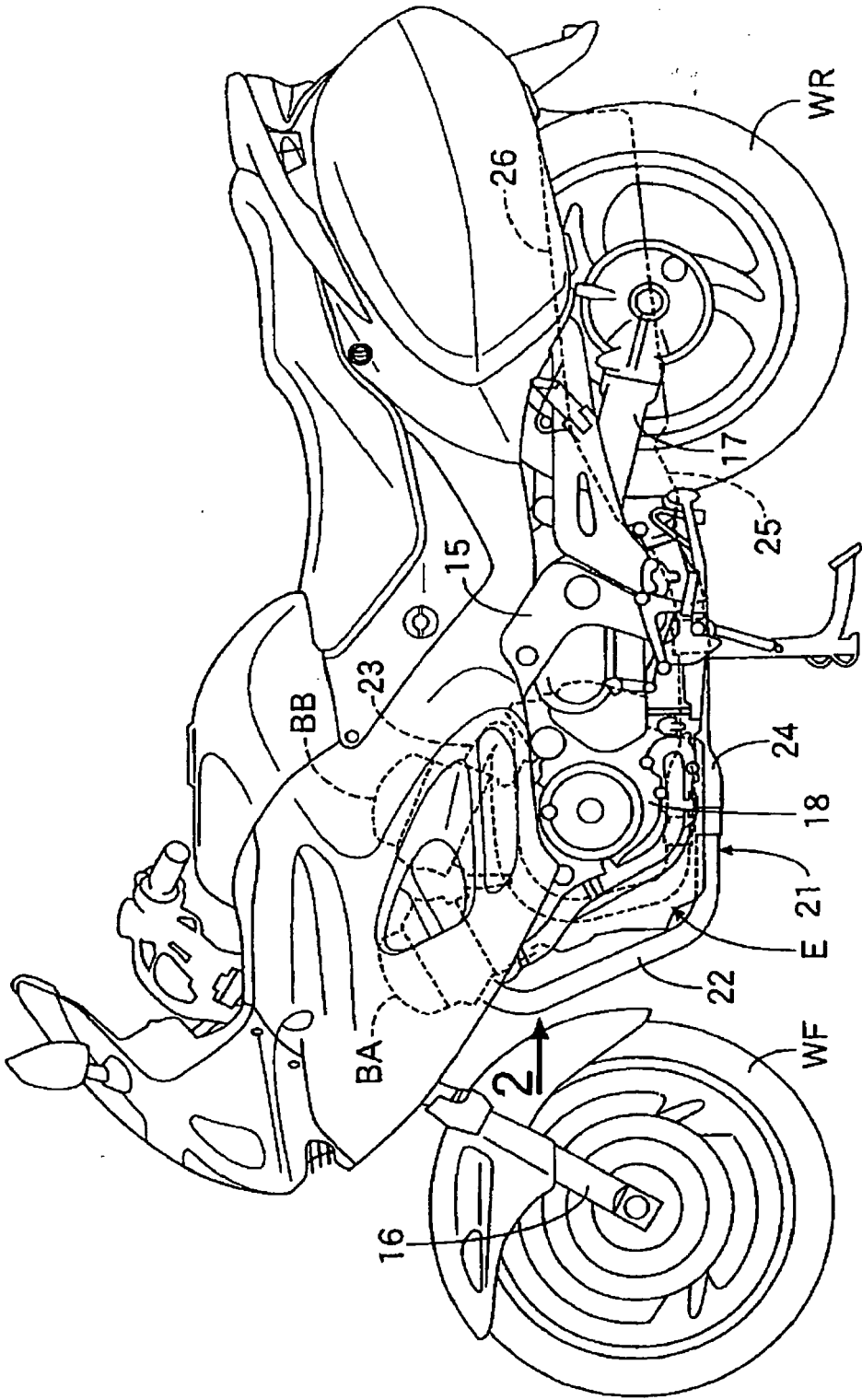


FIG. 2

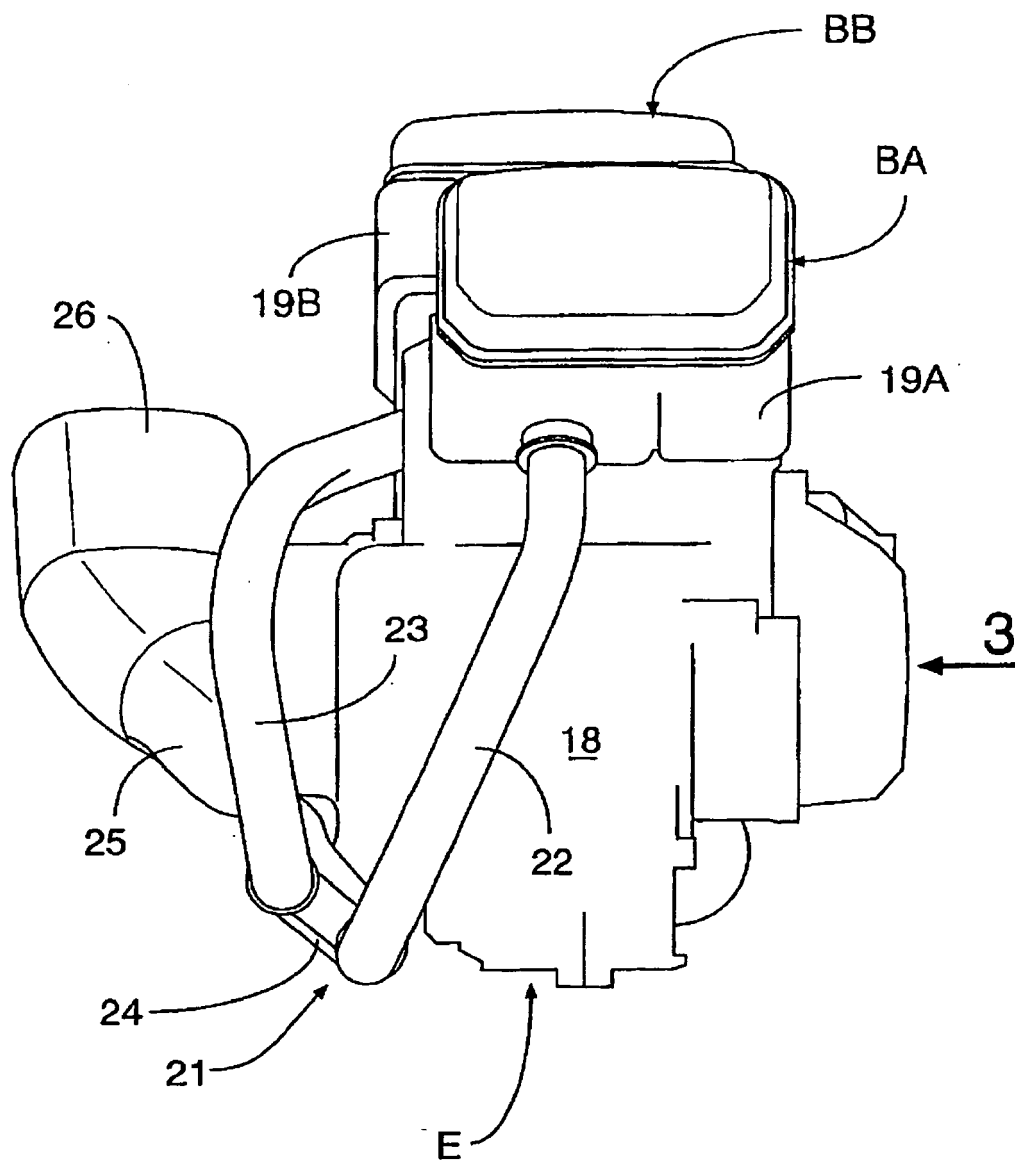


FIG. 3

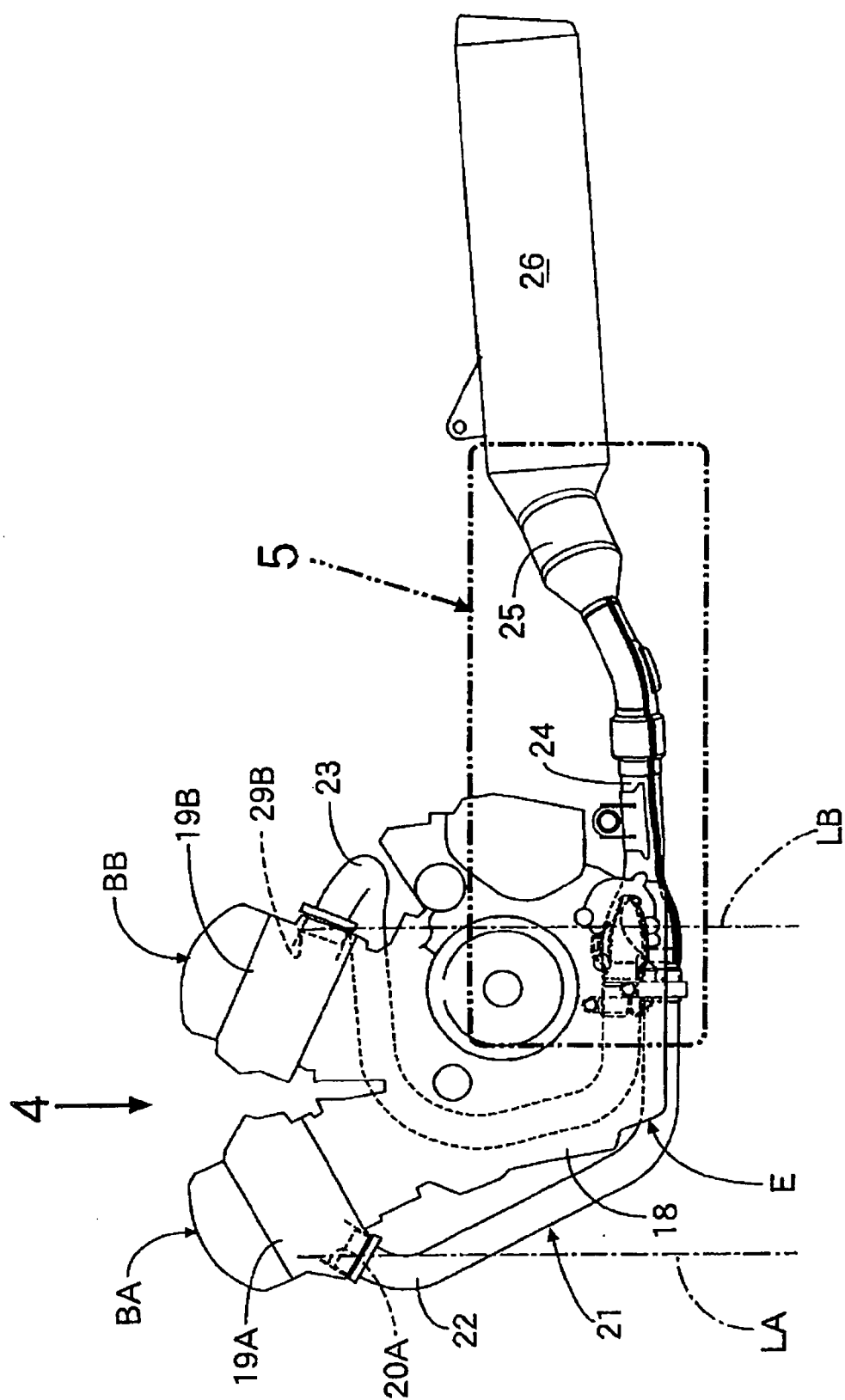


