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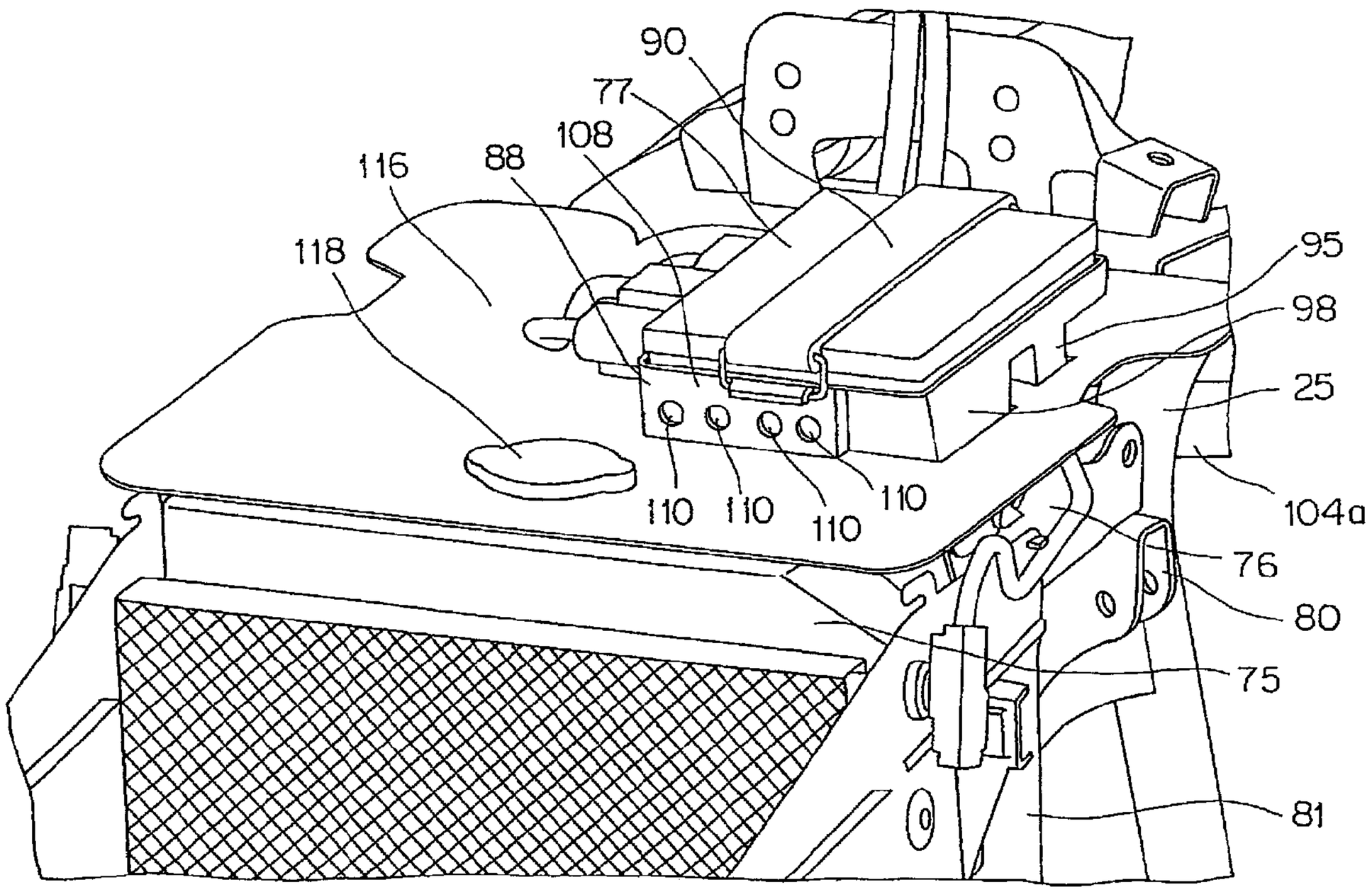
(54) Titre : VEHICULE A SELLE AVEC BLOC DE COMMANDE ELECTRONIQUE AU-DESSUS DU RADIATEUR
(54) Title: SADDLE-TYPE VEHICLE WITH ECU MOUNTED ABOVE THE RADIATOR



(57) Abrégé/Abstract:
To provide a saddle-riding type vehicle that allows an electronic control part, even if the electronic control part is disposed at a front part of the vehicle, to be less subjected to thermal effect from a radiator and a vehicle body cover structure not to become complicated. A saddle-riding type vehicle includes a radiator disposed forwardly of a steering shaft that steers a front wheel, the radiator being covered in a vehicle body cover. The vehicle further includes a holding member extending forwardly of the steering shaft of a vehicle body frame, formed separately from the vehicle body cover, and fixed on a frame supporting the radiator at a position rearward and upward of the radiator. The holding member supports an electronic control part. Further, the vehicle includes a heat shielding cover disposed between the radiator and the electronic control part in a side view. The heat shielding cover shields heat and exhaust heat of the radiator.

ABSTRACT OF THE DISCLOSURE

To provide a saddle-riding type vehicle that allows an electronic control part, even if the electronic control part is disposed at a front part of the vehicle, to be less subjected to thermal effect from a radiator and a vehicle body cover structure not to become complicated. A saddle-riding type vehicle includes a radiator disposed forwardly of a steering shaft that steers a front wheel, the radiator being covered in a vehicle body cover. The vehicle further includes a holding member extending forwardly of the steering shaft of a vehicle body frame, formed separately from the vehicle body cover, and fixed on a frame supporting the radiator at a position rearward and upward of the radiator. The holding member supports an electronic control part. Further, the vehicle includes a heat shielding cover disposed between the radiator and the electronic control part in a side view. The heat shielding cover shields heat and exhaust heat of the radiator.

