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(54) Plug cap attachment structure

(57) A plug cap attachment structure is provided, capable of partially reducing the diameter of a plug cap (60) while maintaining stability for holding the plug cap (60), and disposing an ignition plug (43) at a position closer to an engine (21).

A plate-like extension (63) is provided on an outer shell of a plug cap (60) which is connected to an ignition plug (43) at a main body (64) and a ring-like engaging projection (53) for supporting the extension (63) is provided at one end of a cylinder head cover (49). In this way, since the plug cap (60) is supported at two positions to increase stability, the main body (64) can be reduced in diameter and the ignition plug (43) can be brought into a position closer to an engine. A grip (62) is provided in the vicinity of the extension (63) to facilitate the attachment and detachment of the plug cap (60). Alternatively, the extension (63) is replaced with a plate-like member (82) formed with a through-hole (83) and the engaging member (59) is replaced with one engaging projection (77) and two engaging plates (75, 76). Then, the engaging projection (77) is engaged with the through-hole and the engaging plates (75, 76) are abutted against both side surfaces of the plate-like member (82).

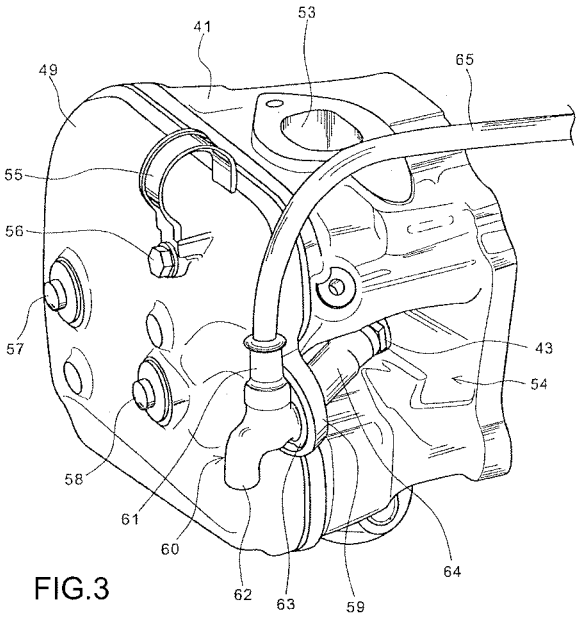

FIG.3

EP 1 804 351 A1

Description

[0001] The present invention relates to a plug cap attachment structure, and in particular to a plug cap attachment structure capable of partially reducing the diameter of a plug cap while maintaining stability for holding the plug cap, and disposing an ignition plug at a position closer to an engine.

[0002] There have been attempts to increase the rigidity of a plug cap by devising the internal structure, the plug cap being adapted to insulation-protect a high-voltage supply unit which applies high voltage to an ignition plug of an engine.

[0003] Japanese Patent Laid-Open No. 2002-151231 discloses a plug cap having an outer shell made of an elastic high-molecular material such as a rubber and a strengthening agent, disposed inside the outer shell, made of a high-molecular material harder than the elastic high-molecular material.

[0004] A need to downsize the engine room of a motorcycle or the like has recently been increased for the purpose of enlargement of occupant-space. Along with this need, there is another need to reduce, as much as possible, the outer diameter of a cylindrical portion of a plug cap disposed near an engine. In particular, an SOHC engine has a camshaft and rocker arms just above a combustion chamber. In many configurations, therefore, an ignition plug is inserted into the combustion chamber from not just above but obliquely above the combustion chamber at a position close to a side surface wall of a cylinder head. If the diameter of the plug cap can be reduced, it is possible to bring the combustion chamber and the ignition plug into an ideal shape and position, respectively, by bringing the tip of the ignition plug into the center of the combustion chamber as much as possible. In the plug cap disclosed in the above-mentioned Japanese patent document, however, if the hard high-molecular material as a strengthening agent is removed in order to reduce the diameter of the plug cap, the durability is decreased.

[0005] It is an object of the present invention to solve the problem of the conventional art described above and to provide a plug cap attachment structure capable of partially reducing the diameter of a plug cap while maintaining stability for holding the plug cap, and disposing an ignition plug at a position closer to an engine.

[0006] This and other objects are achieved according to the invention by a plug cap attachment structure having the features defined in claim 1.

[0007] The present invention is firstly characterized by a plug cap attachment structure including: an ignition plug located close to a cylinder head side surface wall of an engine and obliquely inserted into an combustion engine; a cord adapted to supply electric power to the ignition plug; a plug cap disposed between the ignition plug and the cord to connect the ignition plug with the cord; an extension provided on an outer shell of the plug cap; and an engaging member provided on an constituent part of the engine and engaged with the extension.

[0008] The present invention is secondly characterized in that the constituent part of the engine is a cylinder head cover; the extension is a plate-like member extending circumferentially outward of a cylindrical portion of the plug cap; and the engaging member is a ring-like projection which projects from the cylinder head cover and is formed with a hole portion adapted to hold an end face of the plate-like member.

[0009] The present invention is thirdly characterized in that the plate-like member is formed virtually oval and the end face of the plate-like member is provided with a plurality of projections.

[0010] The present invention is fourthly characterized in that the constituent part of the engine is a cylinder head cover; the extension is a plate-like member which extends circumferentially outward of a cylindrical portion of the plug cap and is provided with a through-hole extending in a thickness direction; and the engaging member includes one engaging projection which projects from the cylinder head cover and passes through the through-hole and two engaging plates which are abutted or virtually abutted against two side end faces of the extension.

[0011] The present invention is fifthly characterized in that the plug cap is provided with a grip which is virtually located on a line extending along a longitudinal direction of the ignition plug so as to bend with respect to the longitudinal direction.

[0012] According to the first aspect of the invention, since the extension of the plug cap is engaged with the engaging member provided on the constituent part of the engine, the plug cap is supported by the engine side component at two points, whereby the plug cap can be supported with increased stability. In addition, the plug cap can be reduced in diameter by partially removing the strengthening agent made of a hard high-molecular material in response to the increased support-stability. Since the ignition plug can be located closer to the engine with the reduced diameter of the plug cap, it becomes possible to increase the degree of freedom of design for the surrounding of the engine.

[0013] According to the second aspect of the invention, the plate-like member is provided on the plug cap and the ring-like projections are provided on the cylinder head cover which is more easily molded than the cylinder head or the like. Only such provisions can suppress the vibration of the plug cap, whereby the plug cap can be supported more stably.

[0014] According to the third aspect of the invention invention, since also the engaging member is formed virtually oval, the position of engagement of the extension with the engaging portion can be stably established. Because of the provision of a plurality of projections, the extension and the engaging portion are engaged with each other at a plurality of points and lines. Thus, the plug cap can be supported more stably and attachment/detachment operation can be facilitated.

[0015] According to the fourth aspect of the invention,

the plate-like member with a through-hole is provided on the plug cap and the single engaging projection and the two engaging plate are provided on the cylinder head cover which is more easily molded than the cylinder head or the like. Only such provisions can suppress vibration of the plug cap, whereby the plug cap can be supported more stably.

[0016] According to the fifth aspect of the invention, the grip engaged with a tool, a finger or the like is provided on a line extending along the longitudinal direction of the ignition plug; therefore, the operation of pulling out the plug cap from the ignition plug can be facilitated.

[0017] Preferred embodiment of the present invention will be hereunder described in detail with reference to the drawings, in which:

Fig. 1 is a side view of a motorcycle according to an embodiment of the present invention;
Fig. 2 is a cross-sectional view of an engine according to an embodiment of the invention;
Fig. 3 is a perspective view of a cylinder head and a cylinder head cover according to an embodiment of the invention;
Fig. 4 is a plan view of the cylinder head cover according to the embodiment of the invention;
Fig. 5 is a front view of a plug cap according to an embodiment of the invention;
Fig. 6 is a view as viewed from the direction of symbol A in Fig. 5;
Fig. 7a is a side view of the plug cap according to the embodiment of the invention;
Fig. 7b is a cross-sectional view of the plug cap according to the embodiment of the invention;
Fig. 8 is a perspective view of a cylinder head and a cylinder head cover according to a second embodiment of the present invention;
Fig. 9 is a plan view of the cylinder head cover according to the second embodiment of the invention;
Fig. 10 is a perspective view of the cylinder head cover according to the second embodiment of the invention;
Fig. 11 is a plan view of a plug cap according the second embodiment of the invention;
Fig. 12 is a partial enlarged view of the plug cap according to the second embodiment of the invention;
Fig. 13a is a side view of the plug cap according to the second embodiment of the invention; and
Fig. 13b is a cross-sectional view of the plug cap according to the second embodiment of the invention.