FIG. 4

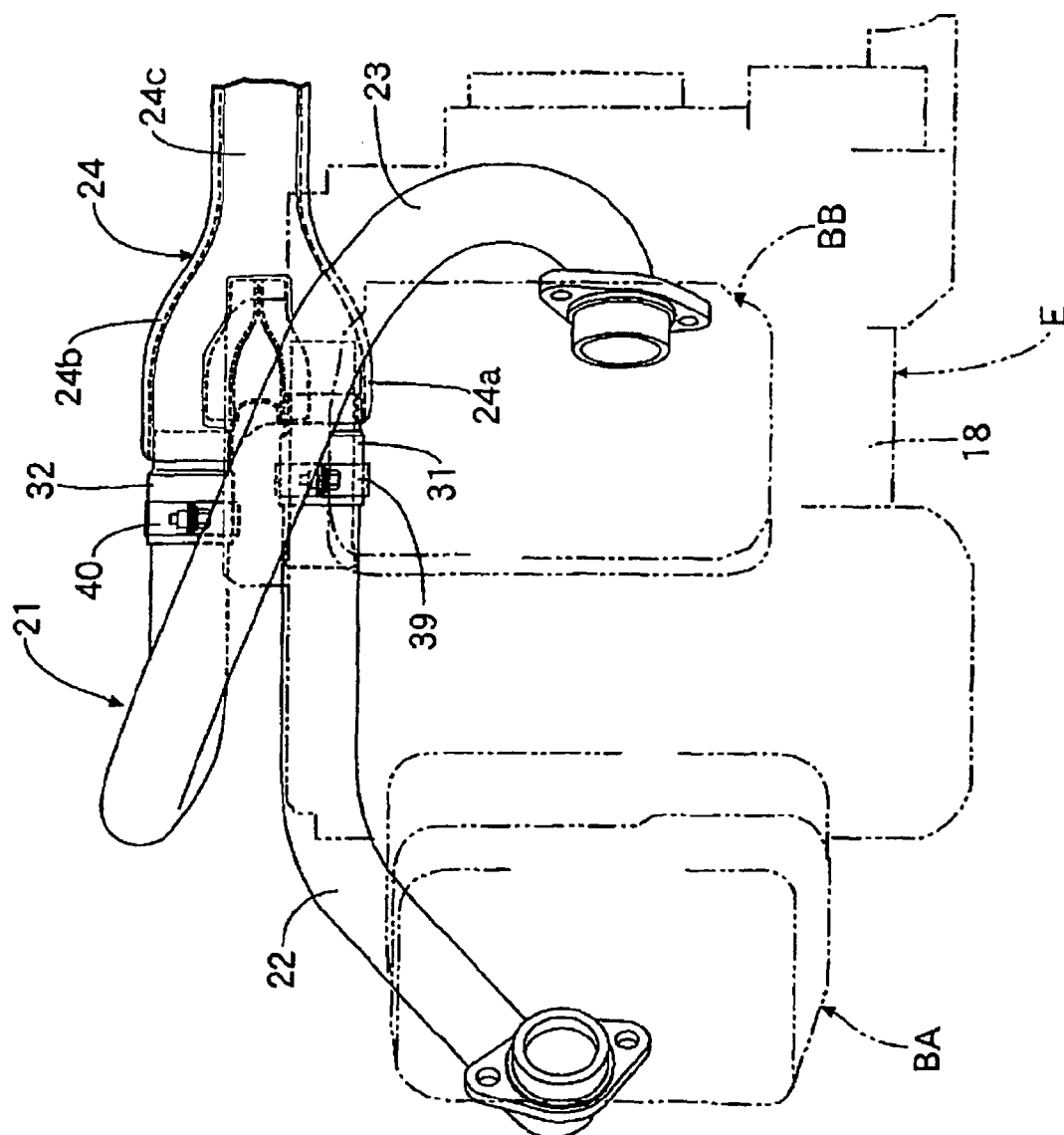


FIG. 5

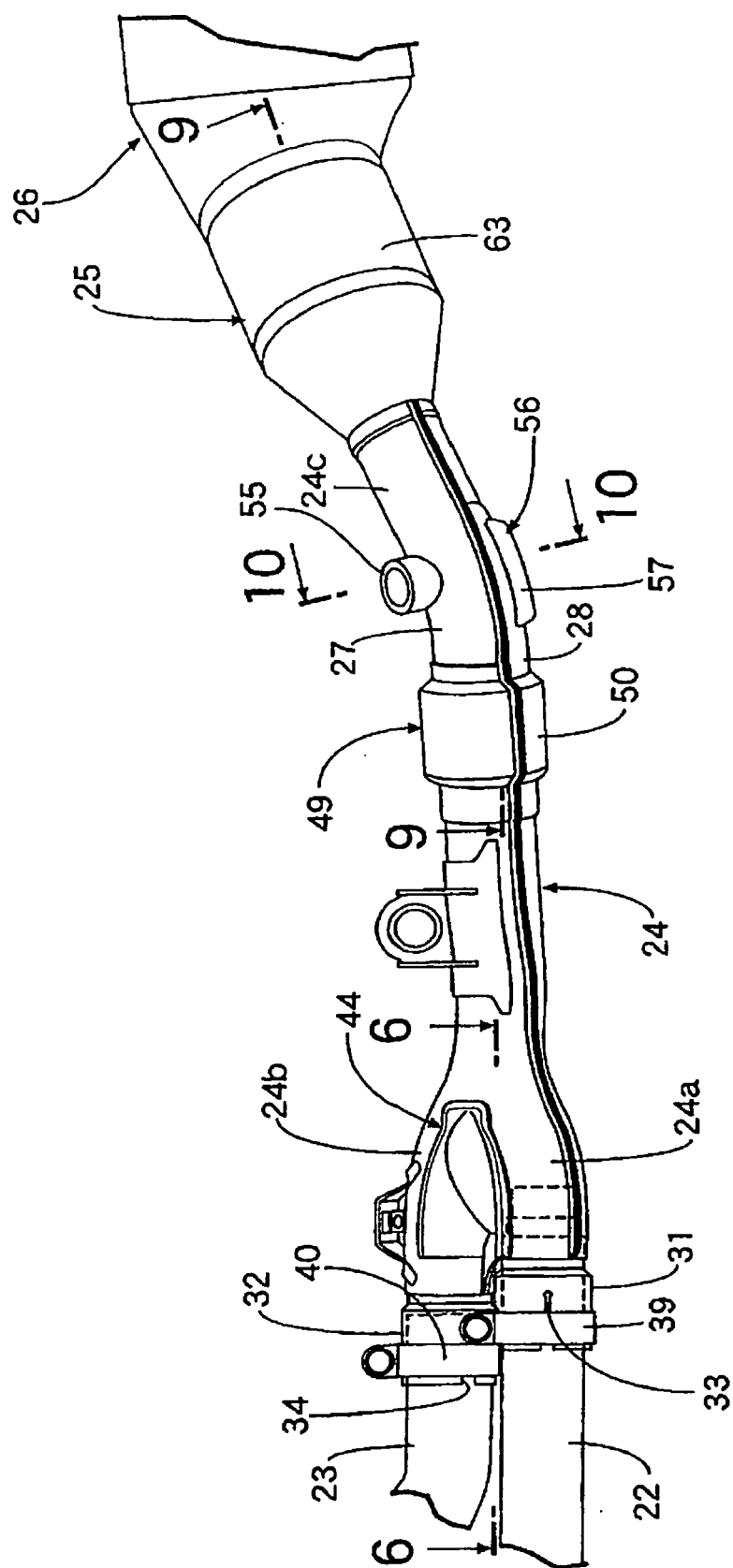


FIG. 6