SADDLE-TYPE VEHICLE WITH ECU MOUNTED ABOVE THE RADIATOR

FIELD OF THE INVENTION

The present invention relates to a saddle-riding type vehicle having a radiator disposed forwardly of a steering shaft that steers a front wheel.

BACKGROUND OF THE INVENTION

A known arrangement for an ATV vehicle (saddle-riding type vehicle) capable of running on rough terrain has a radiator disposed at a front part of the vehicle, so that an airflow that is produced as the vehicle runs can be used to cool the radiator (see, for example, Japanese Patent Laid-open No. Sho 63-13875).

When an ECU (electronic control part) for performing, for example, an FI control is to be mounted, a known saddle-riding type vehicle has the ECU disposed at a rear part of the vehicle.

If the ECU is to be disposed at the front of the vehicle, an arrangement should be made to ensure that the ECU is less subjected to thermal effect caused by heat generated by the radiator. The ECU, which generates heat itself, should also be efficiently cooled.

A known vehicle has the ECU disposed on a vehicle body cover. This, however, requires that a major change be made in the vehicle body cover. It is also necessary to install a lid for covering the ECU and take necessary steps for the heat generated by the ECU. All leads to a complicated structure.

The present invention has been made under the foregoing circumstances and it is an object of the present invention to provide a saddle-riding type vehicle that allows an electronic control part, even if the electronic control part is disposed at a front part of the vehicle, to be less subjected to thermal effect from a radiator and a vehicle body cover structure not to become complicated.

SUMMARY OF THE INVENTION

An aspect of the present invention provides a saddle-riding type vehicle including a radiator disposed forwardly of a steering shaft that steers a front wheel, the radiator being covered in a vehicle body cover. This saddle-riding type vehicle includes: a holding member extending forwardly of the steering shaft of a vehicle body frame, formed separately from the vehicle body cover, and fixed on a frame supporting the radiator at a position rearward and upward of the radiator, the holding member for supporting an electronic control part; and a heat shielding cover disposed between the radiator and the electronic control part in a side view, the heat shielding cover for shielding heat and exhaust heat of the radiator.

In accordance with the foregoing arrangements, the heat shielding cover shields the exhaust heat of the radiator, so that an exhaust draft can be prevented from being blown against the electronic control part.

Preferably, the holding member is formed into a box having an open upper portion for holding the electronic control part. The holding member may preferably include an intake portion disposed in a wall on a vehicle forward side, the intake portion for introducing an airflow generated as the vehicle runs from a vehicle forward direction, and an exhaust portion disposed at a position different from the intake portion. The holding member may also include a rib protruding upwardly formed on a bottom surface of the box.

In accordance with the foregoing arrangements, the electronic control part can be cooled with the airflow generated as the vehicle runs and introduced through the intake portion.

Further preferably, the rib extends from the intake portion toward the exhaust portion.

In accordance with the foregoing arrangement, the rib can be used for guiding airflow.

Further preferably, the exhaust portion is disposed at a side portion of the holding member and the airflow generated as the vehicle runs and introduced from the intake portion disposed at a vehicle forward position is discharged sideways of the vehicle.

In accordance with the foregoing arrangements, the airflow can be decelerated for a longer period of time of the air staying in the holding member by changing the direction of the airflow.

In the saddle-riding type vehicle according to the aspect of the present invention, the holding member extends forwardly of the steering shaft of the vehicle body frame and is formed separately from the vehicle body cover. Further, the holding member is fixed on the frame supporting the radiator at a position rearward and upward of the radiator. The holding member supports the electronic control part. Further, the heat shielding cover for shielding heat and exhaust heat of the radiator is disposed between the radiator and the electronic control part in a side view. The heat shielding cover shields the exhaust heat of the radiator, so that the exhaust draft can be prevented from being blown against the electronic control part. As a result, the electronic control part can be made to be less subjected to thermal effect from the radiator.

In addition, the holding member is formed into a box having the open upper portion for holding the electronic control part. The holding member includes the intake portion disposed in the wall on the vehicle forward side, the intake portion for introducing the airflow generated as the vehicle runs from the vehicle forward direction, and the exhaust portion disposed at a position different from the intake portion. The holding member further includes the rib protruding

upwardly formed on the bottom surface of the box. The airflow generated as the vehicle runs and introduced through the intake portion can therefore be directed to the bottom portion of the electronic control part, so that the electronic control part itself can be efficiently cooled.

Further, the rib extends from the intake portion toward the exhaust portion and can be used for guiding airflow. A flow rate of the airflow can be slowed inside the holding member and the airflow contacts the electronic control part for a longer period of time, so that the electronic control part can be efficiently cooled. Moreover, the rib helps smooth the airflow for a reduced likelihood of turbulence occurring in the airflow. This again ensures efficient cooling of the electronic control part.

Additionally, the exhaust portion is disposed at the side portion of the holding member and the airflow generated as the vehicle runs and introduced from the intake portion disposed at the vehicle forward position is discharged sideways of the vehicle. By changing the direction of the airflow, the airflow is decelerated for a longer period of time of the air staying in the holding member. This results in a longer period of time of heat exchange between the airflow and the electronic control part to achieve even more effective cooling of the electronic control part.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

FIG. 1 is a left side elevational view showing a saddle-riding type vehicle according to an embodiment of the present invention.

FIG. 2 is a perspective view showing a condition, in which an ECU is disposed at a front portion of a vehicle body.

