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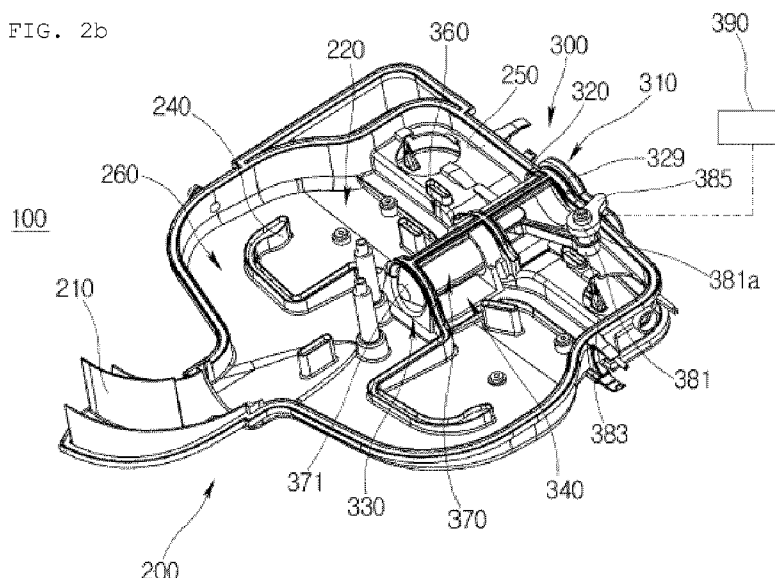
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(54) Title: INTAKE MANIFOLD STRUCTURE

FIG. 2b



(57) Abstract: The present invention relates to an intake manifold structure including: an apparatus body in which an intake port is disposed; a surge tank part disposed inside the apparatus body and connected to the intake port; a runner part disposed inside the apparatus body and connected to the surge tank part; and a flow changing means disposed between the surge tank part and the runner part and adjusting a flow rate or direction of air flowing from the surge tank part to the runner part. According to the present invention, there is an effect of variably adjusting the amount of air flowing from the surge tank to the runner according to operation states.

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[SPECIFICATION]

[Title of the Invention]
INTAKE MANIFOLD STRUCTURE

[Technical Field]

[0001] The present invention relates to an intake manifold structure, and more particularly, to an intake manifold structure capable of variably adjusting the flow rate of air flowing from a surge tank to runners according to travelling states.

[Technical Background]

[0003] An Intake manifold mounted on a vehicle is an apparatus for supplying air introduced via a throttle valve, an air filter, or the like to cylinders of an engine.

[0004] The meaning of such an intake manifold basically includes a surge tank, runners, and the like. Air introduced through an intake port of the intake manifold is temporarily stored in the surge tank and then allowed to flow while relatively uniformly distributed to a plurality of runners respectively connected to a plurality of cylinders in an engine.

[0005] Although the structures of intake manifolds presently used in vehicles vary with vehicles, one type thereamong is illustrated in FIGS. 1a and 1b.

[0006] In general, when a driver of a vehicle is to increase the travelling speed of a vehicle, the driver steps on an accelerator pedal, so that a throttle valve is further opened and an amount of air introduced into cylinders of an engine is thereby increased.

[0007] However, most conventional intake manifolds only performed a function of distributing and introducing intake air via a tank to runners and therefore could not variably change the amount of air.

[0008] In such a case, due to the size limitation of the intake manifold itself there is a limit to quickly increasing and introducing the required amount of air from cylinders of an engine for acceleration. This also causes the phenomenon delay in acceleration.

[0009] Accordingly, a vehicle structure, which allows an instantaneous acceleration such as what is commonly called zero-to-one-hundred performance, to be quickly performed, has been demanded from the industry, and research is continued on a structure which can quickly change the amount of air introduced from an intake manifold into runners to adapt to an acceleration environment.

[0010] FIGS. 1a and 1b illustrate one example of a structure of a conventional intake manifold (1) studied as part of the research.

[0011] Air having passed through a throttle valve, an air filter, and the like is introduced through an intake port (3) provided on one end of an apparatus body (2), and the air is then distributed to both sides along a distributing flow passage (4a) formed by a partitioning plate (4) and is introduced into a surge tank (5).

[0012] The air introduced into the surge tank (5) flows again toward a plurality of runners (6) and flows toward cylinders of an engine. The intake manifold (1) illustrated in FIGS. 1a and 1b is mounted on a 6-cylinder (V6) engine, and is provided with six runners which are disposed as two pairs of three runners respectively on both sides.

[0013] In this case, at the central side of a partitioning plate (4), a flow rate reinforcing means (10) for increasing the amount of air is disposed. The flow rate reinforcing means (10) corresponding to a conventional art is configured to include an

introducing port (13), a rotating circular plate (12), and openings (11).

[0014] During a low-speed travelling or non-operating state, as illustrated in FIG. 1a, the rotating circular plate (12) is positioned so that the openings (11) face an upper portion of the apparatus body (2). In this case, the air introduced from the intake port (3) cannot flow through the introducing port (13).

[0015] During a high-speed or operating state, as illustrated in FIG. 1b, the rotating circular plate (12) is rotated approximately 90 degrees so that the openings (11) face both surge tanks (5) on both sides. In this case, the air introduced through the intake port (3) passes through the openings (11) via the introducing port (13) and flows toward the surge tanks (5) on both sides, and this causes an increase in the amount of air. Thus, a fast counter measure against a fast change in the amount of air may be achieved under a high-speed environment.

[Related art document]

[Patent document]

[0017] (Patent document 0001) German Patent Publication No. 10-2007-060413 A1

[Description of Invention]

[Problems to be Solved]

[0018] The present invention was devised to solve the above-mentioned drawbacks of conventional arts, and the purpose of the present invention is to provide an intake manifold structure capable of variably adjusting the amount of air flowing from a surge tank to runners according to travelling states.

[Means for Solving the Problems]

[0020] In order to achieve the above-mentioned purposes, the present invention relates to an intake manifold structure including: an apparatus body in which an intake port and a distributing flow passage are disposed; a surge tank part disposed inside the apparatus body and connected to the distributing flow passage; a runner part disposed inside the apparatus body and connected to the surge tank part; and a flow changing means disposed between the surge tank part and the distributing flow passage and adjusting a flow rate or direction of air flowing from the surge tank part to the runner part.

[0021] In an embodiment of the present invention, the flow changing means may include: a guide unit installed to be connected to a partitioning plate for partitioning the distributing flow passage and the surge tank part and guiding an air flow; and an opening/closing unit movably disposed on the guide unit and adjusting a flow of air.

[0022] Also, in an embodiment of the present invention, the guide unit may include: a guide frame having one end portion connected to the partitioning plate and the other end portion connected to an inner surface border plate of the apparatus body; an introducing part which is provided on the one end portion of the guide frame, and into which air in the surge tank part is introduced; and a distributing part provided on a side end portion of the guide frame and provided to distribute the air introduced from the introducing part to the runner part.

[0023] Also, in an embodiment of the present invention, the opening/closing unit may include: a cylindrical part disposed inside the guide frame; a power transmission part disposed on the apparatus part, connected to the cylindrical part; and moving the

cylindrical part; and a driving part disposed to be associated with the apparatus part and driving the power transmission part.

[0024] Also, in an embodiment of the present invention, the cylindrical part may include: a head part inserted into the introducing part; a link part connected to the power transmission part; and a connecting part for connecting the head part and the link part.

[0025] Also, in an embodiment of the present invention, the head part may be formed in a streamlined cone shape protruding toward the introducing part so as to smoothly distribute air when the introducing part is opened.

[0026] Also, in an embodiment of the present invention, the connecting part may include: a first sealing plate disposed on a side of the head part and corresponding to a shape of an inner surface of the introducing part; a second sealing plate disposed to a side of the link part and corresponding to a shape of an inner surface of the guide frame; and a rod plate connecting the first sealing plate and the second sealing plate.

[0027] Also, in an embodiment of the present invention, the connecting part may further include a first sealing disposed along an outer periphery of the first sealing plate.

[0028] Also, in an embodiment of the present invention, the connecting part may further include a second sealing disposed along an outer periphery of the second sealing plate.