[0018] Fig. 1 is a side view of a motorcycle according to an embodiment of the invention. The motorcycle 1 is a scooter-type motorcycle including a unit-swing type power unit incorporating a continuously variable transmission. A pair of left and right main frames 8 are covered by a body cover 23 from the front of a vehicle body. A head pipe 4 together with gussets 6 as joint reinforcing members is fixedly joined to the main frames 8. A pair of left and right front forks 5 are turnably supported by the head pipe 4 and a front wheel WF is rotatably supported by the lower ends of the front forks 5. A stem shaft 2 is turnably supported in the cylindrical head pipe 4. The front forks 5 can be steered by handlebars 3 connected to the stem shaft 2. A pair of left and right handle grips 3a gripped by an operator are attached to the handlebars 3. A cross member 9 is attached vehicle-widthwise to the main frames 8 so as to connect left and right pipe members. A single center frame 7 is disposed on the rear side of the cross member 9 so as to be close to a leg shield 24 arranged forward of the legs of the operator. The center frame 7 is joined to a pair of left and right connection frames 13 at a lower portion of the vehicle body. These joints and the main frame 8 are connected by a pair of left and right pipe members 14. A guard pipe 15 for protecting a radiator 25 is disposed at a portion near the pipe members 14. The end of the connection frame 13 on the rear side of the vehicle body is joined to a side frame 10 formed integrally with the main frame 8.

[0019] A pair of left and right pivot plates 16 are each attached between a rising frame portion 11 formed integrally with the side frame 10 and a rear sub frame 18 joined to the rising frame portion 11. The pivot plates 16 turnably support a pivot shaft 17 for a power unit 22 described later. Seat rail portions 12 supporting a storage box 30 and a fuel tank 32 disposed below a seat 31 on which an occupant seats are joined to upper rear portions of the rising frame portions 11. The power unit 22 including an engine 21, a carburetor 27 and an air cleaner box 26 is pivotally supported through the pivot shaft 20 by a link mechanism 19 turnably supported by the pivot shaft 17. The power unit 22 is suspended by rear cushions 28 attached to the seat rail portions 12 so that it can be swingable about the pivot shaft 17. A rear wheel WR as a drive wheel is rotatably supported by the rear end of the power unit 22.

[0020] Fig. 2 is a cross-sectional view of the engine 21 to which a plug cap attachment structure according to the present invention is applied. The four-cycle single cylinder engine 21 is of a rocker arm-used SOHC (single over head camshaft) type two-valve unit. Fig. 2 depicts only an upper portion of the engine including a crankshaft 40 housed in a crankcase 34. A continuously variable transmission is installed at an end of a crankshaft 40 as an output shaft 34 so as to transmit the power of the engine 21 to the rear wheel WR at an optional speed change ratio. The transmission includes a drive side movable pulley half 51, a drive side stationary pulley half 52 and an endless V-belt 50. A cylinder block 39 is fastened to the crankcase 34. A tubular piston 36 slidable inside a sleeve 38 fitted in the cylinder block 39 is connected to the crank shaft 40 via a connecting rod 37. A cylinder head 41 is fastened to the upper end of the cylinder block 39. The cylinder head 41, the cylinder block 39 and the piston 36 define a combustion chamber 42 in which an

air-fuel mixture is burned. A cam shaft 44 is rotatably journaled by the cylinder head 41 so as to drive rocker arms 47 which open/close intake and exhaust valves (not shown in the figure). The cam shaft 44 and a cam sprocket 45 fixedly attached to one end thereof are drivingly rotated by an endless cam chain 46 connected to the crankshaft 40. A cylinder head cover 49 is disposed above the rocker arms 47 and the cam sprocket 45.

[0021] An ignition plug 43 adapted to ignite an air-fuel mixture compressed in the combustion chamber 42 is removably attached to the cylinder head 41. The ignition plug 43 is disposed so that its electrode 43a disposed at the tip thereof may face the combustion chamber 42. An insulator 43b and a terminal 43c are disposed adjacently to the outer wall of the cylinder head 41. A plug cap (not shown in the figure) is attached to the ignition plug 43 to insulation-protect a high voltage supply unit which applies high voltage required for ignition. Since this plug cap is configured to mostly cover the whole of the terminal 43c and the insulator 43b, if the outer diameter of this portion is large, it becomes difficult to dispose the ignition plug 43 at a position close to the center of the cylinder head 41. In other words, it becomes difficult to downsize an engine room and to bring the shape of the combustion chamber into an ideal hemisphere by reducing a tilt angle of the ignition plug 43 attached to the combustion chamber 42. In order to solve the problem, a plug cap attachment structure according to the present invention is applied to the plug cap attached to the plug 43 and the cylinder head cover 49.

[0022] Fig. 3 is a perspective view of the cylinder head 41 and the cylinder head cover 40 to which the plug cap attachment structure according to an embodiment of the present invention is applied. Like reference numerals denote like or corresponding portions. The ignition plug 43 is arranged in a recessed portion 54 of the cylinder head 41 formed with an intake port 53. A plug hole (not shown in the figure) formed with an internal thread is provided in the bottom of the recessed portion 54. The internal thread is threadedly engaged with an external thread formed on the plug 43 so that the plug 43 is joined to the plug hole. A plug cap 60 is attached to the plug 43 so as to insulation-protect a joint between the terminal 43c (see Fig. 2) and a high-tension cord 65 used to supply electric power. The plug cap 60 is composed, as a single piece, of a cylindrical main body 64, an extension 63, a joint 61 with the high-tension cord 65, and a grip 62. The cylindrical main body 64 covers the insulation 43b and terminal 43c of the ignition plug 43. The extension 63 protrudes toward the circumferential outside of the main body 64. The grip 62 functions as a handle used when the plug cap 60 is removed from the ignition plug 43.

[0023] Attachment bolts 56, 57, 58 are attached to the cylinder head cover 49. An attachment bolt 56 is used to support a guide stay 55 adapted to dispose wiring cords and the like not shown at appropriate positions. The other attachment bolts 57, 58 are used to fixedly fasten the cylinder head cover 49 to the cylinder head 41. The cylinder head cover 49 is formed at its end with a ring-like engaging member 59 which is engaged with the extension 63 of the plug cap 60. The plug cap attachment structure according to an embodiment of the invention is composed of the engaging member 59 formed on the cylinder head cover 49 and the plug cap 60 having the extension 63.

[0024] Fig. 4 is a plan view of the cylinder head cover 49 according to an embodiment of the present invention. The engaging member 59 is formed of a thin plate integral with the cylinder head cover 49 at one end of the cylinder head cover 49 so as to define a support hole 59a adapted to support the extension 63. When the plug cap 60 is connected to the ignition plug 43, the engaging member 59 is engaged with the extension 63, whereby the plug cap 60 can stably be supported by the cylinder head cover 49. Incidentally, while the inner circumferential surface of the engaging member 59 is a smooth surface in this embodiment, the engaging member may be formed with a projection, groove or the like so as to be easily engaged with the extension 63. The cylinder head cover 49 is formed with through-holes 57a and 58a adapted to receive the attachment bolts 57 and 58, respectively, inserted therethrough.

[0025] Fig. 5 is a front view of the plug cap 60. Like reference numerals denote like or corresponding portions. As described above, the plug cap 60 of the embodiment is formed with the extension 63 as a plate member having a plurality of projections 63a. When the plug cap 60 is connected to the plug 43, the outer circumferential surface of the extension 63 is engaged with the inner circumferential surface of the engaging member 59. Thus, the plug cap 60 is supported at two points by the main body 64 and the extension 63 on the engine side; therefore, it can be more stably supported than by the conventional method in which the plug cap is supported by only the main body 64. In the present embodiment, the outer diameter of the main body 64 can be made smaller than that of the conventional method correspondingly to the stability enhanced by the two-point support. The grip 62 formed near the joint 61 is bent at an angle of about 90 degrees with respect to the main body 64 so as to make it easy to pull the plug cap with a tool, a finger or the like engaged therewith. Since the extension 63 is almost elliptical and the engaging member 59 is formed to correspond thereto, when the extension 63 is engaged with the engaging member 59, the engagement position is established in a stable manner.