FIG. 3 is a perspective view showing a condition, in which an ECU holding member is mounted at the front portion of the vehicle body.

FIG. 4 is a plan view showing the ECU holding member.

FIG. 5 is a side elevational view showing the ECU holding member.

FIG. 6 is a front view showing the ECU holding member.

FIG. 7 is a perspective view showing a condition, in which a heat shielding cover is mounted at a front portion of the vehicle body.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The best mode for carrying out the present invention will be described below with reference to the accompanying drawings. Throughout the descriptions given hereunder, "longitudinal," "crosswise," "vertical," and other directional expressions are relative to the direction viewed by the rider. The drawings should be viewed in the direction of reference numerals.

FIG. 1 is a side elevational view showing a saddle-riding type off-road vehicle according to an embodiment of the present invention.

A saddle-riding type off-road vehicle 10 (hereinafter referred to, simply, as "saddle-riding type vehicle 10") includes a vehicle body frame 11, an engine 12, a power transmission system 13, a front suspension 15, a rear suspension 16, and a steering system 21. Specifically, the engine 12 is mounted at a center lower portion of the vehicle body frame 11. The power transmission system 13 is connected to the engine 12 and mounted on the vehicle body frame 11. The front suspension 15 and the rear suspension 16 suspend left and right front wheels 17, 17 and left and right rear wheels 18, 18, respectively. The steering system 21 is connected to the front wheels 17, 17 and mounted on the vehicle body frame 11.

The vehicle body frame 11 includes a main frame 25, a front frame 26, a rear frame 27, a bracket 31, and a cross member 32. Specifically, the front frame 26 and the rear frame 27 are mounted at the front and rear of the main frame 25, respectively. The bracket 31 is mounted across the front frame 26 at a lower portion thereof. The cross member 32 is mounted across the front frame 26 at an

upper portion thereof. In FIG. 1, reference numeral 33 denotes a seat mounted on the main frame 25; reference numeral 34 denotes a fuel tank; reference numeral 35 denotes a front guard mounted on the front frame 26; reference numeral 36 denotes a front carrier mounted on the front frame 26; and reference numeral 37 denotes a rear carrier mounted at a rear portion of the main frame 25.

The front suspension 15 is an independent suspension for the left and right wheels. The front suspension 15 includes a pair of left and right front upper arms 40, 40, a pair of left and right front lower arms 41, 41, and a pair of front cushion units 42, 42. The front upper arms 40, 40 and the front lower arms 41, 41 are mounted vertically swingably on the vehicle body frame 11. The front cushion units 42, 42 are mounted across the front upper arms 40, 40 and the cross member 32.

The rear suspension 16 includes a rear cushion unit 44 mounted on the vehicle body frame 11.

The power transmission system 13 includes a transmission 47, a gear change pedal 48, a front drive shaft 51, a rear drive shaft 52, a front final reduction gear 53, and a rear final reduction gear 54. Specifically, the transmission 47 is connected to an output shaft of the engine 12. The front drive shaft 51 and the rear drive shaft 52 are connected to the front and rear of the transmission 47, respectively. The front final reduction gear 53 is connected to the front drive shaft 51 and mounted on a side of the vehicle body frame 11. The rear final reduction gear 54 is connected to the rear drive shaft 52.

The steering system 21 includes a steering shaft 56 (steering shaft) and a handlebar 57. Specifically, the steering shaft 56 is mounted at a front upper portion of the main frame 25 with a shaft holder 55. The handlebar 57 is attached to the steering shaft 56. In addition, a headlight 59 for illuminating the forward of the vehicle body is mounted forward of the handlebar 57. The headlight 59 is covered in a headlight cover 58.

In FIG. 1, reference numeral 61 denotes a front fender covering an area upward of the front wheels 17, 17; and reference numeral 62 denotes a rear fender covering an area upward of the rear wheels 18, 18.

The engine 12 is a four-cycle engine, including a cylinder block 63, a cylinder head 64, an exhaust system 65, and a throttle body 66. The cylinder head 64 is mounted on an upper portion of the cylinder block 63. The exhaust system 65 is connected to a front portion of the cylinder head 64. The throttle body 66 is mounted at a rear portion of the cylinder head 64. A valve actuating mechanism, a piston inserted movably in the cylinder block 63, and a crankshaft connected to the piston via a connecting rod are housed in the cylinder head 64.

Additionally, an underguard 73 covering a substantially entire underside of the vehicle body is disposed under the engine 12.

A radiator 75 for cooling the engine 12 is disposed forward of the steering shaft 56. The radiator 75 and the engine 12 are connected by an upper hose 104a and a lower hose 104b. Coolant is supplied to, and circulated through, the engine 12 via the upper hose 104a and the lower hose 104b. Note that the coolant is fed by a water pump (not shown) of the engine 12. Specifically, that part of the coolant with a high temperature flowing from the cylinder head 64 of the engine 12 toward an upper portion of the radiator 75 flows through the upper hose 104a, while that part of the coolant that has been cooled to flow from a lower portion of the radiator 75 toward the side of a crankcase flows through the lower hose 104b.

A pair of right and left frames 76 extending forwardly of the steering shaft 56 supports the radiator 75. An ECU 77 (electronic control part) is mounted on the frames 76 at a position rearward and upward of the radiator 75 in a side view. A battery 78 is mounted, on the other hand, at a rear portion of the vehicle body. The ECU 77 and the battery 78 are connected together by a harness (not shown). Power is thereby supplied to the ECU 77.