[0029] Also, in an embodiment of the present invention, the connecting part may further include a guide bar disposed along an edge of the rod plate and mounted on a guide groove provided in the guide frame.

[0030] In addition, in an embodiment of the present invention, the power transmission part may include: a shaft disposed adjacent to the guide unit on the apparatus body; a first lever having one side rotatably connected to the shaft and the other side connected to the link part; a second lever having one side rotatably connected to the shaft and the other side connected to the driving part ; wherein the first lever and the second lever may be fixed at a certain angle and integrally rotated.

[Effects of the Invention]

[0033] According to the present invention, there is an effect that the amount of air flowing from a surge tank to runners inside an intake manifold may be variably adjusted according to travelling states.

[Brief Description of the Drawings]

[0035] FIGS. 1a and 1b are views illustrating a structure of a conventional intake manifold.

FIG. 2a is a view illustrating an exterior appearance of an intake manifold of the present invention when viewed from under the intake manifold.

FIG. 2b is a view illustrating an intake manifold structure in an invention illustrated in FIG. 2a when viewed from under the intake manifold.

FIG. 2c is a view illustrating an intake manifold structure in an invention illustrated in FIG. 2a when viewed from over the intake manifold.

FIG. 3a is a view illustrating an intake manifold structure and a sealed state of the present invention illustrated in FIG. 2b.

FIG. 3b is a view illustrating an opened state in the invention illustrated in FIG. 3a.

FIGS. 4a and 4b are views illustrating, from another angle, an operation state of a flow changing means in the invention illustrated in FIG. 2c.

FIGS. 5a and 5b are views illustrating an opening/closing unit in the invention illustrated in FIG. 2b.

FIGS. 6a and 6b are views illustrating a guide unit in the invention illustrated in FIG. 2b.

[Detailed Mode for Carrying out the Invention]

[0036] Hereinafter preferred embodiments of an intake manifold structure according to the present invention will be described in detail with reference to the accompanying drawings.

[0037] FIG. 2 is a view illustrating an intake manifold structure of the present invention, FIG. 3a is a view illustrating an intake manifold structure and a sealed state of the present invention, FIG. 3b is a view illustrating an opened state in the invention illustrated in FIG. 3a, FIGS. 4a and 4b are views illustrating, from another angle, an in-operation state of a flow changing means in the invention illustrated in FIG. 2c, FIGS. 5a and 5b are views illustrating an opening/closing unit in the invention illustrated in FIG. 2b, and FIGS. 6a and 6b are views illustrating a guide unit in the invention illustrated in FIG. 2b.

[0038] Referring to FIGS. 2a to 6b, a structure of an intake manifold (100) of the present invention may be configured to include an apparatus body (200), a surge tank part (220), a runner part (230), and a flow changing means (300).

[0039] The apparatus body (200) may be provided with an intake port (210) for introducing air. Although not shown in the drawings, air used for being mixed with vehicle fuel is introduced, via a throttle valve, an

air filter, and the like, to the intake port (210) of the apparatus body (200).

[0040] The air introduced through the intake port (210) of the apparatus body (200) is introduced to the surge tank part (220) via the distributing flow passage (260) provided inside the apparatus body (200). The surge tank part (220) is the portion which is disposed inside the apparatus body (200) and connected to the distributing flow passage (260).

[0041] In this case, a partitioning plate (240) for partitioning the distributing flow passage (260) and the surge tank part (220) may be disposed inside the apparatus body (200).

[0042] In addition, the runner part (230) is the portion which is disposed inside the apparatus body (200), is connected to the surge tank part (220), and allows the air temporarily stored in the surge tank part (220) to be relatively uniformly distributed and introduced to cylinders of an engine. Referring to FIG. 2a, in an embodiment of the present invention, while the runner part (230) has a structure in which two pairs of three runners are provided to face each other under the assumption of being applied to a 6-cylinder (V6) vehicle, the number of runners of the runner part (230) may be differently determined according to the number and shape of the cylinders of a vehicle engine.

[0044] In addition, the flow changing means (300) may be provided between the surge tank part (220) and the distributing flow passage (260) and provided to adjust the flow rate or the flow direction of the air flowing from the surge tank part (220) to the runner part (230).

[0045] Such a flow changing means (300) may be configured to include a guide unit (310) and an opening/closing unit (360). The guide unit (310) is installed to be connected to the partitioning plate

(240) for partitioning the distributing flow passage (260) and the surge tank part (220), and functions to guide an air flow. The opening/closing unit (360) is movably disposed on the guide unit (310) and functions to adjust the air flow.

[0047] Specifically, the guide unit (310) may first be configured to include a guide frame (320), a guide cover (329), a guide groove (321), a support block (323), an introduction part (330), and a distributing part (340).

[0048] Referring to FIGS. 6a and 6b, one end portion of the guide frame (320) is connected to the partitioning plate (240) and the other end portion is connected to an inner surface border plate (250) of the apparatus body (200). The shape of the guide frame (320) may be an overall circular shape and may be a shape having an opening in the middle portion thereof.

[0049] The introducing part (330) is the portion which is provided in the guide frame (320) on one end portion connected to the partitioning plate (240), and through which the air introduced from the intake port (210) to flow through the distributing flow passage (260) is introduced. This may be provided in a circular shape according to the outer shape of the guide frame (320).

[0050] The distributing part (340) is provided on a side end portion of the guide frame (320) and may be an opening portion in the guide frame (320). The distributing part (340) may be provided to distribute the air introduced from the introducing port to the runner part (230).

[0051] In addition, the guide cover (329) is a component which is fastened to the other end portion of the guide frame (320) on an outer surface of the apparatus body (200) and functions to prevent an opening/closing unit (360), to be described later, from being detached inside the guide frame (320) after the

opening/closing unit (360) is attached. The guide cover (329), although not shown in the drawings, may be coupled by fastening bolts, but not limited thereto.

[0052] The support block (323) may be disposed on the guide frame (320) at a central portion. The support block functions to support the outer side surface of a cylindrical part (370) so that the cylindrical part (370) of the opening/closing unit (360) does not deviate from a moving path of the guide frame (320).

[0053] In addition, the guide groove (321) may be formed on upper and lower ends of a portion on which the cylindrical part (370) of the opening/closing unit (360) is disposed on the guide frame (320). The guide groove may be formed in the moving direction of the cylindrical part (370) and is the portion in which a guide bar (378a) of the cylindrical part (370) to be described later is inserted and moved.

[0055] In addition, the opening/closing unit (360) may be configured to include a cylindrical part (370), a power transmission part (380), and a driving part (390).

[0056] Specifically, referring to FIGS. 5a and 5b, the cylindrical part (370) may be the portion which is disposed inside the guide frame (320) and provided to move in the lengthwise direction of the guide frame (320).

[0057] The cylindrical part (370) may be configured to include a head part (371), a link part (373), and a connecting part (375). The head part (371) may be the portion inserted into the introducing part (330) provided on one end portion of the guide frame (320) and may thereby be provided to have a circular cross-sectional shape.

[0058] In this case, the head part (371) is provided in a streamlined cone shape protruding toward the introducing part (330) so that air is smoothly

distributed and moved to the distributing part (340) when the introducing part (330) is opened. That is, when the flow changing means (300) is not operated, as illustrated in FIGS. 2b and 3a, the head part (371) is inserted into the introducing part (330).

[0059] In addition, when more air is required according to high-speed travelling, as illustrated in FIG. 3b, the head part (371) is moved back in the lengthwise direction of the guide frame (320) while being separated from the introducing part (330). The time when the cone shape of the head part (371) is effective is when the head part (371) is just separated from the introducing part (330).

[0060] When the head part (371) is just separated from the introducing part (330), air smoothly flows to the distributing part (340) while flowing along the cone shape of the head part (371). If the head part (371) has a flat plate shape, air undergoes flow resistance on the central side of the head part (371). This decreases the effect of distributing air.

[0061] Accordingly, the cone shape of the head part (371) enables a more effective air distribution.