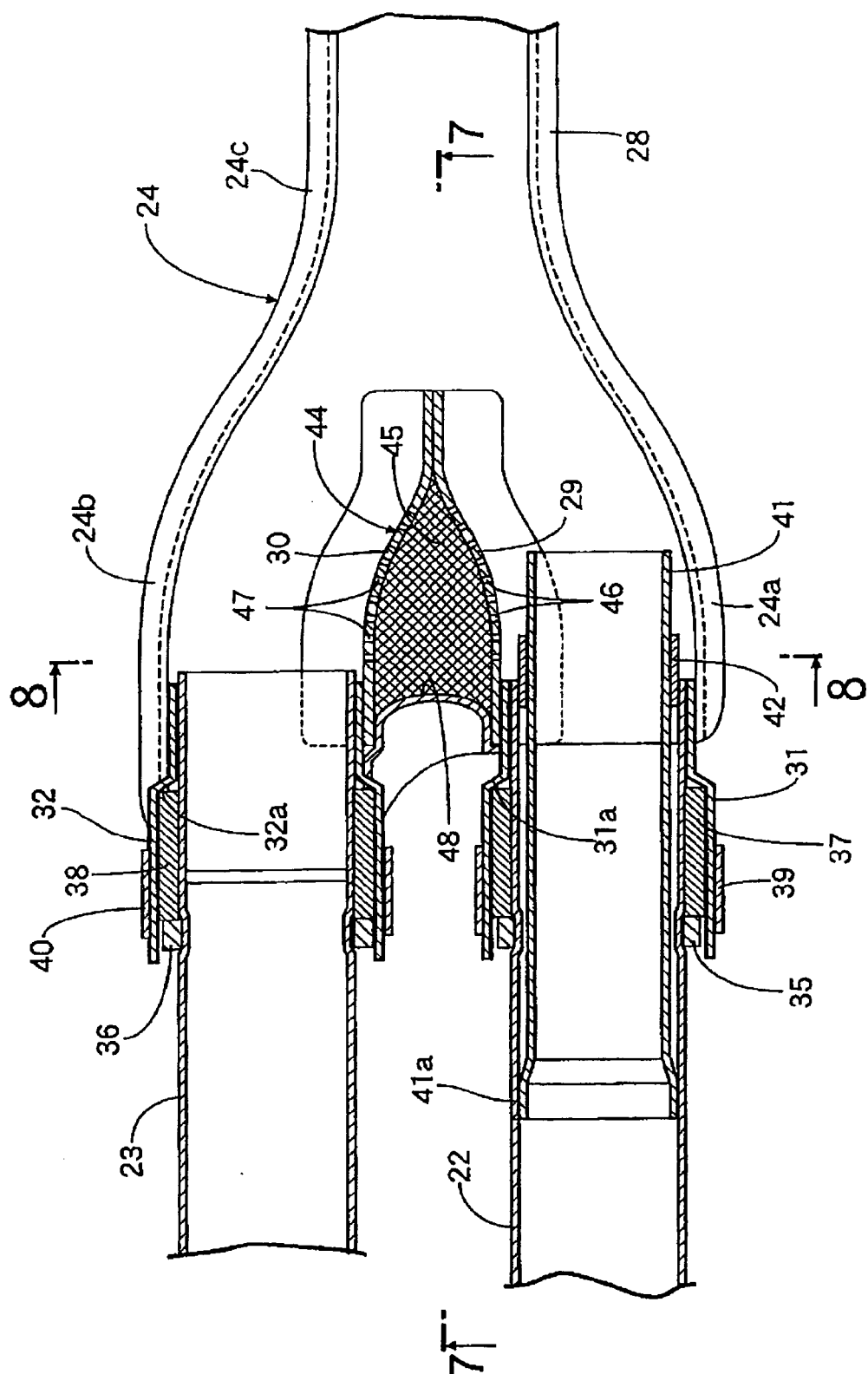


FIG. 7

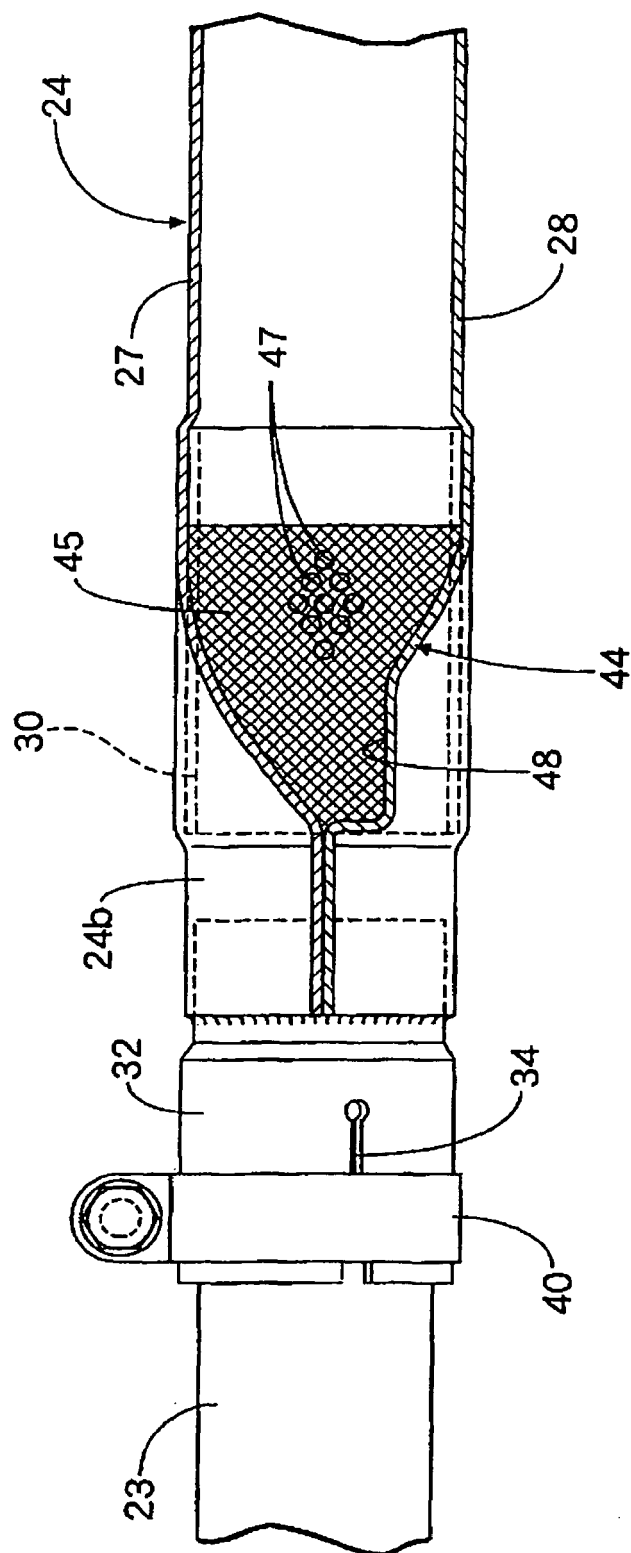


FIG. 8

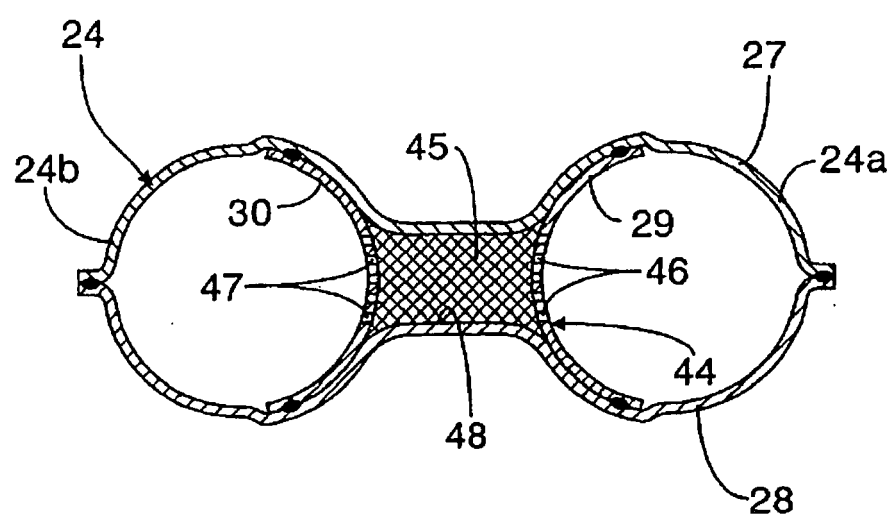