FIG. 2 is a perspective view showing a condition, in which the ECU 77 is disposed at the front portion of the vehicle body, as viewed from a left obliquely upward direction.

A cushion support portion 80 supporting an upper portion of the front cushion unit 42 (see FIG. 1) is disposed at the frame 76 forming part of the front frame 26. The front cushion unit 42 has a lower portion mounted on a down frame 81 (see FIG. 1) that forms part of the front frame 26.

The frame 76 has a front end portion to which an upper portion of a fan stay 84 for mounting a fan motor 82 cooling the radiator 75 is mounted with a bolt 86. The radiator 75 is disposed at a front side of the fan stay 84 and mounted on the down frame 81 (see FIG. 1) forming part of the front frame 26.

Referring to FIG. 2, the ECU 77 is mounted on the frame 76 via an ECU holding member 88 (holding member) formed separately from a vehicle body cover. More specifically, a rubber band 90 is mounted on an upper portion of the ECU holding member 88 so as to extend in a vehicle longitudinal direction and such that the ECU 77 is pressed against the upper portion of the ECU holding member 88 by elasticity of the rubber band 90.

FIG. 3 is a perspective view showing a condition, in which the ECU 77 shown in FIG. 2 is removed from the ECU holding member 88. Further, FIG. 4 is a plan view showing the ECU holding member 88; FIG. 5 is a side elevational view showing the ECU holding member 88; and FIG. 6 is a front view showing the ECU holding member 88.

The ECU holding member 88 is a one-piece molding of a resin material. Referring to FIGS. 3 and 4, the ECU holding member 88 has a substantially rectangular shape in a plan view. The ECU holding member 88 has an upper portion 88a that is formed into a box shape opening upwardly as shown in FIGS. 3 to 6. The upper portion 88a has a bottom surface formed into two sections: a left-hand-side bottom surface 102a and a right-hand-side bottom surface 102b. The left-hand-side bottom surface 102a is formed to be higher than the right-

hand-side bottom surface 102b. Referring now to FIG. 3, the upper hose 104a sending the coolant of the radiator 75 is routed on the underside of the left-hand-side bottom surface 102a. The left-hand-side bottom surface 102a is disposed at the higher level for this purpose.

In addition, the ECU 77 is mounted so as to be placed on an inward side of the box shape in alignment with the level of the left-hand-side bottom surface 102a.

The right-hand-side bottom surface 102b of the ECU holding member 88 includes a plurality of ribs 106 formed thereon to protrude upwardly. Each of the ribs 106 is formed to extend from an intake hole 110 formed in a front side wall portion 108 of the upper portion 88a of the ECU holding member 88 toward an exhaust hole 114 formed in a right side wall portion 112 of the upper portion 88a of the ECU holding member 88. This arrangement allows an airflow generated as the vehicle runs and taken in through the intake hole 110 at the front side of the vehicle body to be directed toward, and discharged from, the exhaust hole 114. The airflow taken in is also blown against a bottom of the ECU 77 to cool the ECU 77.

Note that, in FIG. 6, there is provided a plurality of round intake holes 110. The intake hole 110 may nonetheless be a rectangular hole, or a single slot elongated in a crosswise direction. Similarly, though there is one exhaust hole 114 provided according to the embodiment of the present invention, there may be a plurality of exhaust holes 114.

The intake holes 110 are formed at the front side, the exhaust hole 114 is formed in the right side wall portion 112, and the ribs 106 are used to discharge the airflow through the right-hand side. These arrangements are intended to achieve an efficient heat transfer between the heat of the ECU 77 and the airflow by temporarily slowing the flow rate of the airflow taken in so as to extend the period of time over which the airflow contacts the ECU 77. Further, the ribs 106 may be shaped into a mild curve to prevent turbulence from occurring as the airflow contacts the ribs 106.

The ribs 106 are integrally formed with the ECU holding member 88. Further, the ribs 106 are formed to be substantially as high as the left-hand-side bottom surface 102a such that upper ends of the ribs 106 support a right-hand-side bottom portion of the ECU 77. Note that not all ribs 106 are necessarily as high as the left-hand-side bottom surface 102a; rather, at least any one of the ribs 106 is as high as the left-hand-side bottom surface 102a to support the bottom portion of the ECU 77 with the left-hand-side bottom surface 102a.

Three mounting portions 94, 95, 96 are disposed on a bottom portion 88b of the ECU holding member 88. The mounting portions 94, 95, 96 protrude downwardly from a bottom surface 92 of the ECU holding member 88.

The mounting portion 94 disposed at the front left side of the ECU holding member 88 includes a mounting hole 94a formed in a side face thereof. The mounting hole 94a is aligned with a mounting hole (not shown) formed at a front side of the frame 76 and the mounting portion 94 is mounted using a grommet 98.

The mounting portion 95 disposed at the rear left side of the ECU holding member 88 includes a mounting hole 95a formed in a bottom surface protruding downwardly as shown in FIG. 4. The mounting portion 95 is attached with a bolt inserted in a mounting hole (not shown) disposed in a cross pipe 100 (see FIG. 3) that connects the right and left frames 76.

Further, the mounting portion 96 disposed at the rear right side of the ECU holding member 88 includes, like the mounting portion 95, a mounting hole 96a formed in a bottom surface thereof. The mounting portion 96 is attached with a bolt inserted in a mounting hole (not shown) disposed in the cross pipe 100 (see FIG. 3).

FIG. 7 is a perspective view showing a condition, in which a heat shielding cover 116 is mounted on the underside of the ECU 77.