[0062] In addition, referring again to FIG. 5a, the link part (373) may be a portion connected to the power transmission part (380). The link part (373) may be configured to include: a pair of support beams (373a) disposed on one end portion of the connecting part (375); and a link bar (373b) disposed between a pair of support beams (373a).

[0063] In addition, the connecting part (375) may be a portion connecting the head part (371) and the link part (373). The connecting part (375) may be configured to include a first sealing plate (376), a first sealing (376a), a second sealing plate (377), a second sealing (377a), a rod plate (378), and guide bars (378a).

[0064] First, the first sealing plate (376) may be disposed on the side of the head part (371) and formed in a circular plate shape so as to correspond to the shape of the inner surface of the introducing part (330). In an embodiment of the present invention, since the inner surface of the introducing part (330) is circular, the first sealing plate (376) is also formed in, but not limited to, such a shape, and when the shape of the inner surface of the introducing part (330) is different, the first sealing plate may be changed corresponding thereto.

[0065] In addition, the first sealing (376a) may be disposed along the outer periphery of the first sealing plate (376). The first sealing (376a) is brought into close contact with the inner circumferential surface of the introducing part (330), and when the flow changing means (300) is not operated, the first sealing prevents the air from being introduced from the introducing part (330). If the flow changing means (300) is operated and the cylindrical part (370) thereby moves back, the first sealing (376a), as illustrated in FIG. 3b, is in a state of being brought into close contact with the inner circumferential surface of the support block (323) of the guide frame (320).

[0066] The second sealing plate (377) may be disposed on the side of the link part (373) and formed in a circular plate shape so as to correspond to the shape of the inner circumferential surface of the guide frame (320). In an embodiment of the present invention, since the inner surface of the guide frame (320) is circular, the second sealing plate (377) is also formed in, but not limited to, such a shape, and when the shape of the inner surface of the guide frame (320) is different, the second sealing plate may be changed corresponding thereto.

[0067] In addition, the second sealing (377a) may be disposed along the outer periphery of the second sealing plate (377). While the flow changing means (300) is not operated, the second sealing (377a) is in a state of being in close contact with the inner circumferential surface of the support block (323) of the guide frame (320).

[0068] In addition, referring again to FIG. 5a, the rod plate (378) may be a portion connecting the first sealing plate (376) and the second sealing plate (377) and provided in a rectangular plate shape. When the flow changing means (300) is not operated, the rod plate functions as a wall for blocking an air flow between distributing parts (340) provided on both side portions of the guide frame (320).

[0069] The guide bars (378a) mounted on the guide grooves (321) formed inside the guide frame (320), may be disposed on edges of the rod plate (378), that is, on upper and lower ends of the rod plate. The guide bars (378a) function to guide the moving direction of the cylindrical part (370) inside the guide frame (320) while being inserted into the guide grooves (321) and moved.

[0071] In addition, referring to FIGS. 2b, 3a, and 5b, the power transmission part (380) may be disposed on the apparatus body (200), connected to the cylindrical part (370), and provided so as to move the cylindrical part (370). In addition, the driving part (390) may be disposed to be associated with the apparatus body (200) and provided so as to drive the power transmission part (380).

[0072] Specifically, the power transmission part (380) may be configured to include a shaft (381), a first lever (383), and a second lever (385).

[0073] The shaft (381) may be fixedly disposed adjacent to the guide unit (310) on the apparatus body

(200). In addition, the shaft may be configured such that one side of the first lever (383) is rotatably connected to the shaft (381) and the other side thereof is connected to the link bar (373b) of the link part (373). One side of the second lever (385) may be rotatably connected to the shaft (381) and the other side may be connected to the driving part (390).

[0074] The first lever (383) and the second lever (385) are connected to the shaft (381) and then fixed by being fastened with a fixing bolt (381a).

[0075] In this case, the driving part (390) although not limited to a specific power device, may be a hydraulic motor (not shown) in an embodiment of the present invention. Although not shown in the drawings, the hydraulic motor may be mounted on a portion outside the apparatus body (200) and a rod end portion of the hydraulic motor may be coupled to the connecting bar (385a) of the second lever (385).

[0076] Referring to FIGS. 2b, 3a, and 3b, when a user drives the driving part (390) and pushes the second lever (385), the cylinder part (370) connected to the first lever (383) moves along the inside of the guide frame (320) toward the introducing part (330) while the first lever (383) connected to the shaft (381) moves forward, and blocks air introduction while being brought into close contact with the introducing part (330).

[0077] If the user drives the driving part (390) and pulls the second lever (385), the cylindrical part (370) connected to the first lever (383) moves backward along the inside of the guide frame (320) while the first lever (383) connected to the shaft (381) moves backward. In this case, since the introducing part (330) is opened, the introduced air flows through the distributing part (340) toward both sides thereof.

[0078] The user may adjust the opening degree of the distributing part (340) by adjusting the moving amount of the second lever (385) and thereby adjusting the degree of the forward or backward movement of the cylindrical part (370).

[0079] When the opened degree of the distributing part (340) is large, that is, when the cylindrical part (370) is fully moved backward, the amount of introduced and distributed air increases, whereby it is suitable for high-speed travelling.

[0080] When the opened degree of the distributing part (340) is small, that is, when the cylindrical part (370) is slightly moved backward and separated from the introducing part (330), the amount of introduced and distributed air is small, whereby it is suitable for a travelling state in which the speed is slightly increased.

[0081] During low-speed travelling, the user fully moves the cylindrical part (370) forward toward the introducing part (330) to seal the introducing part (330) and only needs to supply, to the runner part (230), the air purely introduced into the surge tank part (220) through the distributing flow passage (260).

[0082] FIGS. 2b, 3a, and 3b illustrate a disposition structure of the flow changing means (300) when viewed from under the apparatus body (200), and accordingly, the surge tank part (220) forming an inner upper end of the apparatus body (200) may be viewed.

[0083] FIGS. 2c, 4a, and 4b illustrate a structure of disposing the flow changing means (300) when viewed from above the apparatus body (200), and accordingly, the runner part (230) in which six runners forming an inner lower end of the apparatus body (200) may be viewed.

[0084] Referring to FIGS. 2c, 4a, and 4b, when the flow changing means (300) is not operated, the air

introduced from the intake port (210) is moved to the runner part (230) and introduced to each individual runner while flowing, to detour through the distributing flow passage (260) toward the surge tank part (220). Subsequently, the air is supplied to each of the engine cylinders connected to the individual runner.

[0085] If the user is to increase the travelling speed of the vehicle, the user only needs to increase the amount of air supplied to the engine cylinders. To this end, the user needs to increase the the amount throttle valve is opened (not shown) and to more quickly supply the air introduced from the intake port (210) of the apparatus body (200) to the runner part (230). That is, the flow rate of air and the speed of air introduced into the runner part (230) are increased.

[0086] In this case, the user operates the driving part (390) through a controller, and the driving part (390) pulls the second lever (385) and rotates the first lever (383) connected to the second lever (385) by means of the shaft (381). As the first lever (383) rotates, the cylindrical part (370) connected to the first lever (383) by means of the link part (373) moves backward along the inside of the guide frame (320), and while the head part (371) is separated from the introducing part (330), not only air is introduced into the surge tank part (220) through the distributing flow passage (260), but also air is introduced into the surge tank (220) through the distributing part (340) formed in the guide frame (320) via the introducing part (330).

[0087] That is, the flow rate and the speed of air introduced into the surge tank part (220) are increased, and since air is introduced simultaneously from the distributing flow passage (260) and the introducing part (340) which are separated by the

partitioning plate (240), the amount of air flowing toward the runner part (230) is variably increased.

[0088] When the user determines the moving amount which is for the hydraulic motor and has been previously calculated corresponding to a desired travelling speed, the amount of rotating the second lever (385) and the first lever are also determined, and therefore, the amount the cylindrical part is moved (370) inside the guide frame (320) is also determined. Since this determines the area of the distributing part (340), as a result, the amount of air introduced into the surge tank part (220) through the distributing part (340) may be determined.

[0090] Through the above-mentioned structure and operating processes, the user may more quickly and efficiently change the amount of air supplied to engine cylinders corresponding to the travelling environment desired by the user. Thus, the present invention has an effect of improving the travelling satisfaction level.