[0026] Fig. 6 is a view as viewed from the direction of symbol A in Fig. 5. Like reference numerals denote like or corresponding portions. The extension 63 is formed to have a thickness-wise dimension equal approximately to the height of the engaging member 59 of the cylinder head cover 49. The extension 63 is formed such that its diameter on the side of the connection 61 is greater than that on the side of the main body 64. On the other hand, the engaging member 59 is formed in a conical shape corresponding to the shape of the extension 63 men-

tioned above. Thus, when engaged with the engaging member 59, the extension 63 can stably be held in position. Incidentally, the plurality of projections 63a serves to make it easier to establish the engaging position by being brought into contact with the internal circumferential surface of the engaging member 59 at a plurality of lines. In addition, the projections 63a serve to make it hard for vibration of the engine to be transmitted to the main body 64. Although the projections 63a are formed half-columnar as depicted in the figure, they may be formed like triangular prisms or the number of the projections may optionally be selected. The extension 63 may be configured, without the projections 63a, such that the entire circumferential surface of the extension 63 comes into engagement with the inner circumferential surface of the engaging member 59. Alternatively, the extension 63 may be formed with a plurality of recesses.

[0027] Fig. 7a is a side view of the plug cap 60. Like reference numerals denote like or corresponding portions. The outer shell of the plug cap 60 according to the embodiment is integrally made of the same material, an elastic high-molecular material such as rubber so as to extend from the joint 61 having an insertion port 61a for the high-tension cord 65 (see Fig. 3) to the extension 63 and main body 64. The extension 63 is formed to have a predetermined angle relative to the longitudinal direction of the main body 64 so as to conform to the shape of the engaging member 59. Since the engagement relationship between the extension 63 and the engaging member 59 causes the plug cap 60 to be held stably, the main body 64 adapted to receive the ignition plug 43 inserted therethrough is remarkably reduced in outer diameter as compared with that of the conventional method.

[0028] Fig. 7b is a cross-sectional view of the plug cap 60. Like reference numerals denote like or corresponding portions. The present embodiment achieves the reduced diameter of the main body 64 by removing a strengthening agent applied to a portion adapted to receive the insulator 43b (see Fig. 2) therethrough in the conventional method. Incidentally, a cord setting screw 66 connected to the high-tension cord 65 is disposed on the bottom of the insertion port 61a. An electrode plate 67 connected to the cord setting screw 66 is connected to an electrode 68 to be in contact with the terminal 43c (see Fig. 2) of the ignition plug 43. The embodiment makes it possible that while a hard insulator 69 made of a synthetic resin or the like covers from the electrode plate 67 to the electrode 68, a portion of the plug cap 60 near the insertion hole 64a adapted to receive the ignition plug 43 inserted therethrough can be made of only an elastic high-molecular material such as rubber.

[0029] Fig. 8 is a perspective view of a cylinder head 88 and a cylinder head cover 70 to which a plug cap attachment structure according to a second embodiment of the present invention is applied. As with the embodiment described earlier, an ignition plug 43 is disposed in a recessed portion 78 of a cylinder head 88 formed with an intake port 79. A high-tension cord 85 and the terminal 43c (see Fig. 2) are connected to the ignition plug 43 and a plug cap 80 is attached to the ignition plug 43 so as to insulation-protect the connected portion. The plug cap 80 is composed, as a single piece, of a cylindrical main body 84, a plate-like extension 82, and a joint 81 with the high-tension cord 85. The cylindrical main body 84 covers the insulation 43b and terminal 43c of the ignition plug 43. The extension 82 protrudes toward the circumferential outside of the main body 84. The extension 82 is formed at its almost-central portion with a through-hole 83 adapted to receive an engaging projection 77 inserted therethrough. The engaging projection 77 is formed on the cylinder head cover 70.

[0030] Attachment bolts 72, 73, 74 are attached to the cylinder head cover 70. An attachment bolt 72 is used to support a guide stay 71 adapted to dispose wiring cords and the like not shown at appropriate positions. The other attachment bolts 73, 74 are used to fixedly fasten the cylinder head cover 70 to the cylinder head 88. The cylinder head cover 70 is formed at its one end with the engaging projection 77, and a first engaging plate 75 and a second engaging plate 76 which sandwich the extension 82 therebetween. A plug cap attachment structure according to the present embodiment is composed of the extension 82, the engaging projection 77, the first engaging plate 75 and the second engaging plate 76.

[0031] Fig. 9 is a plan view of the cylinder head cover 70 according to the second embodiment of the present invention. The engaging projection 77, the first engaging plate 75 and the second engaging plate 76 are integrally formed on one end of the cylinder head cover 70. When the plug cap 80 is connected to the ignition plug 43, the extension 82 is engaged with the engaging projection 77, the first engaging plate 75 and the second engaging plate 76, whereby the plug cap 80 is stably held by the cylinder head 88. The cylinder head cover 70 is formed with through-holes 73a and 74a adapted to receive the attachment bolts 73 and 74 inserted therethrough, respectively.

[0032] Fig. 10 is a partial enlarged view of the cylinder head cover 70. Like reference numerals denote like or corresponding portions. The first engaging plate 75 and the second engaging plate 76 are to be abutted or approximately abutted against the extension 82 of the plug cap 80 so as to sandwich it therebetween from both sides. In addition, the first and second engaging plates 75, 76 are arranged approximately vertically with respect to a dividing plane between the cylinder head 88 (see Fig. 8) and the cylinder head cover 70. A rib 77a is formed to extend in the same direction as the first and second engaging plates 75, 76 so as to support the engaging projection 77. The engaging projection 77 has almost the same angle as the attachment angle of the ignition plug 43. Consequently, when the plug cap 80 is connected to the plug 43, the engaging projection 77 is smoothly engaged with the through-hole 83.

[0033] Fig. 11 is a plan view of the plug cap 80. Like

reference numerals denote like or corresponding portion. The extension 82 is formed to have approximately linear lines so as to engage with the side surfaces of the first and second engaging plates 75 and 76. In addition, the extension 82 is formed with an oval through-hole 83 at its almost-central portion. Also in this embodiment, the plug cap 80 may be formed integrally with a grip in the vicinity of the joint 81. The grip functions as a handle used when the plug cap 80 is removed from the ignition plug 43.

[0034] Fig. 12 is a partial enlarged view of the plug cap 80. Like reference numerals denote like or corresponding portions. The outer shell of the plug cap 80 according to the embodiment is integrally made of the same material, an elastic high-molecular material such as rubber so as to extend from the joint 81 having an insertion port 81a for the high-tension cord 85 (see Fig. 8) to the extension 82 and main body 84. Since the plug cap attachment structure described above stably holds the plug cap 80, the main body 84 adapted to receive the ignition plug 43 inserted therethrough is remarkably reduced in outer diameter as compared with that of the conventional method.

[0035] Fig. 13a is a side view of the plug cap 80. Like reference numerals denote like or corresponding portions. In the present embodiment, the extension 82 is simply formed to extend vertically with respect to the longitudinal direction of the main body 84, which makes it possible to reduce manufacturing processes. This is because the angle of the engaging projection 77 extending from the cylinder head cover 70 (see Fig. 10) is made equal to the attachment angle of the ignition plug 43. As a result, when the plug cap 80 is connected to the ignition plug 43, the extension 82 is stably held by both sides of the first and second engaging plates 75 and 76, the engaging projection 77 and the rib 77b.

[0036] Fig. 13b is a cross-sectional view of the plug cap 80. Like reference numerals denote like or corresponding portions. The present embodiment achieves the reduced diameter of the main body 84 by removing a strengthening agent applied to a portion adapted to receive the insulator 43b therethrough in the conventional method. Incidentally, a cord setting screw 89 to be connected to the high-tension cord 85 (see Fig. 8) is disposed on the bottom of the insertion hole 81a. An electrode plate 86 connected to the cord setting screw 89 is connected to an electrode 87 to be in contact with the terminal 43c (see Fig. 2) of the ignition plug 43. The embodiment also makes it possible that while a hard insulator 90 made of a synthetic resin or the like covers from the electrode plate 86 to the electrode 87, a portion of the plug cap 80 near the insertion hole 84a adapted to receive the ignition plug 43 inserted therethrough can be made of only an elastic high-molecular material such as rubber.