FIG. 9

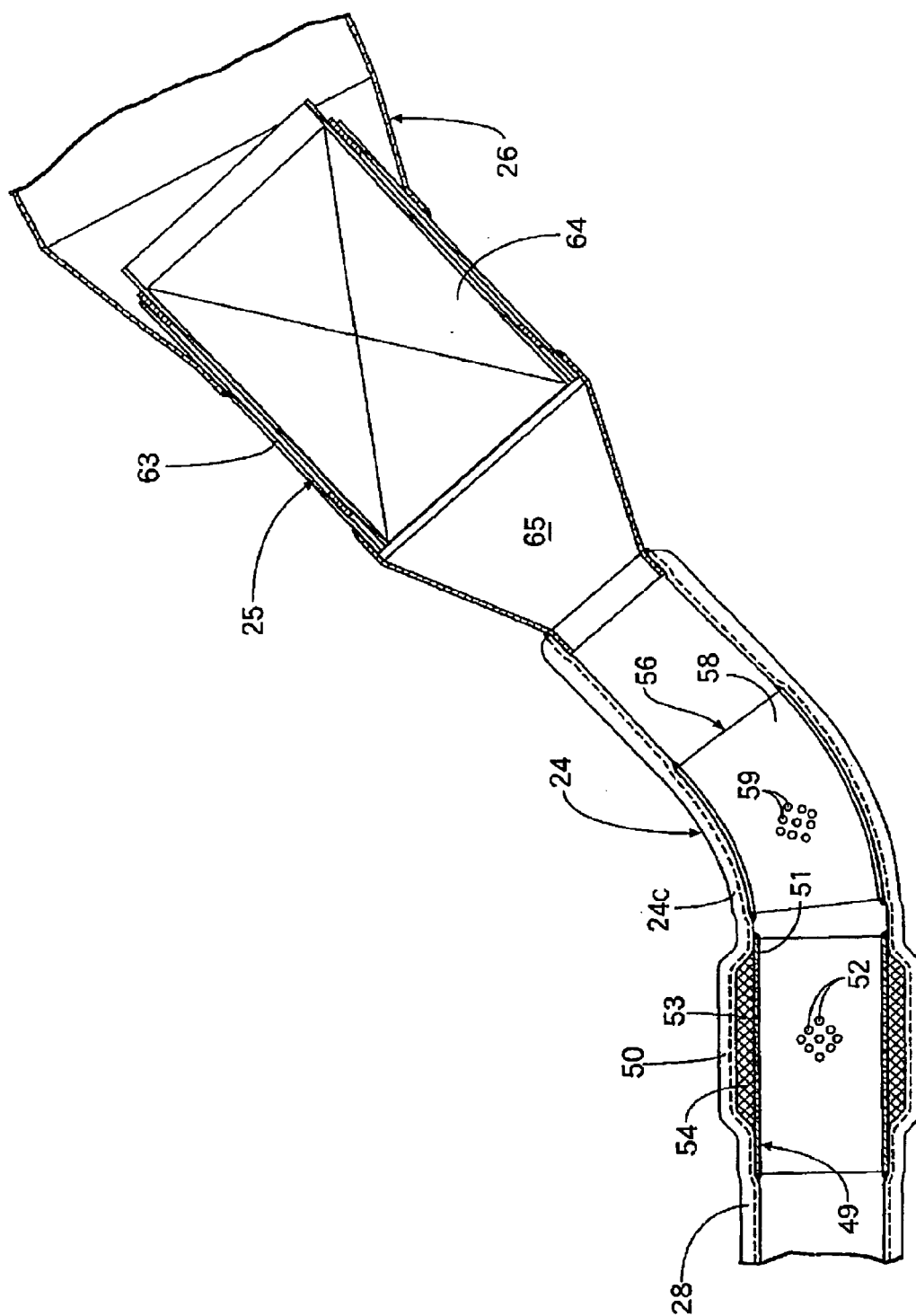


FIG. 10

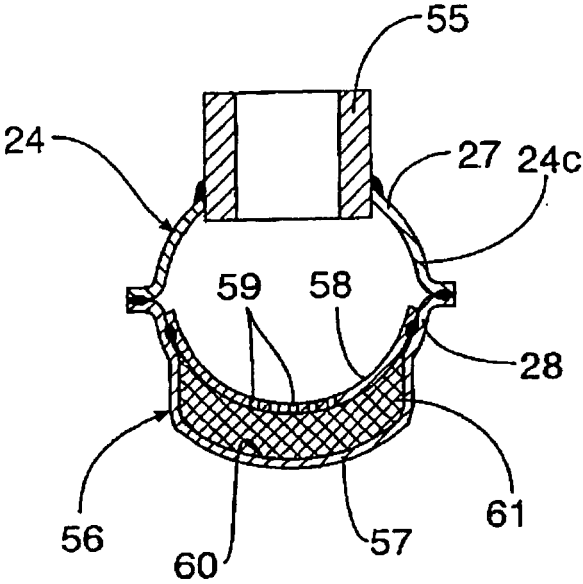