As described earlier, the coolant with a high temperature as a result of absorbing heat from the cylinder head side flows through the upper hose 104a connected to the radiator 75. Further, the radiator 75 itself generates heat to cool the coolant. The heat shielding cover 116 protects the ECU 77 from heat of the foregoing kinds effectively.

The heat shielding cover 116 is formed from a resin or rubber material into a flat form having a substantially rectangular shape as shown in FIG. 7. The heat shielding cover 116 is disposed such that the front portion of the vehicle body is partitioned into an upper and lower half. After the heat shielding cover 116 is installed, a radiator cap 118 disposed at an upper portion of the radiator 75 is fitted and then the ECU holding member 88 is inserted from above. Note that the heat shielding cover 116 includes holes formed therein to have profiles of the radiator cap 118 and the ECU holding member 88, respectively, at positions at which the radiator cap 118 and the ECU holding member 88 are mounted.

The heat shielding cover 116 is adapted such that the ECU 77, the intake holes 110, and the exhaust hole 114 are disposed above the heat shielding cover 116 when the ECU holding member 88 and the ECU 77 are mounted in place. In addition, the upper hose 104a is disposed below the heat shielding cover 116. Through the foregoing arrangements, the heat shielding cover 116 shields both exhaust heat discharged from the radiator 75 and heat transferred from the upper hose 104a, thereby preventing heat from being transferred to an upper side of the heat shielding cover 116. The ECU 77 disposed on the upper side of the heat shielding cover 116 is thereby protected from thermal effect.

In addition, the heat shielding cover 116 is formed to be flat at a portion thereof forward of the ECU holding member 88. The heat shielding cover 116 thereby performs a function as an air guide plate guiding the airflow generated as the vehicle runs into the intake holes 110 in the ECU holding member 88.

The saddle-riding type vehicle according to the embodiment of the present invention includes the frames 76 extending forwardly of the steering shaft 56, the frames 76 having front ends for supporting the radiator 75. The vehicle further

includes the ECU holding member 88 disposed rearwardly and upwardly of the radiator 75, the ECU holding member 88 for holding the ECU 77. The vehicle additionally includes the heat shielding cover 116 between the radiator 75 and the ECU 77 in a side view, the heat shielding cover 116 for shielding the heat and exhaust heat from the radiator 75. This prevents an exhaust draft from being blown against the ECU 77. As a result, the ECU 77, even if disposed at the front portion of the vehicle body, can be less subjected to thermal effect from the radiator 75.

Additionally, the radiator 75 and the upper hose 104a are disposed below the heat shielding cover 116 and the ECU 77 is disposed above the heat shielding cover 116, so that the ECU 77 is less subjected to thermal effect also from the upper hose 104a.

In addition, the upper portion 88a of the ECU holding member 88 holding the ECU 77 is formed into a box shape opening upwardly. The intake holes 110 are formed in the front side wall portion 108 of the ECU holding member 88 to let the airflow generated as the vehicle runs flow in and the exhaust hole 114 is formed in the right side wall portion 112 different from the portion in which the intake holes 110 are formed. Further, the right-hand-side bottom surface 102b of the box shape includes the plurality of ribs 106 formed thereon to protrude upwardly. The ECU 77 is mounted so as to be placed on the upper portion 88a. The airflow introduced through the intake holes 110 is made to flow through a space between the ECU 77 and the right-hand-side bottom surface 102b of the ECU holding member 88. The airflow can therefore be blown against the bottom of the ECU 77 to cool the ECU 77 efficiently.

Moreover, the ribs 106 are adapted to extend from the intake holes 110 toward the exhaust hole 114, so that the ribs 106 can be used as the air guide plate guiding the airflow generated as the vehicle runs. This helps prevent turbulence from occurring in the airflow. This again enables efficient cooling of the electronic control part. The ribs 106 also function to enhance stiffness of the ECU holding member 88.

In addition, the exhaust hole 114 is disposed on a side of the ECU holding member 88, so that the airflow introduced from the intake holes 110 disposed at a forward portion of the vehicle can be discharged sideways the vehicle. By changing the direction of the airflow in this manner, the airflow is decelerated for a longer period of time of the air staying in the ECU holding member 88. This results in a longer period of time of heat exchange between the airflow and the ECU 77 to achieve even more effective cooling of the ECU 77.

The present invention has been described with reference to the preferred embodiment; however, the present invention is not limited to the disclosed embodiment, but also encompasses those changes falling within the spirit and scope of the appended claims.

In the embodiment of the present invention, the ribs 106 are formed integrally with the ECU holding member 88; however, the ribs 106 may be formed separately. If the ribs 106 are to be formed from an independent member, an elastic member having a vibration damping function may be used for the rib.

In addition, the right side wall portion 112 of the ECU holding member 88 includes the exhaust hole 114 formed therein for discharging the airflow. This is, however, not the only one possible arrangement. Specifically, in the embodiment of the present invention, the exhaust hole 114 is formed in the right side wall portion 112 of the ECU holding member 88 in order to circumvent the upper hose 104a routed on the left underside of the ECU holding member 88. The exhaust hole 114 may, instead, be formed in a left side wall portion by changing the position of routing the upper hose 104a. Alternatively, the exhaust hole 114 may be formed in both of the right and left side wall portions. In this case, the ribs 106 may be directed toward the exhaust holes 114 to ensure that no turbulence occurs, so that the airflow can be used to cool the ECU 77 efficiently.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A saddle-riding type vehicle including a radiator disposed forwardly of a steering shaft that steers a front wheel, the radiator being covered in a vehicle body cover, the vehicle comprising: a holding member extending forwardly of the steering shaft of a vehicle body frame, formed separately from the vehicle body cover, and fixed on a frame supporting the radiator at a position rearward and upward of the radiator, the holding member for supporting an electronic control part; and a heat shielding cover disposed between the radiator and the electronic control part in a side view, the heat shielding cover for shielding heat and exhaust heat of the radiator.