[0037] As described above, according to the plug cap attachment structure according to the present invention, the extension provided on the plug cap is brought into engagement with the engaging member provided on the cylinder head cover. That is, the plug cap is supported by the engine side components at two points. Thus, the plug cap can be supported with increased stability. In addition, the plug cap can be reduced in diameter by partially removing the strengthening agent made of a hard high-molecular material in response to the increased support-stability. Since the ignition plug can be located at a position closer to the engine with the reduced diameter of the plug cap, it becomes possible to increase the degree of freedom of design for the surrounding of the engine.

[0038] Needless to say, the shape of the plug cap and cylinder head cover and the internal structure of the plug cap are not limited to the embodiments described above and can be modified in various ways. For example, the engaging member provided on the cylinder head cover may be formed as a single piece or in a recessed shape.

Claims

1. A plug cap attachment structure including: an ignition plug (43) located close to a cylinder head side surface wall of an engine (21) and obliquely inserted into a combustion chamber (42); and a cord (65; 85) adapted to supply electric power to the ignition plug (43) ; and, a plug cap (60; 80) disposed between the ignition plug (43) and the cord (65; 85) to connect the ignition plug (43) with the cord (65; 85),
said plug cap attachment structure comprising:

an extension (63; 82) provided on an outer shell of the plug cap (60; 80); and
an engaging member (59; 77) provided on a constituent part (49; 70) of the engine (21) and engaged with the extension (63; 82).

2. The plug cap attachment structure according to claim 1, wherein:

the constituent part of the engine (21) is a cylinder head cover (49);
the extension is a plate-like member (63) extending circumferentially outward of a cylindrical portion (64) of the plug cap (60); and
the engaging member is a ring-like projection (59) which projects from the cylinder head cover (49) and is formed with a hole portion (59a) adapted to hold an end face of the plate-like member (63).

3. The plug cap attachment structure according to claim 2 wherein the plate-like member (63) is formed virtually oval and the end face of the plate-like member (63) is provided with a plurality of projections (63a).

4. The plug cap attachment structure according to claim

1, wherein:

the constituent part of the engine is a cylinder head cover (70);
the extension is a plate-like member (82) which extends circumferentially outward of a cylindrical portion (84) of the plug cap (80) and is provided with a through-hole (83) extending in a thickness direction; and
the engaging member includes one engaging projection (77) which projects from the cylinder head cover (70) and passes through the through-hole (83) and two engaging plates (75, 76) which are abutted or virtually abutted against two side end faces of the extension (82).

5. The plug cap attachment structure according to any one of claims 1 to 4, wherein the plug cap (60; 80) is provided with a grip (62) which is virtually located on a line extending along a longitudinal direction of the ignition plug (43) so as to bend with respect to the longitudinal direction.