[0091] Descriptions provided so far merely illustrate specific embodiments of an intake manifold structure.

[0092] Thus, it is clarified that those skilled in the art could easily understand the present invention and may be replaced and modified into various forms without departing from the scope of the present invention and set forth in the claims below.

[Description of Reference Symbols]

[0093] 100: Intake manifold	210: Intake port
200: Apparatus body	230: Runner part
220: Surge tank part	
240: Partitioning plate	250: Border plate
260: Distributing flow passage	
300; Flow changing means	310: Guide unit
320: Guide frame	323: Support block
321: Guide groove	329: Guide cover

330: Introducing part	340: Distributing part
360: Opening/closing unit	370: Cylinder part
371: Head part:	373: Link part
373a: Support beam	373b: Link bar
375: Connecting part	376: First sealing plate
376a: First sealing	377: Second sealing plate
377a: Second sealing	378: Rod plate
378a: Guide bar	380: Power transmission part
381: Shaft	381a: Fixing bolt
383: First lever	385: Second lever
385a: Connecting bar	390: Driving part

[Claims]

[Claim 1]

Intake manifold structure comprising:

an apparatus body in which an intake port and a distributing flow passage are disposed;

a surge tank part disposed inside the apparatus body and connected to the distributing flow passage;

a runner part disposed inside the apparatus body and connected to the surge tank part; and

a flow changing means disposed between the surge tank part and the distributing flow passage and adjusting a flow rate or direction of air flowing from the surge tank part to the runner part.

[Claim 2]

Intake manifold structure according to Claim 1, wherein the flow changing means comprises:

a guide unit installed to be connected to a partitioning plate for partitioning the distributing flow passage and the surge tank part for guiding an air flow; and

an opening/closing unit movably disposed on the guide unit for adjusting a flow of air.

[Claim 3]

Intake manifold structure according to Claim 2, wherein the guide unit comprises:

a guide frame having one end portion connected to the partitioning plate and the other end portion connected to an inner surface border plate of the apparatus body;

an introducing part which is provided on the one end portion of the guide frame, and into which air in the surge tank part is introduced; and

a distributing part provided on a side end portion of the guide frame, provided to distribute the air

introduced from the introducing part to the runner part.

[Claim 4]

Intake manifold structure according to Claim 3, wherein the opening/closing unit comprises:

- a cylindrical part disposed inside the guide frame;

- a power transmission part disposed on the apparatus part, connected to the cylindrical part, and moving the cylindrical part; and

- a driving part disposed in association with the apparatus part and driving the power transmission part.

[Claim 5]

Intake manifold structure according to Claim 4, wherein the cylindrical part comprises:

- a head part inserted into the introducing part;

- a link part connected to the power transmission part; and

- a connecting part for connecting the head part and the link part.

[Claim 6]

Intake manifold structure according to Claim 5, wherein the head part is formed in a streamlined cone shape protruding toward the introducing part so as to smoothly distribute air when the introducing part is opened.

[Claim 7]

Intake manifold structure according to Claim 5, wherein the connecting part comprises:

- a first sealing plate disposed on a side of the head part and corresponding to a shape of an inner surface of the introducing part;

a second sealing plate disposed to a side of the link part and corresponding to a shape of an inner surface of the guide frame; and

a rod plate connecting the first sealing plate and the second sealing plate.

[Claim 8]

Intake manifold structure according to Claim 7, wherein the connecting part further comprises a first sealing disposed along an outer periphery of the first sealing plate.

[Claim 9]

Intake manifold structure according to Claim 8, wherein the connecting part further comprises a second sealing disposed along an outer periphery of the second sealing plate.

[Claim 10]

Intake manifold structure according to Claim 9, wherein the connecting part further comprises guide bars disposed along an edge of the rod plate and mounted on guide grooves provided in the guide frame.

[Claim 11]

Intake manifold structure according to Claim 5, wherein the power transmission part comprises:

a shaft disposed adjacent to the guide unit on the apparatus body;

a first lever having one side rotatably connected to the shaft and the other side connected to the link part;

a second lever having one side rotatably connected to the shaft and the other side connected to the driving part ; wherein

the first lever and the second lever are fixed at a certain angle and are integrally rotated.