2. The saddle-riding type vehicle according to claim 1, wherein: the holding member is formed into a box having an open upper portion for holding the electronic control part; the holding member includes an intake portion disposed in a wall on a vehicle forward side, the intake portion for introducing an airflow generated as the vehicle runs from a vehicle forward direction, and an exhaust portion disposed at a position different from the intake portion; and the holding member further includes a rib protruding upwardly formed on a bottom surface of the box.

3. The saddle-riding type vehicle according to claim 2, wherein: the rib extends from the intake portion toward the exhaust portion.

4. The saddle-riding type vehicle according to claim 2 or 3, wherein: the exhaust portion is disposed at a side portion of the holding member and the airflow generated as the vehicle runs and introduced from the intake portion disposed at a vehicle forward position is discharged sideways of the vehicle.

FIG. 1

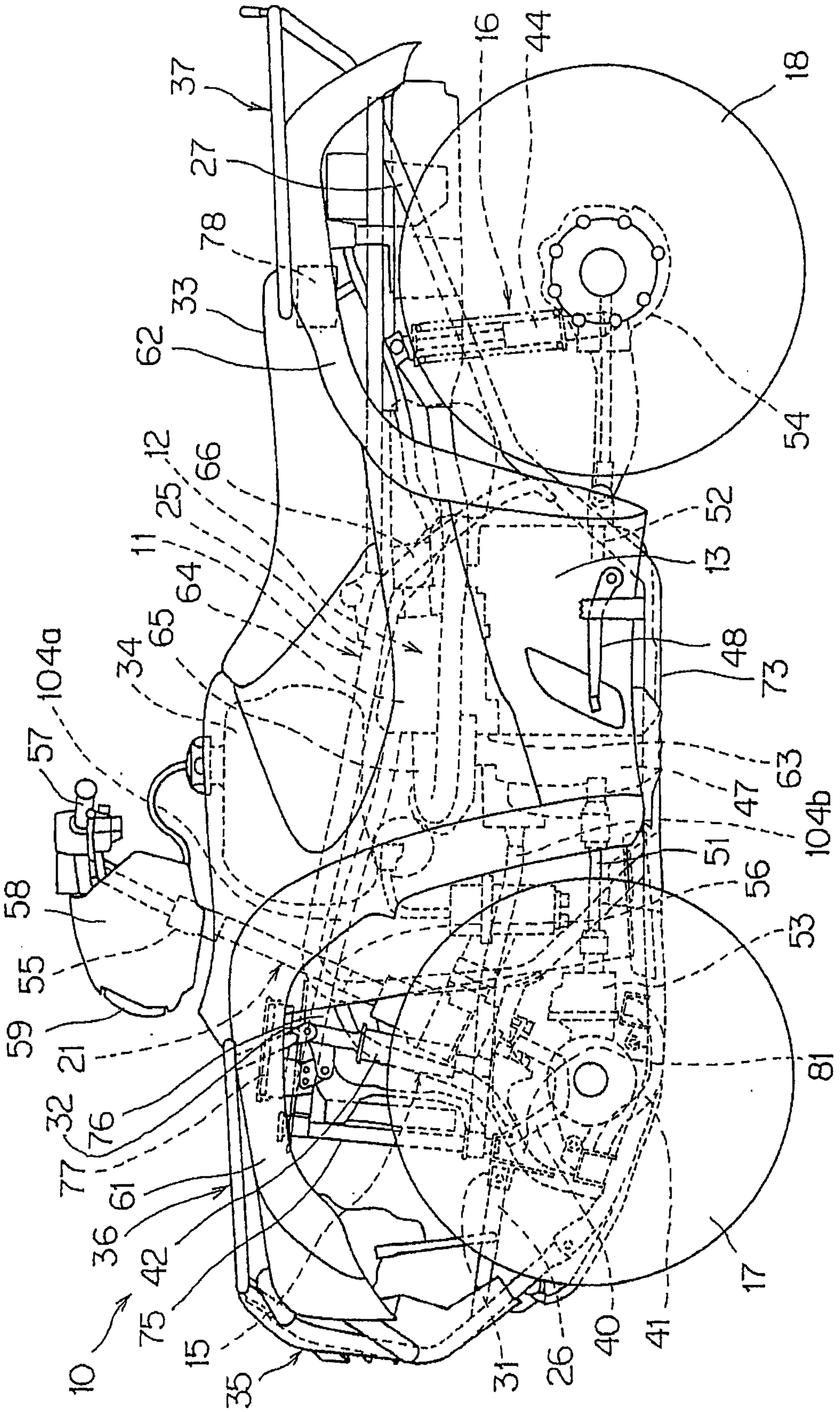

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FIG. 2

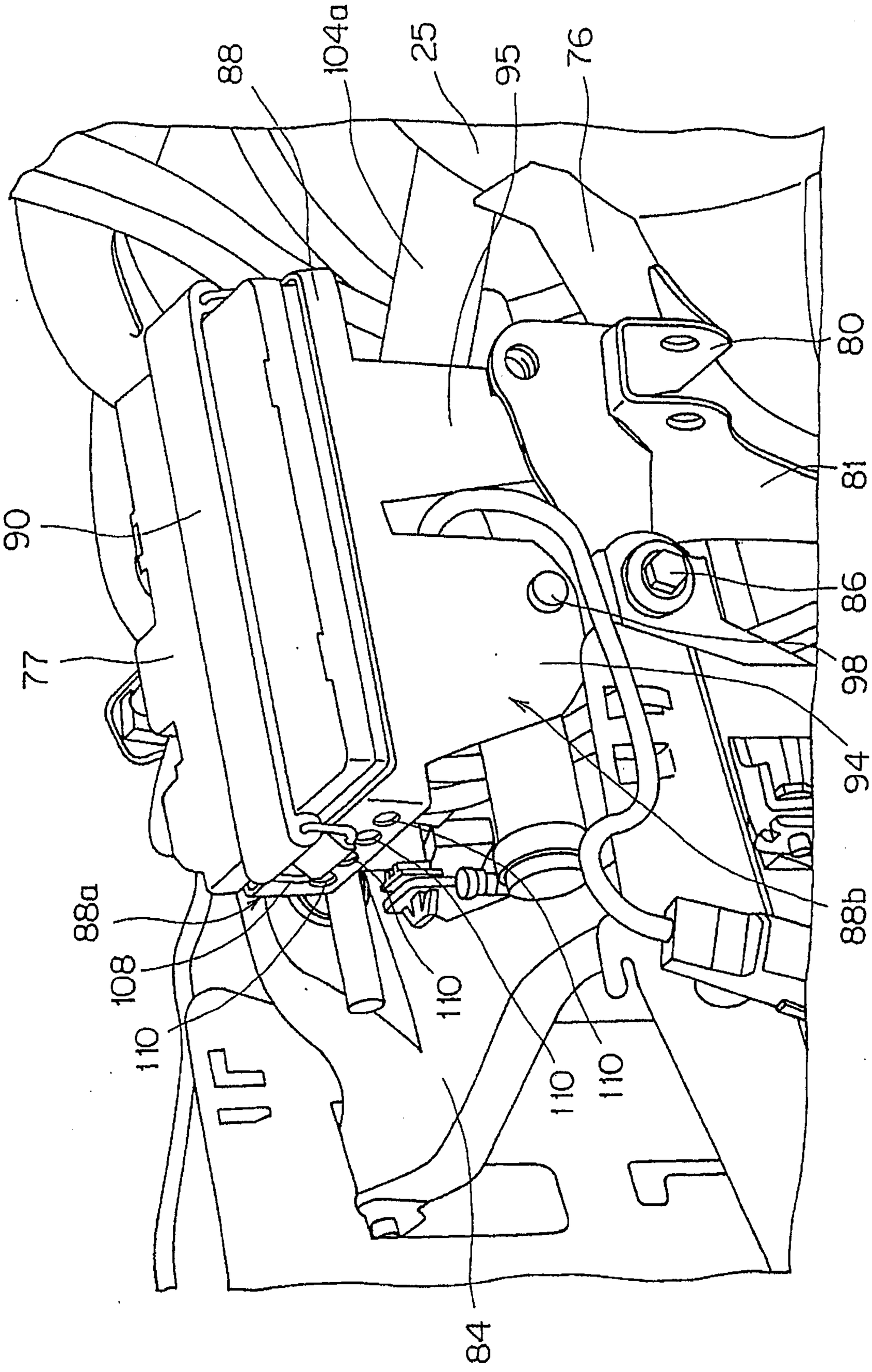

FIG. 3

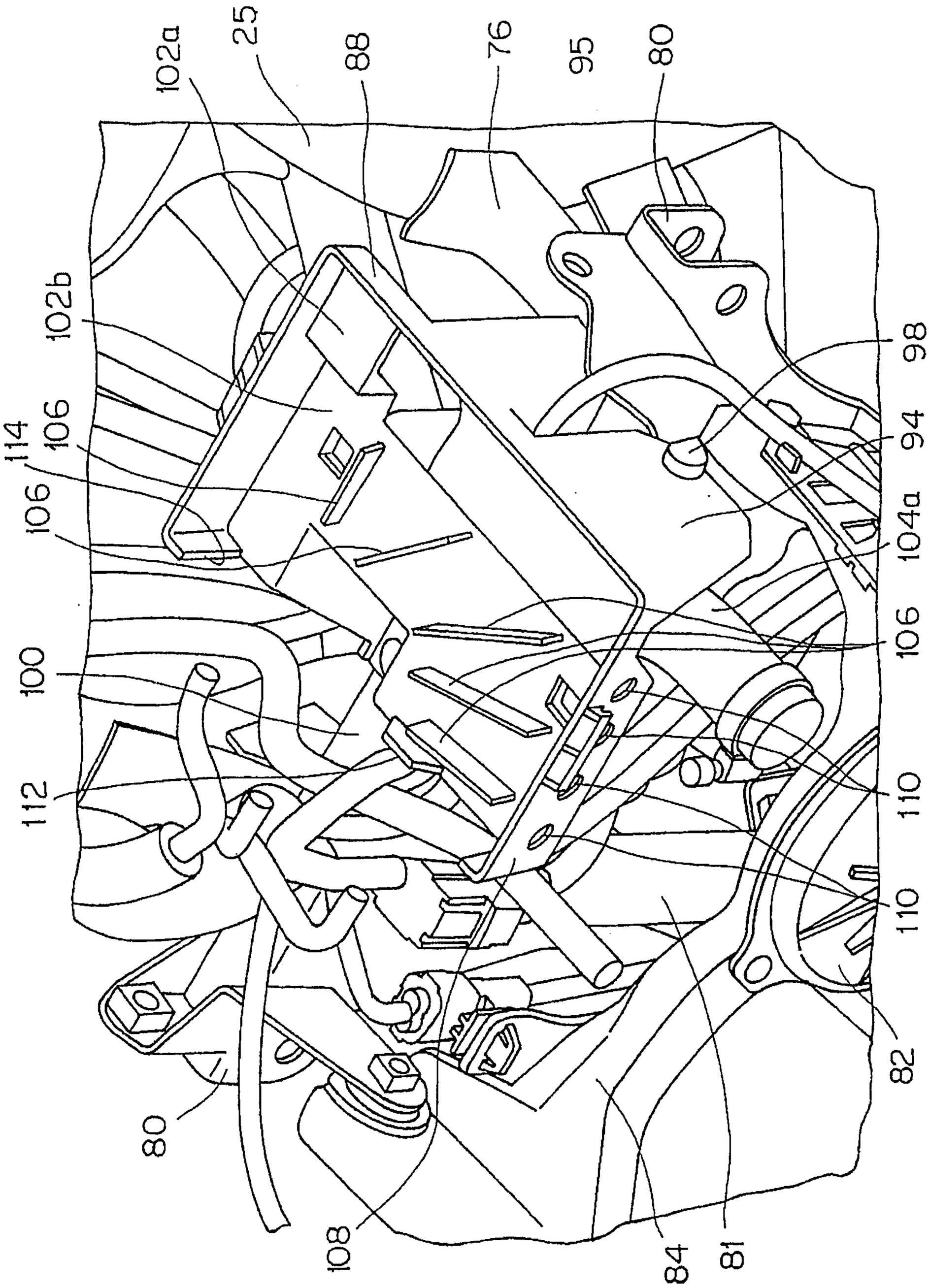
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FIG. 4