FIG.1

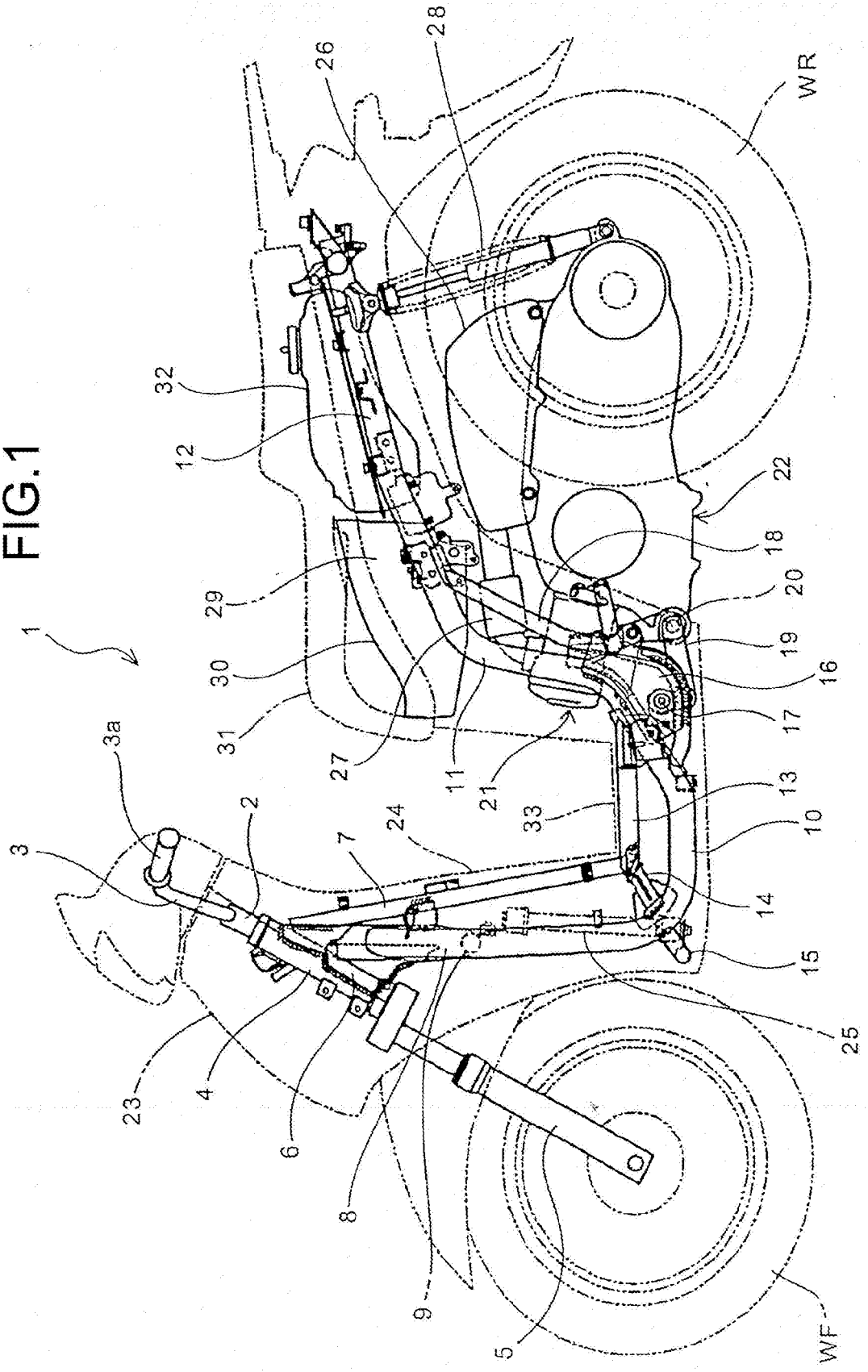
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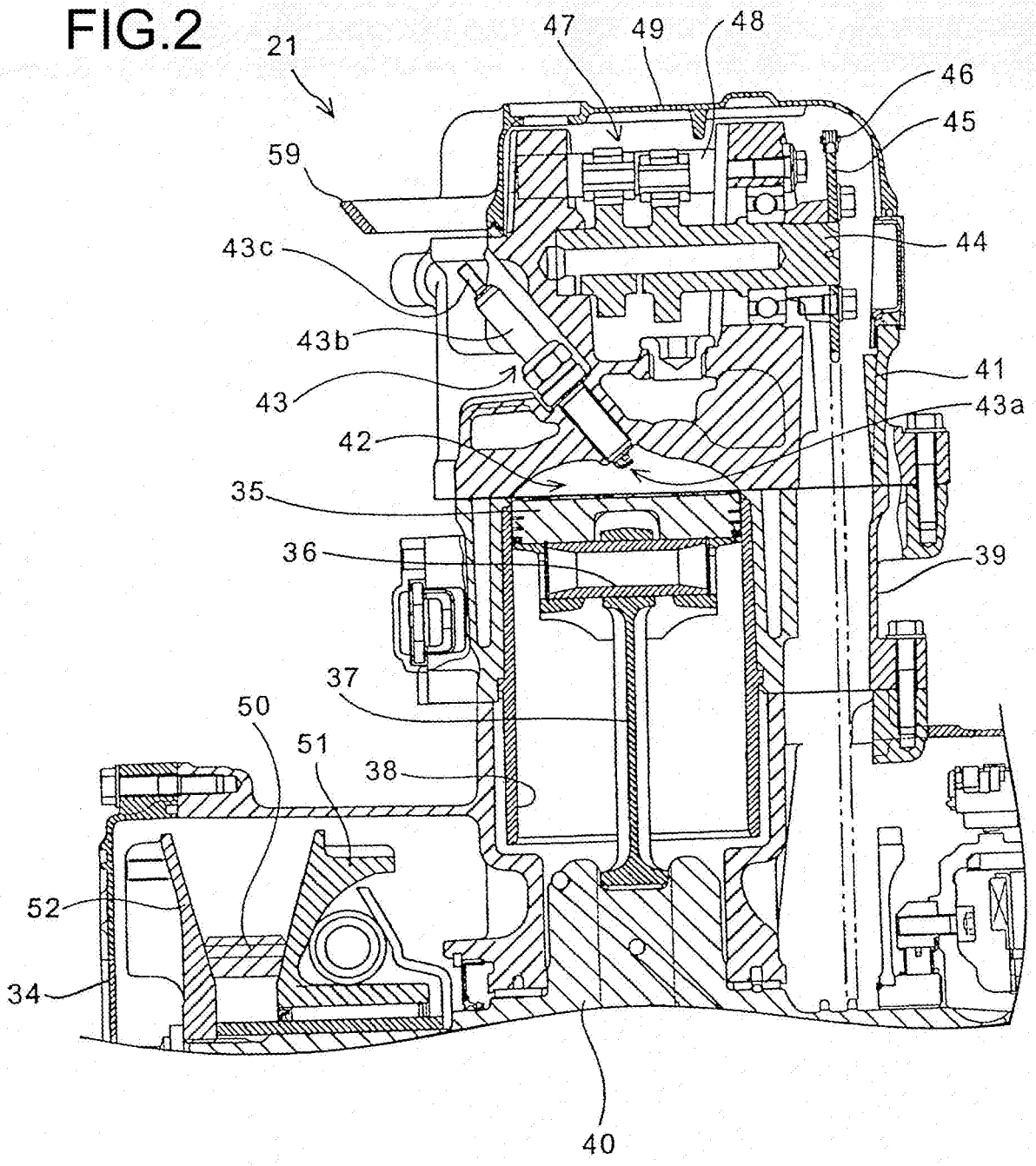
FIG.2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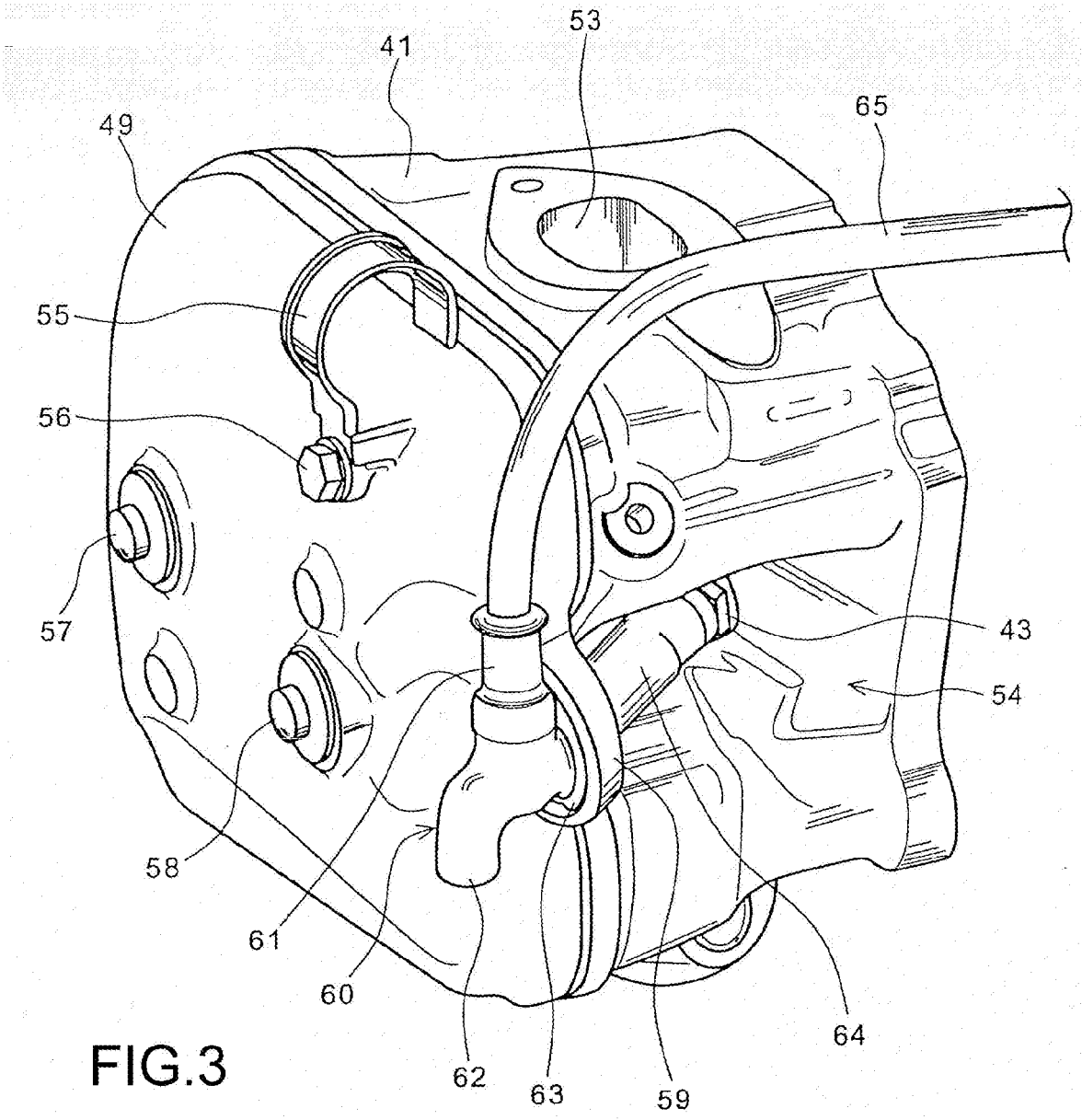