FIG. 1a

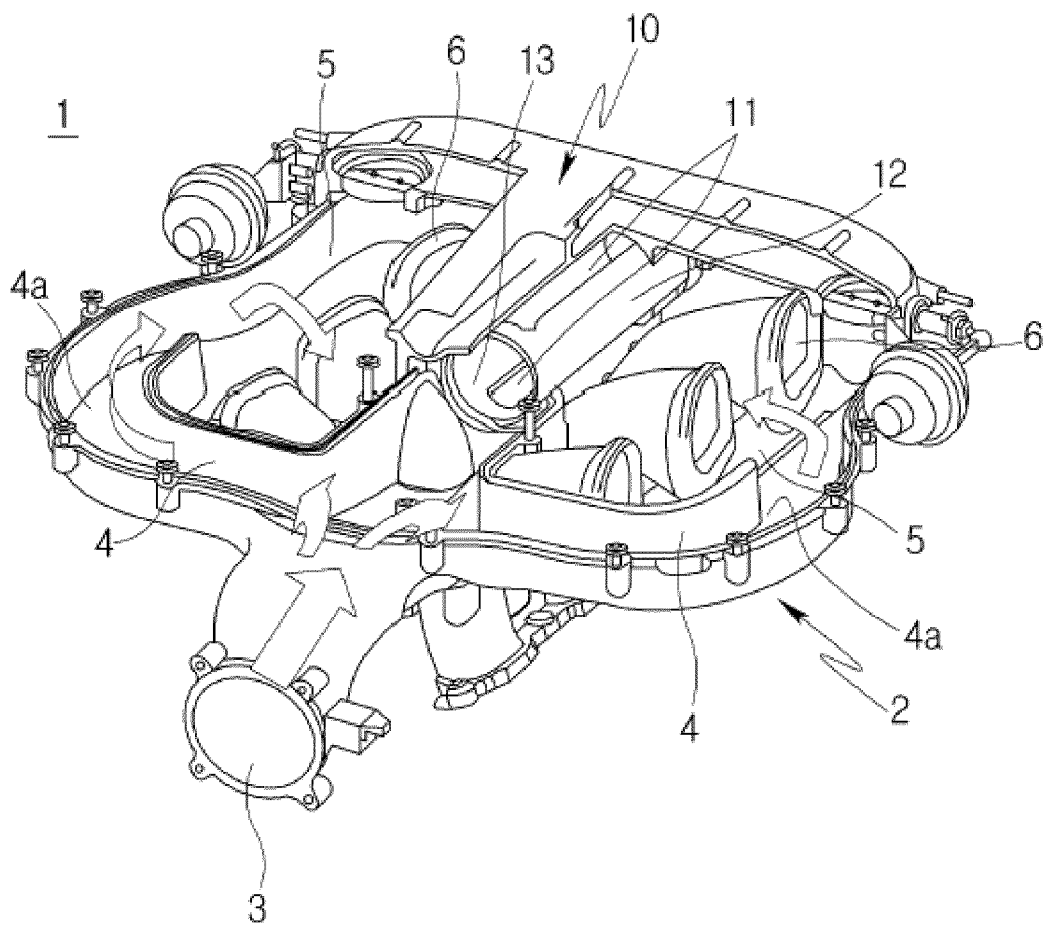


FIG. 1b

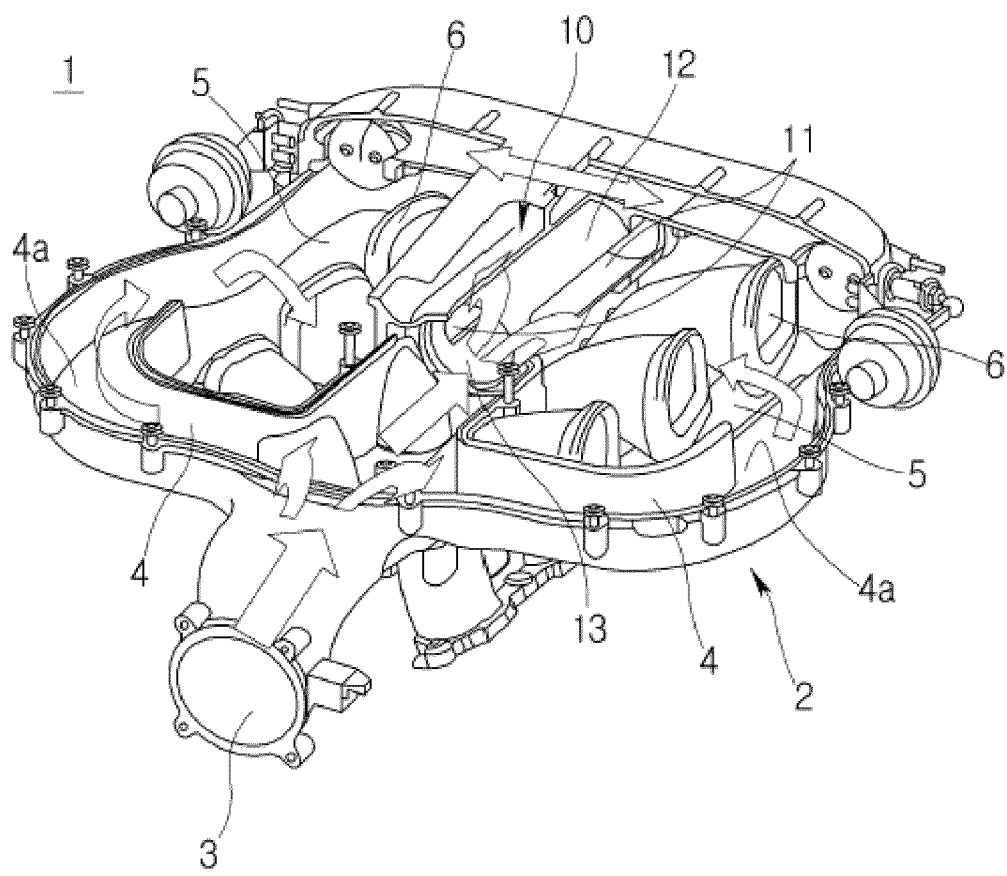


FIG. 2a

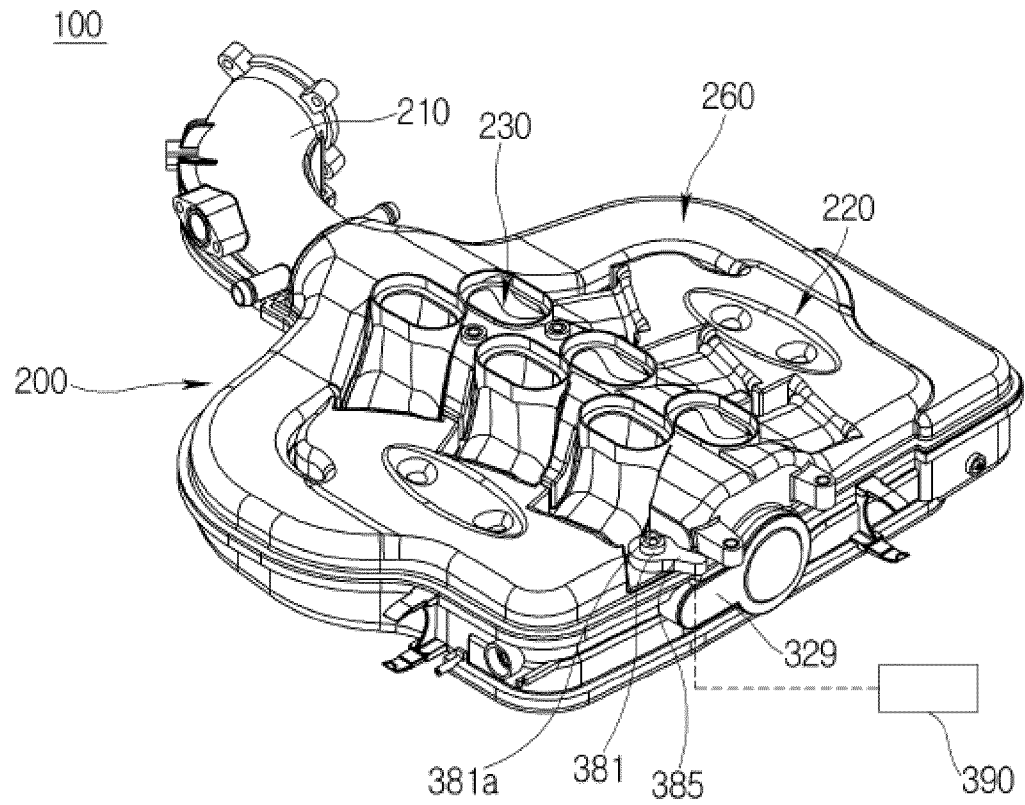


FIG. 2b

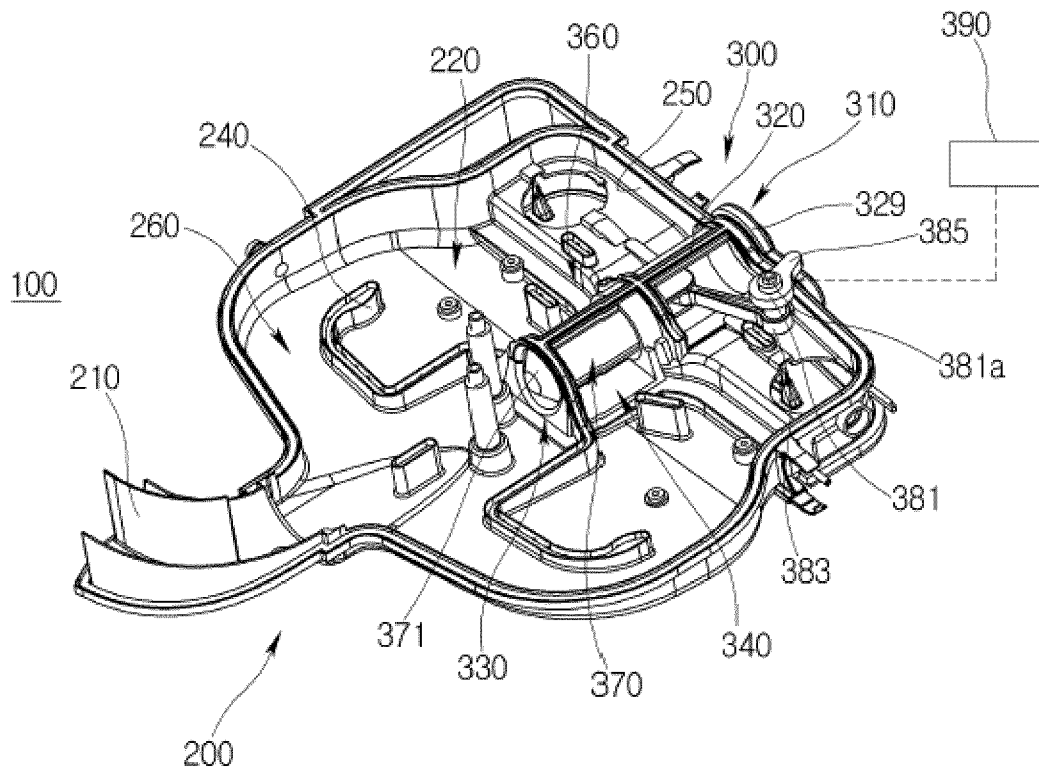


FIG. 2c

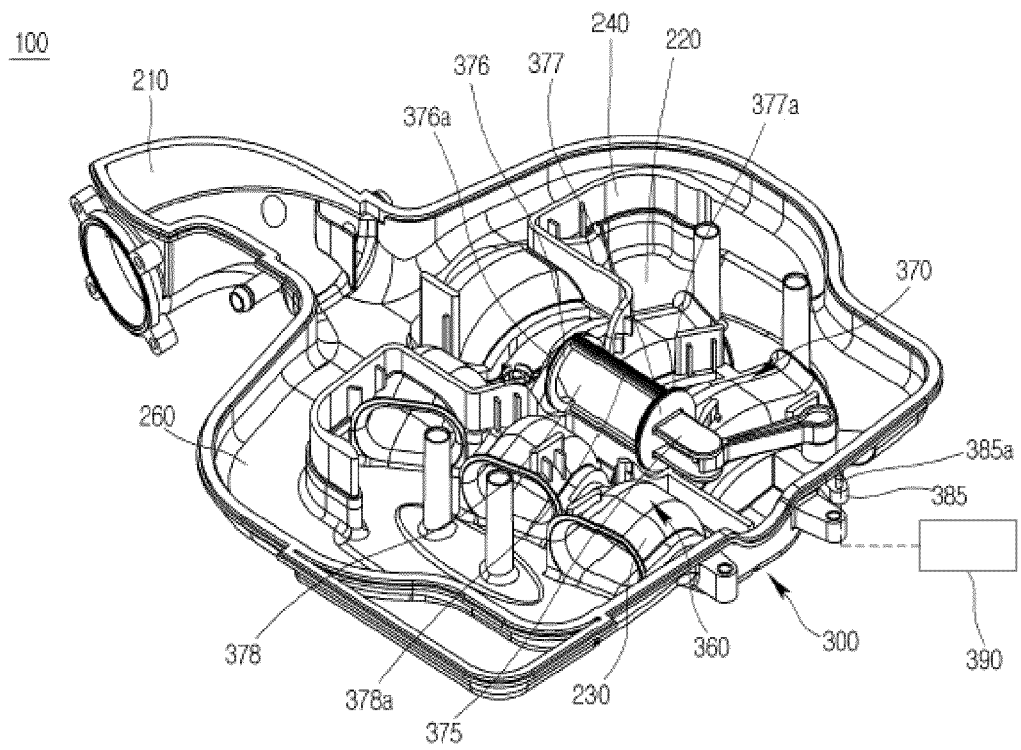


FIG. 3a

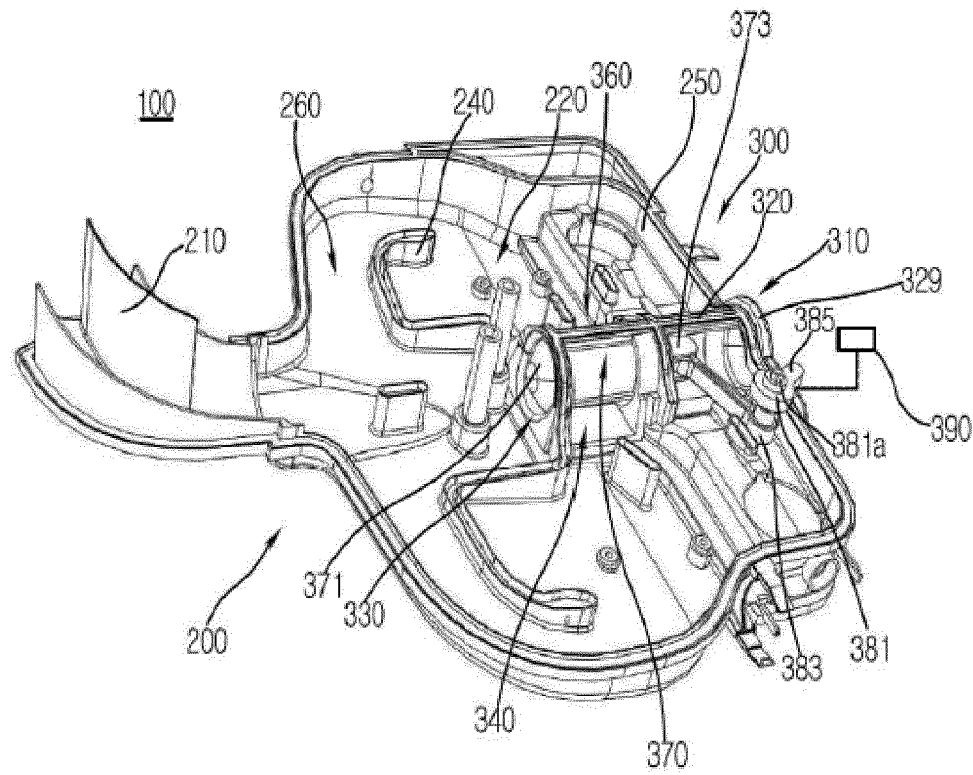


FIG. 3b

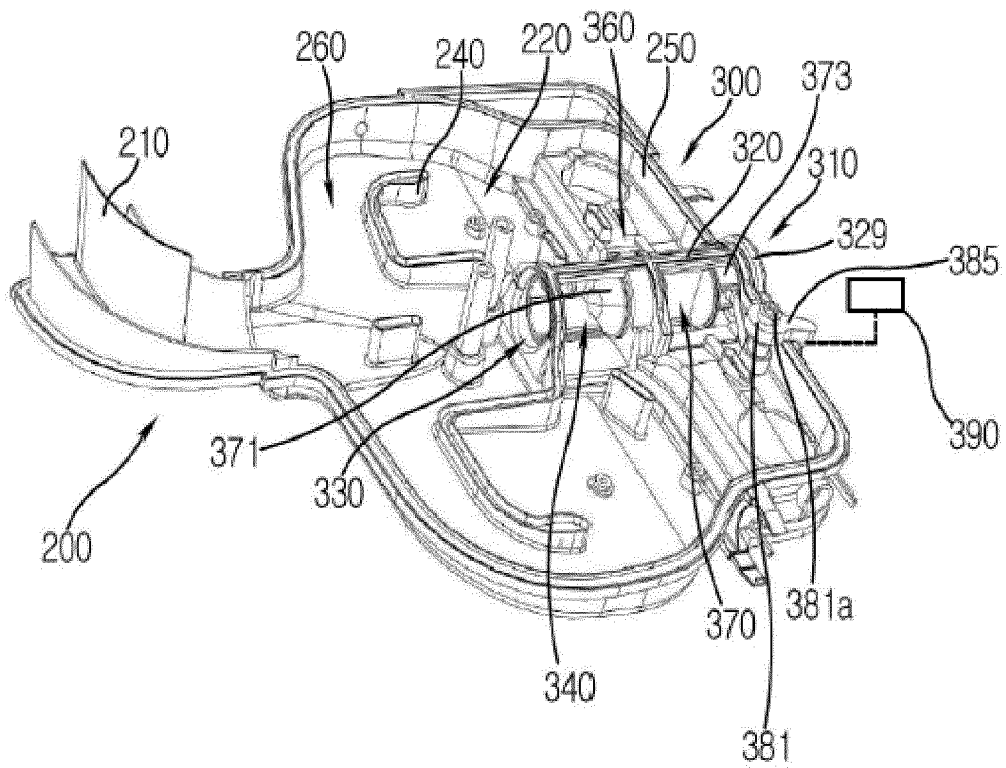


FIG. 4a

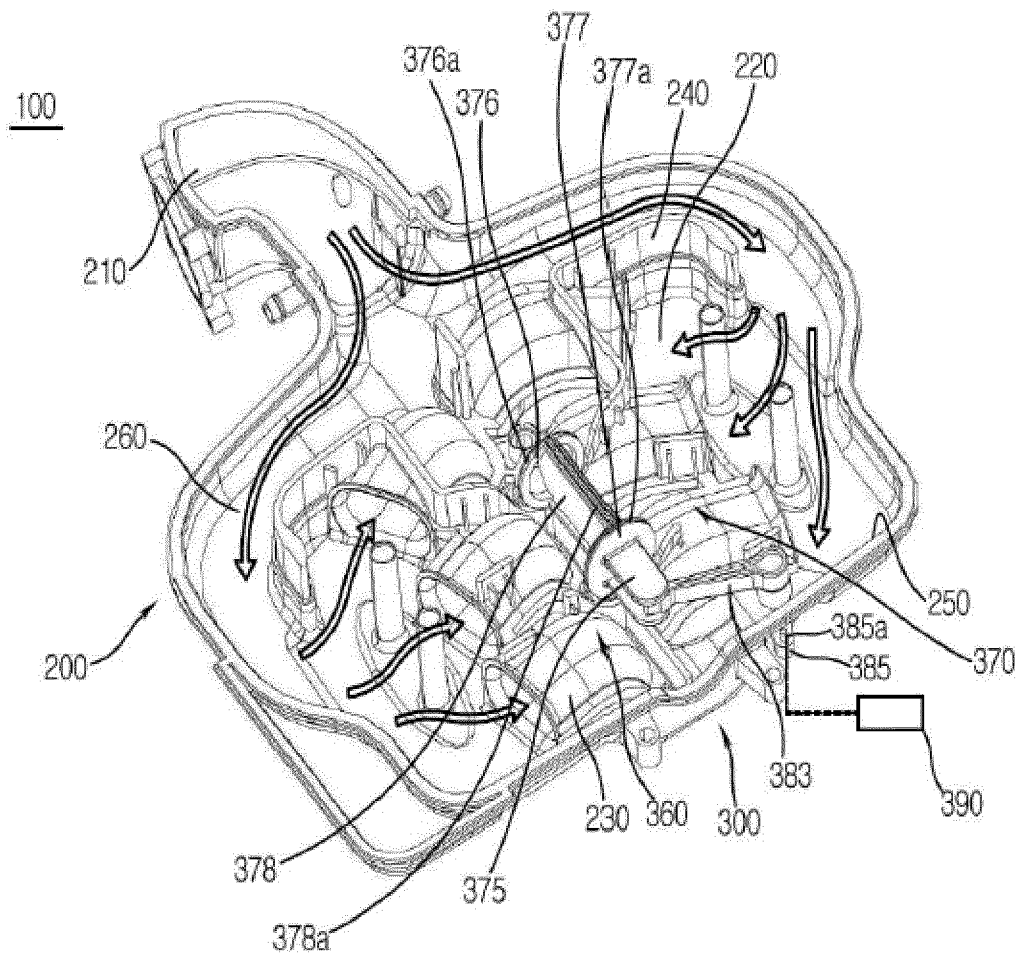


FIG. 4b

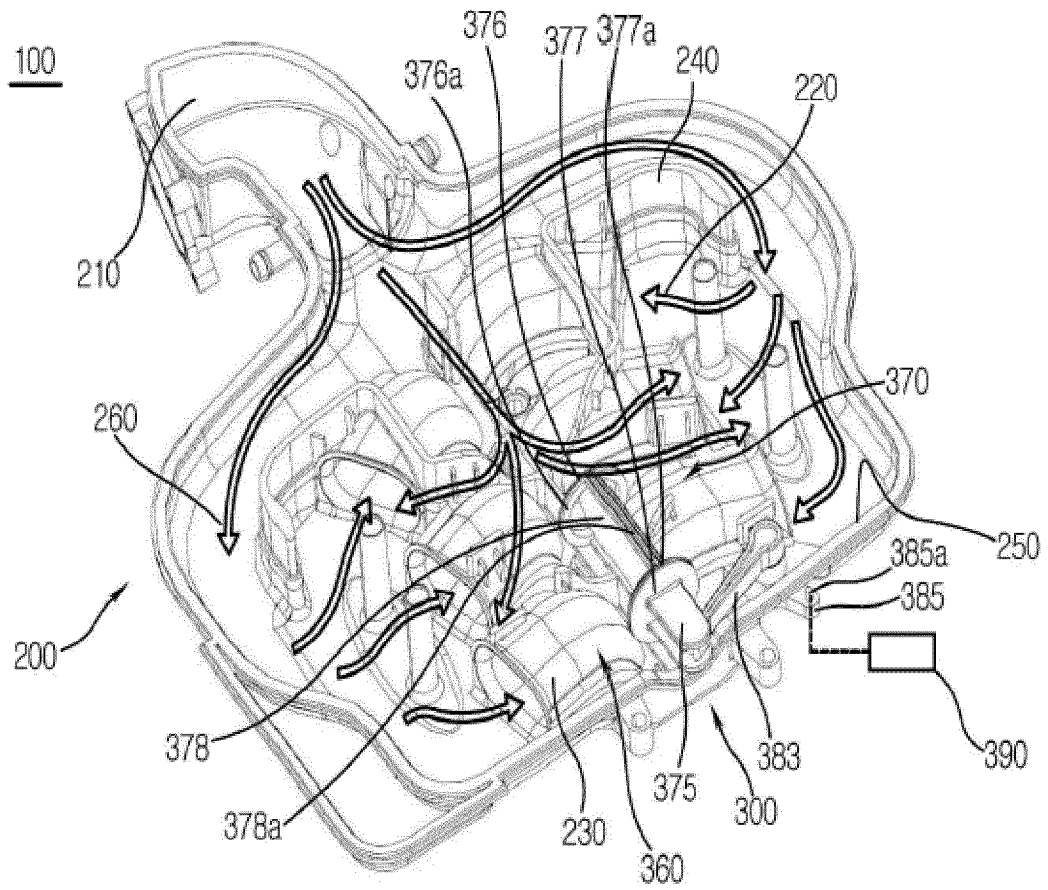


FIG. 5a

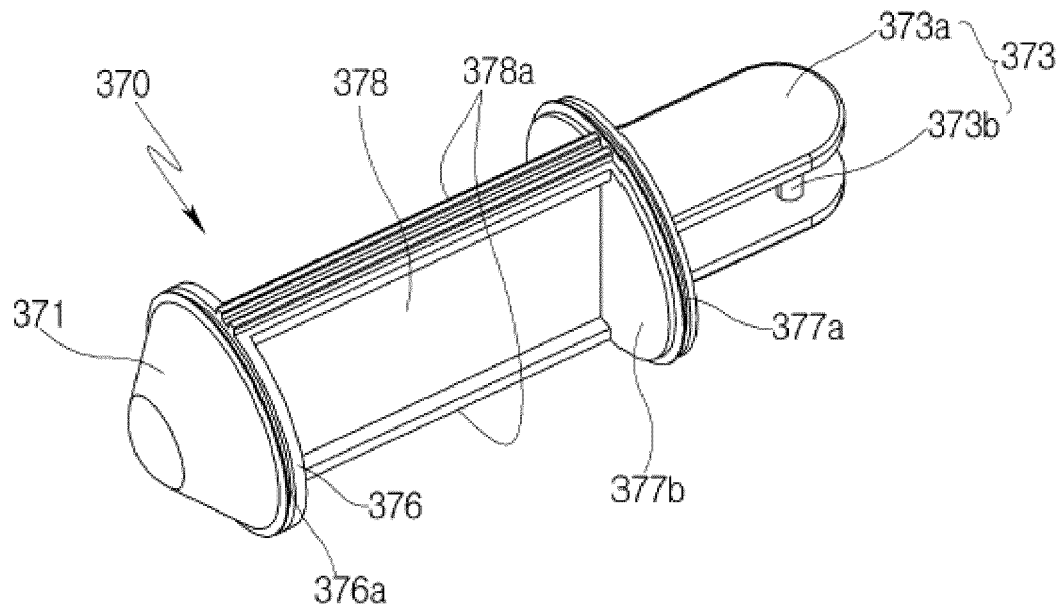


FIG. 5b

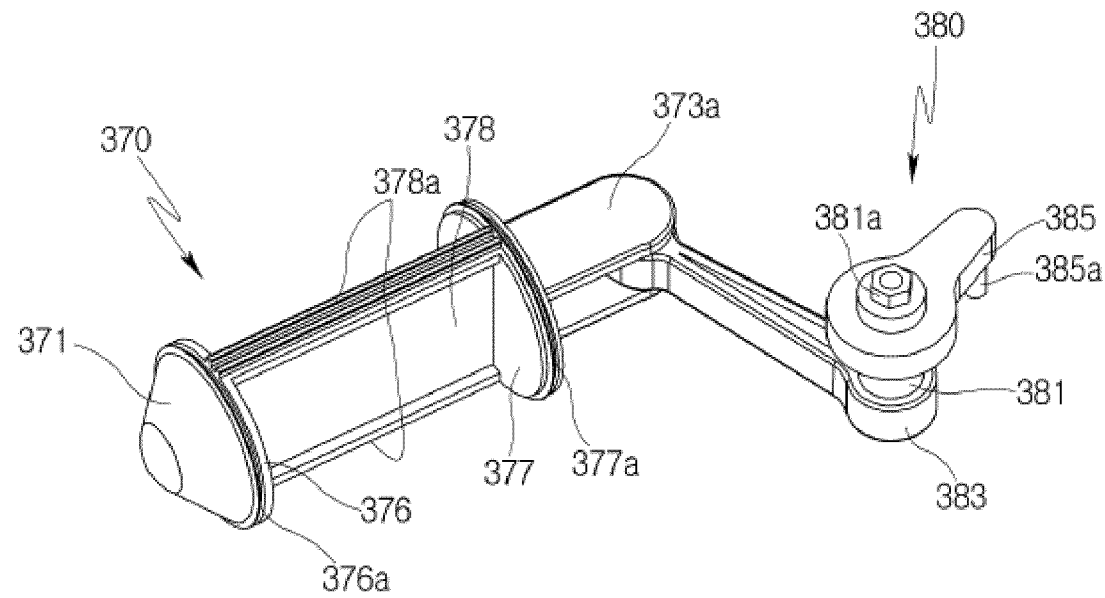


FIG. 6a

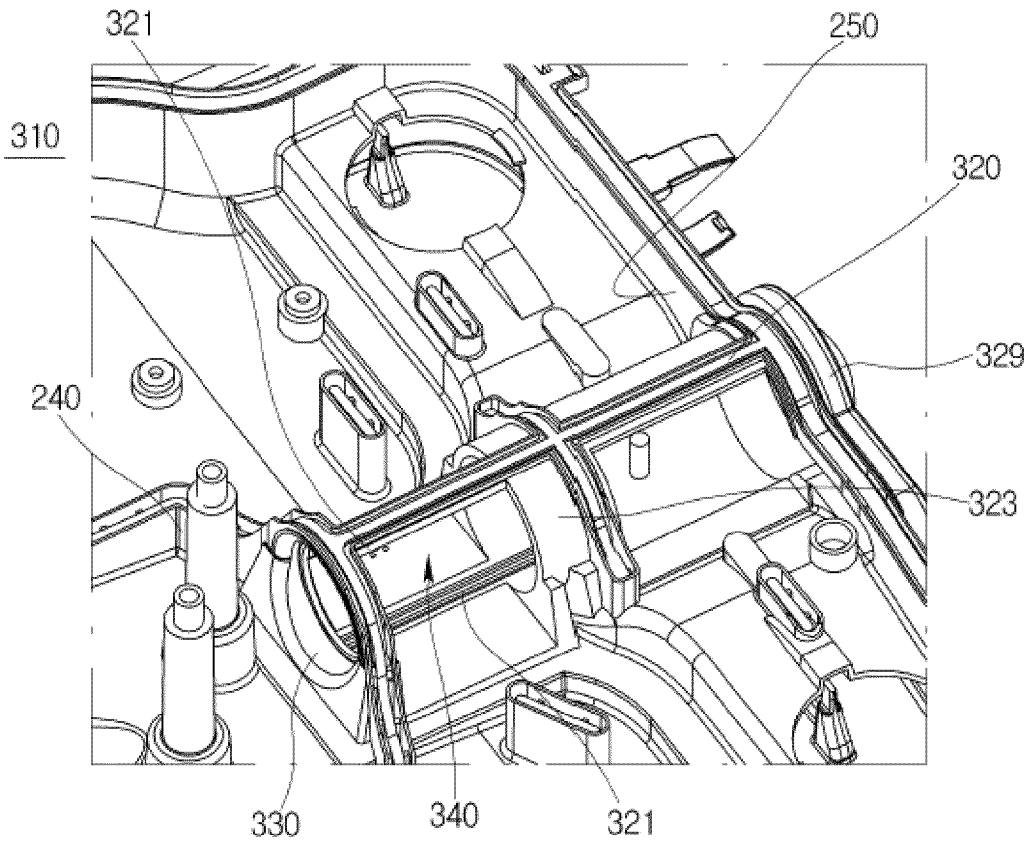
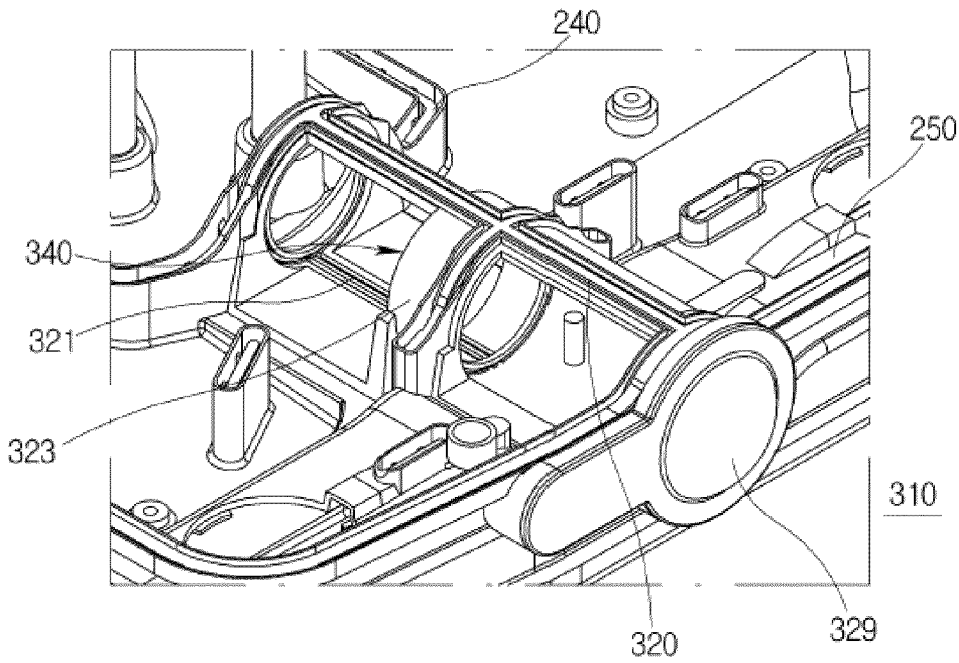