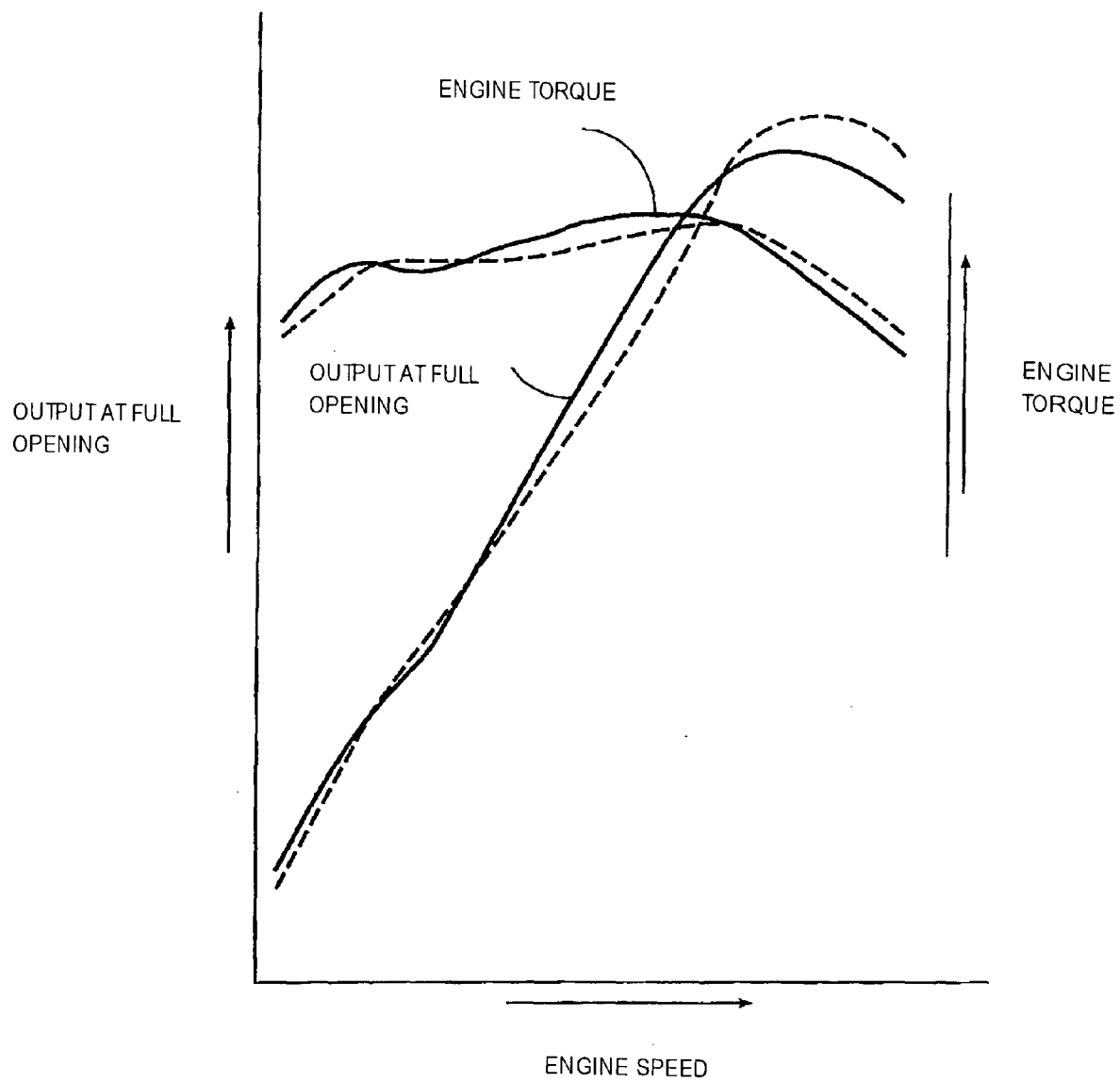


FIG. 11





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 00 9760

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 August 2006	Examiner Zebst, M
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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EPO FORM 1503 03.82 (P04C01)

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

EP 06 00 9760

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01-08-2006

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