FIG.3

FIG.4

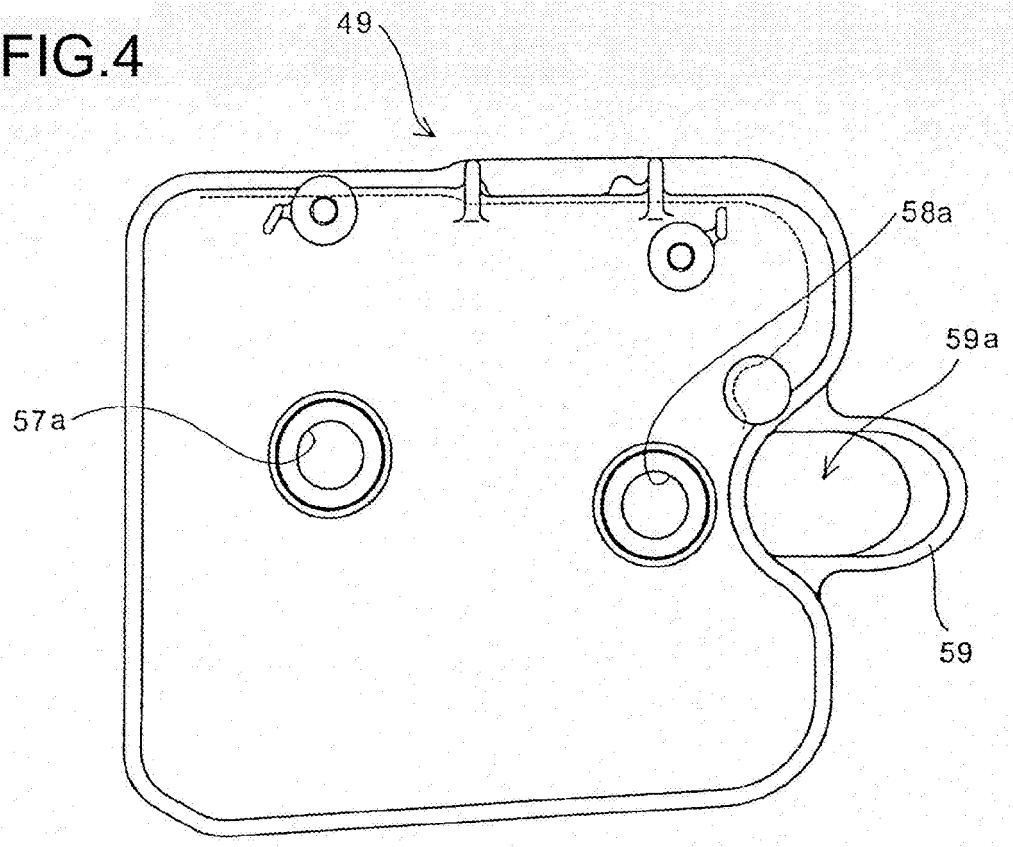


FIG.5

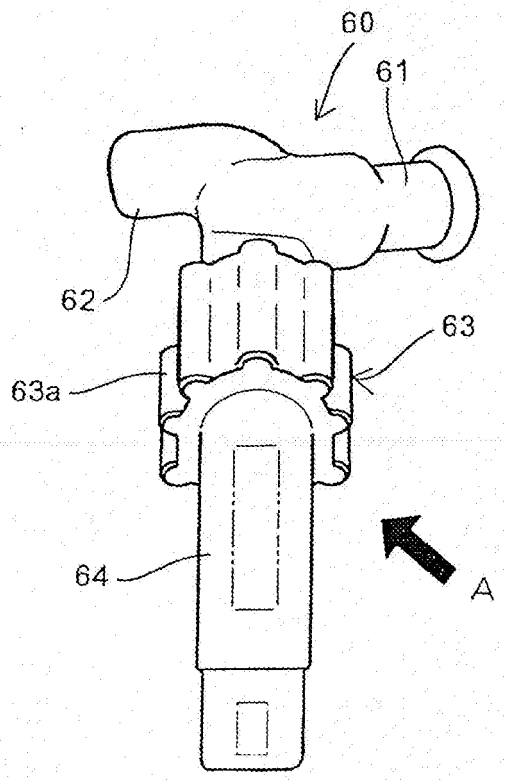


FIG.6

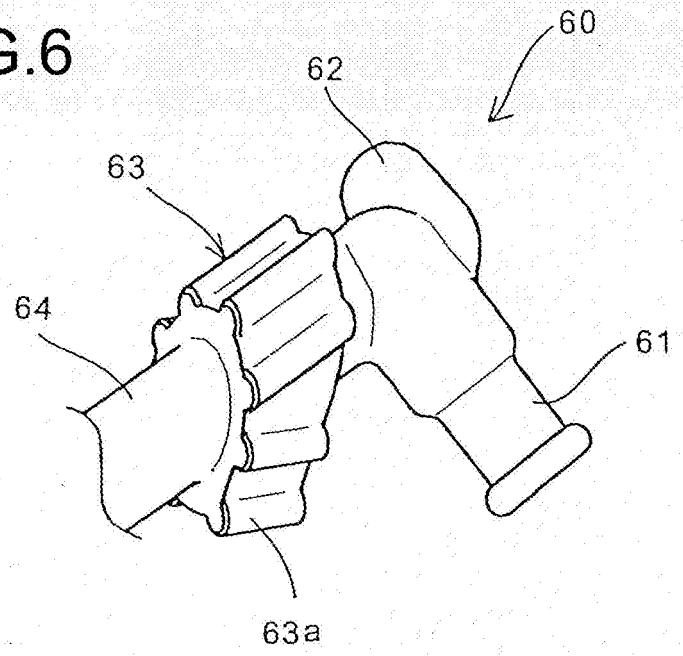
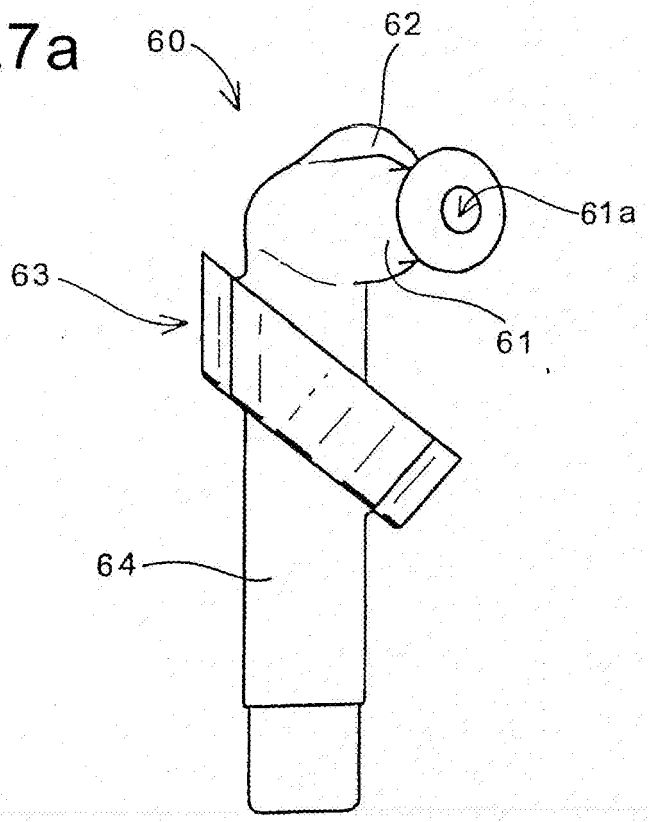