FIG. 6b



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/062008

A. CLASSIFICATION OF SUBJECT MATTER

INV. F02B27/02 F02D9/12 F02M35/10 F02M35/116
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F02B F02D F02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2007 060413 A1 (DAIMLER AG [DE]) 4 September 2008 (2008-09-04) cited in the application	1-5
Y	paragraphs [0001], [0003], [0016] - [0020]; figure 1	6
X	----- EP 0 255 059 A1 (BAYERISCHE MOTOREN WERKE AG [DE]) 3 February 1988 (1988-02-03)	1
Y	column 1, lines 32-37; figure 1 column 3	6
X	----- US 5 263 440 A (BODNAR LOUIS G [US] ET AL) 23 November 1993 (1993-11-23)	1
	column 2, line 1 - column 3, line 13; figures 1-3	
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

15 June 2018

Date of mailing of the international search report

21/08/2018

Name and mailing address of the ISA/

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Authorized officer

Karstens, Thede

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/062008

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 947 678 A2 (PORSCHE AG [DE]) 6 October 1999 (1999-10-06) paragraphs [0006] - [0008], [0011], [0023] - [0026]; figures 1, 5 -----	1
A	DE 37 28 179 A1 (OPEL ADAM AG [DE]) 9 March 1989 (1989-03-09) column 1, lines 64-68; figures 2, 5 column 2, lines 48-51 column 3, lines 21-26 -----	6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2018/062008

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-6

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/062008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102007060413 A1	04-09-2008	NONE	
EP 0255059 A1	03-02-1988	DE 3625756 A1 EP 0255059 A1 ES 2013746 B3	04-02-1988 03-02-1988 01-06-1990
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DE 3728179 A1	09-03-1989	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6

Shape

2. claims: 7-10

Sealing structure

3. claim: 11

Drive mechanism