FIG.7a



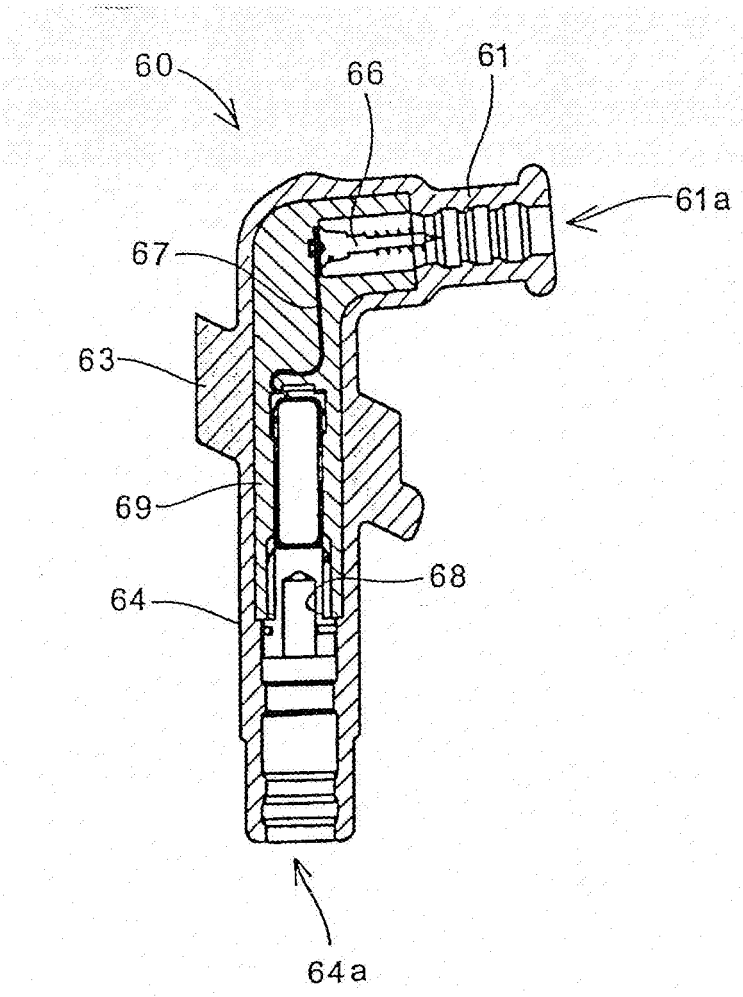


FIG.7b

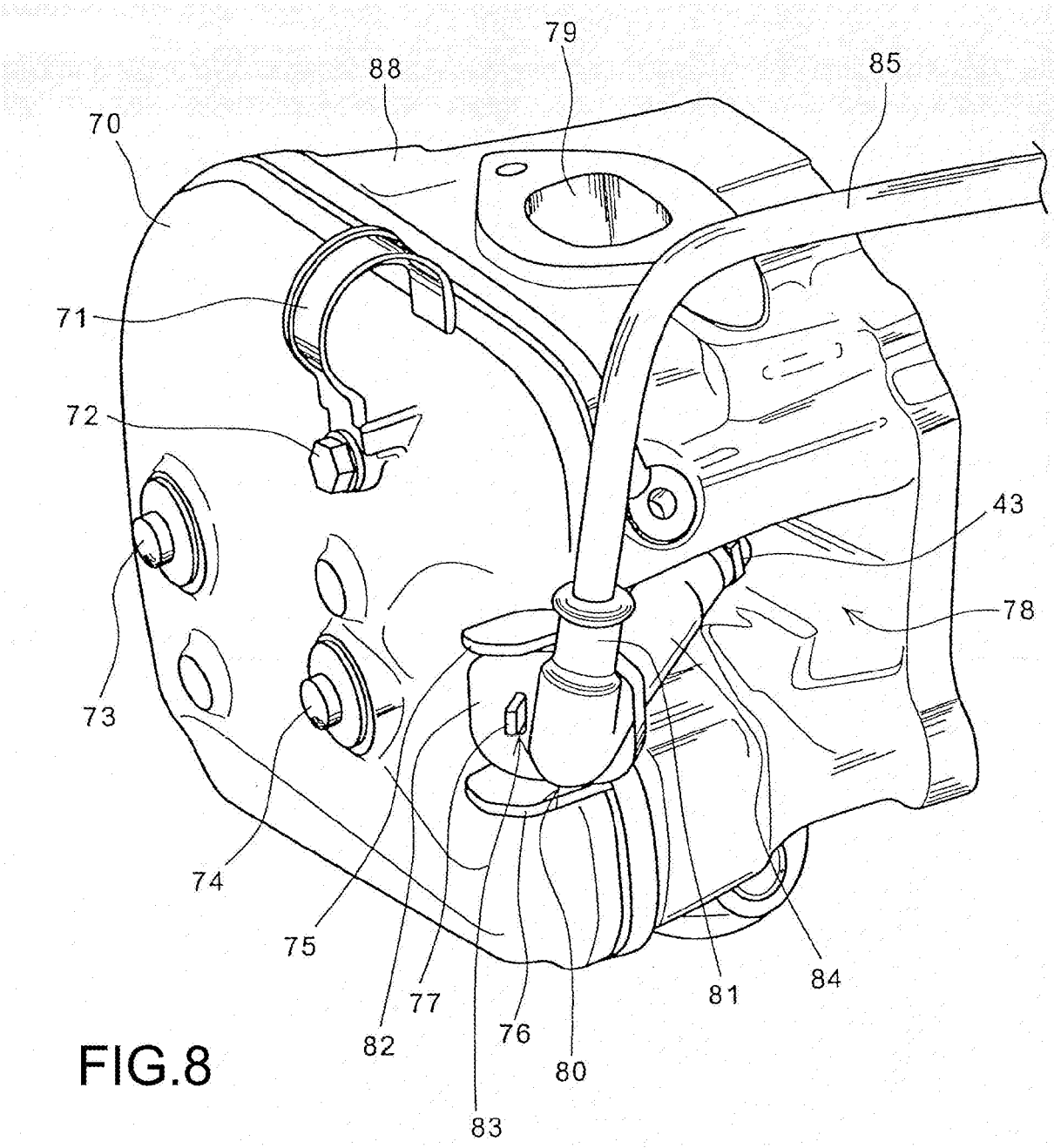
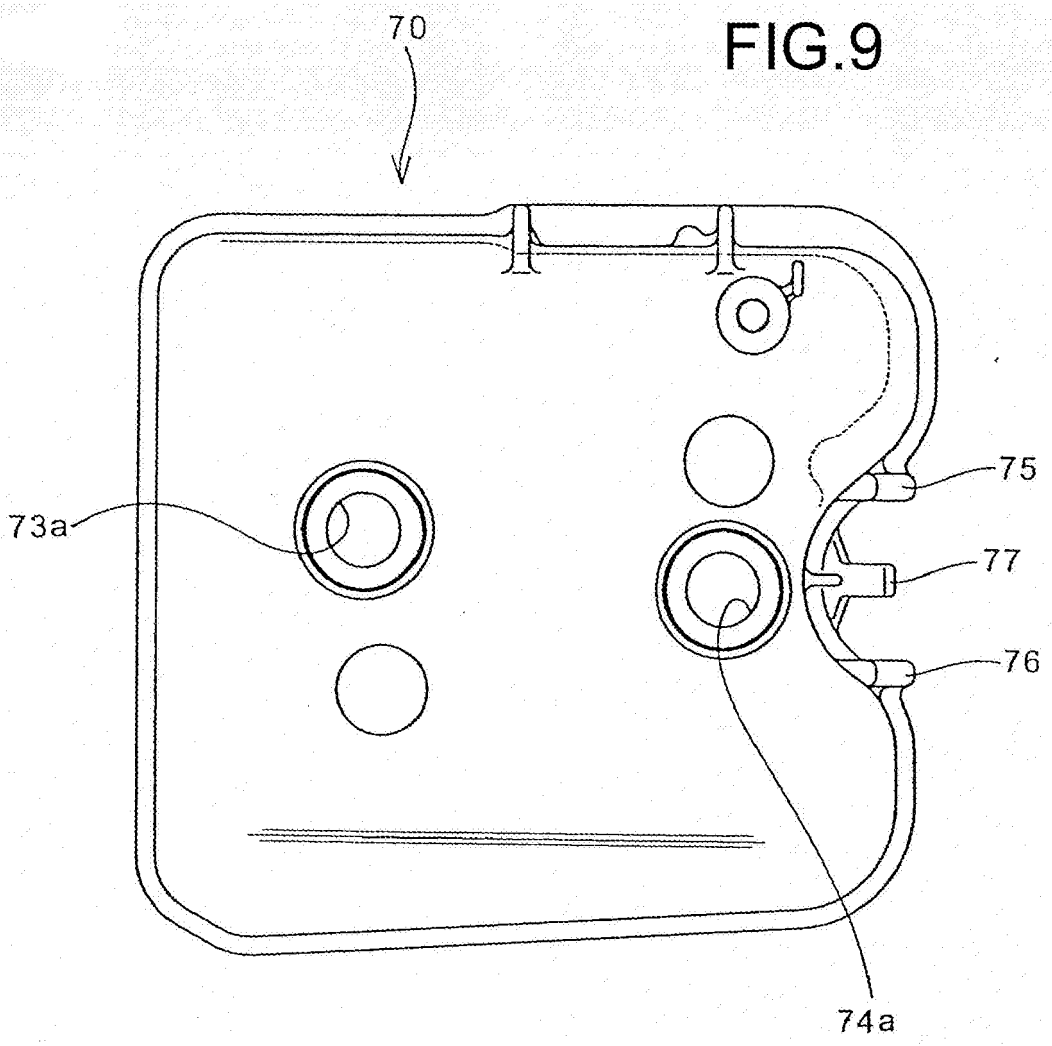


FIG.8

FIG.9



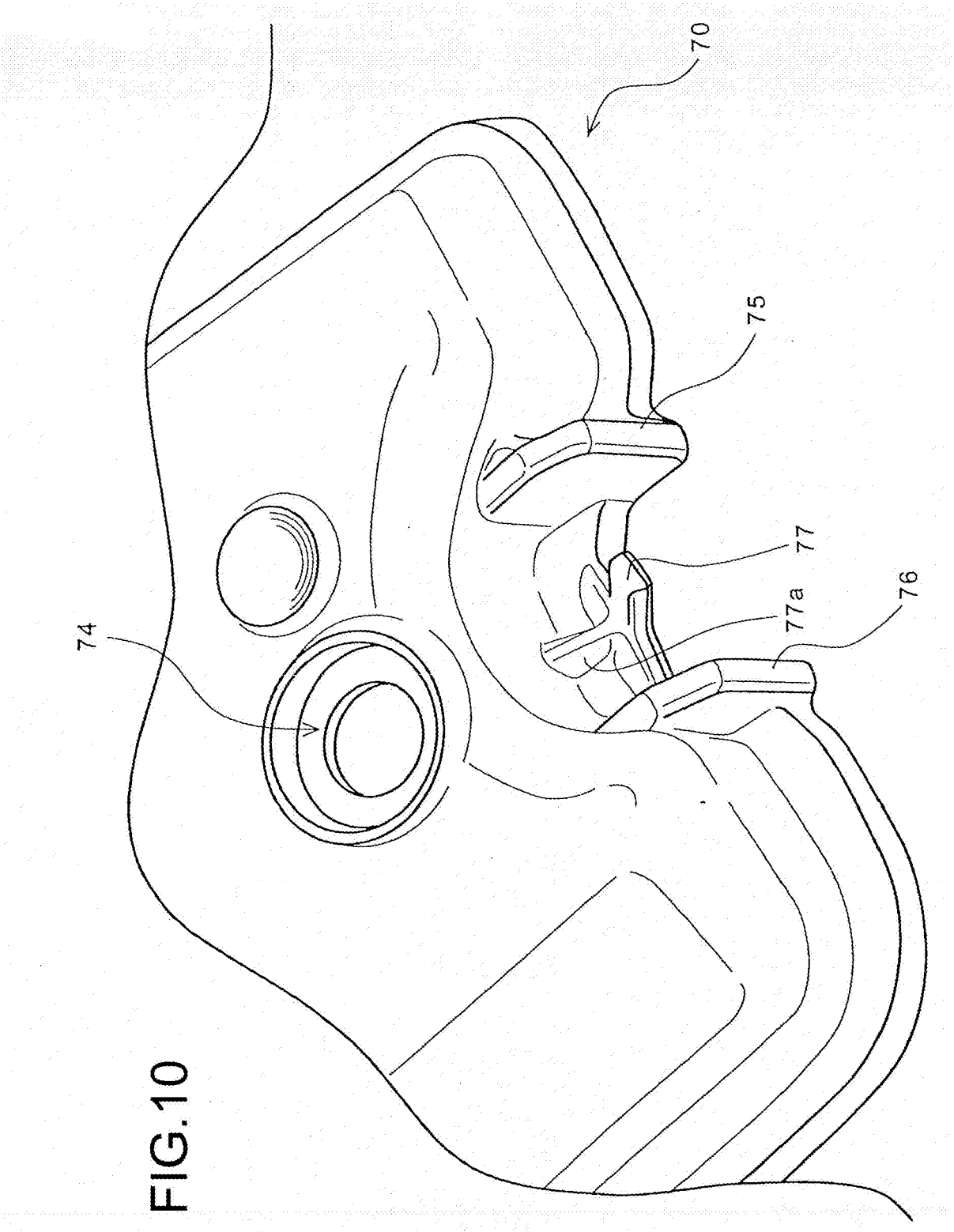


FIG.10

FIG.11

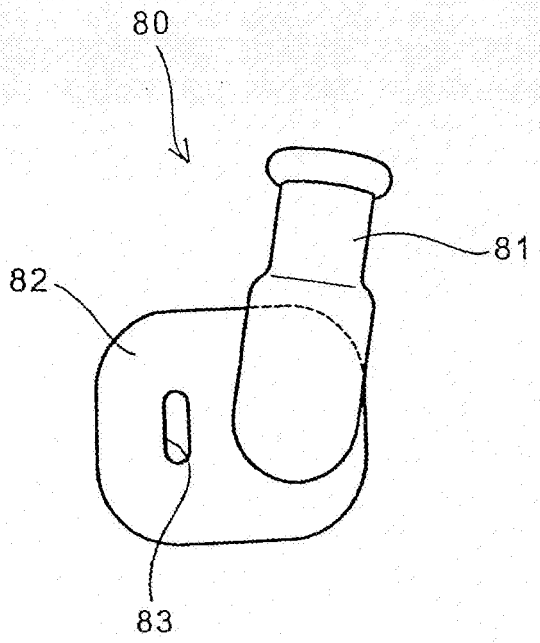


FIG.12

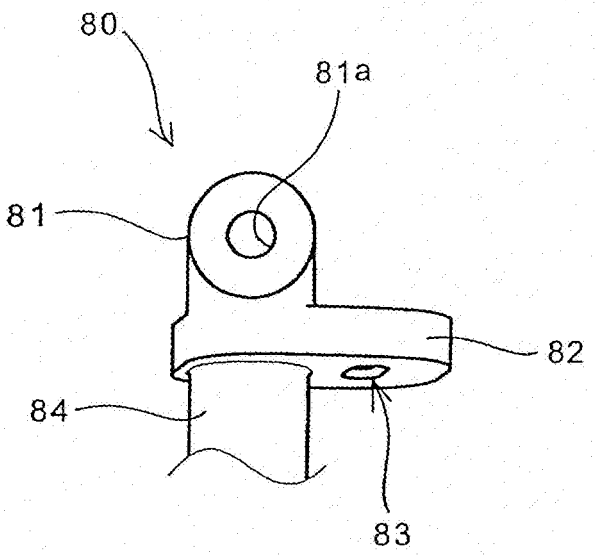


FIG.13a

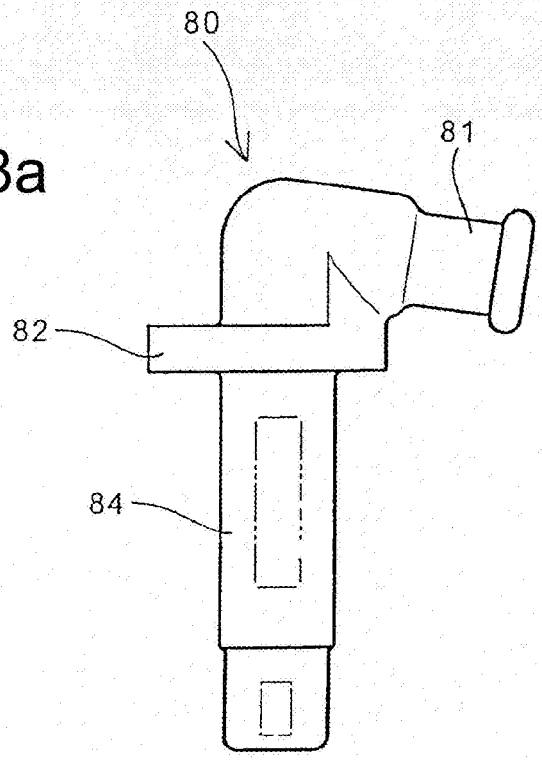
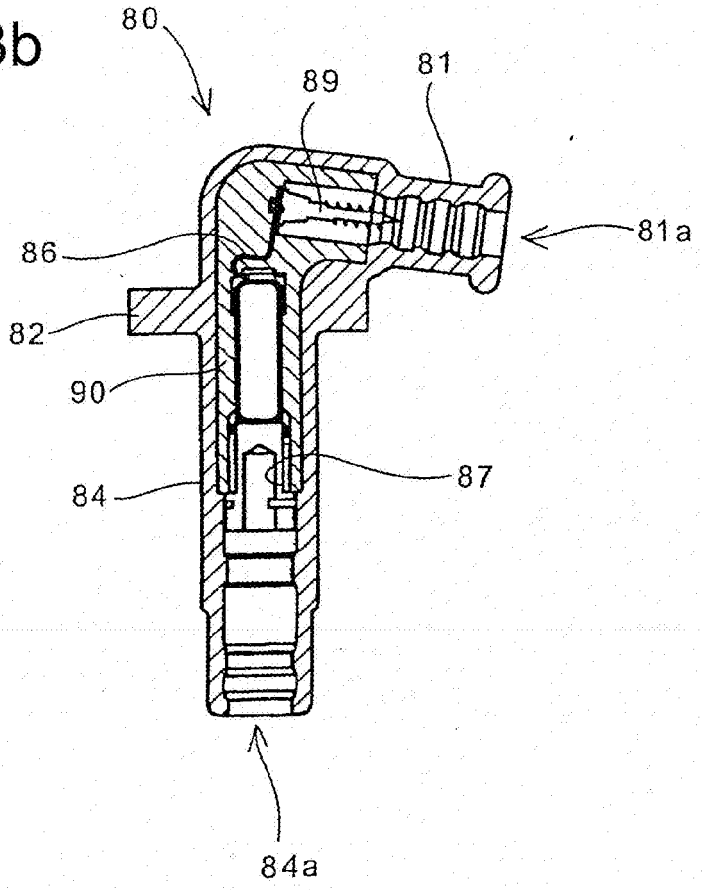


FIG.13b



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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 March 2007	Lommel, Armand

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