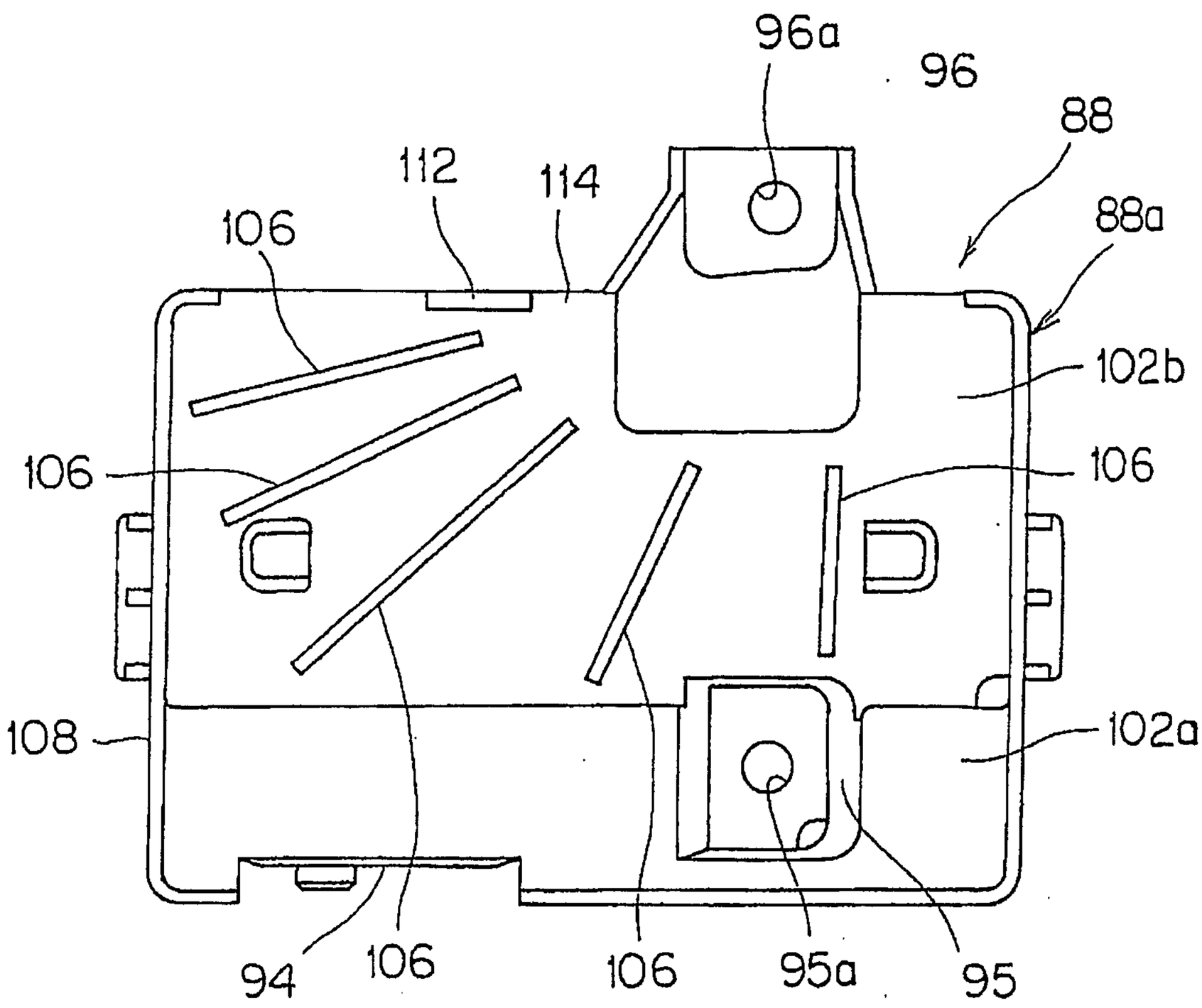


FIG. 5

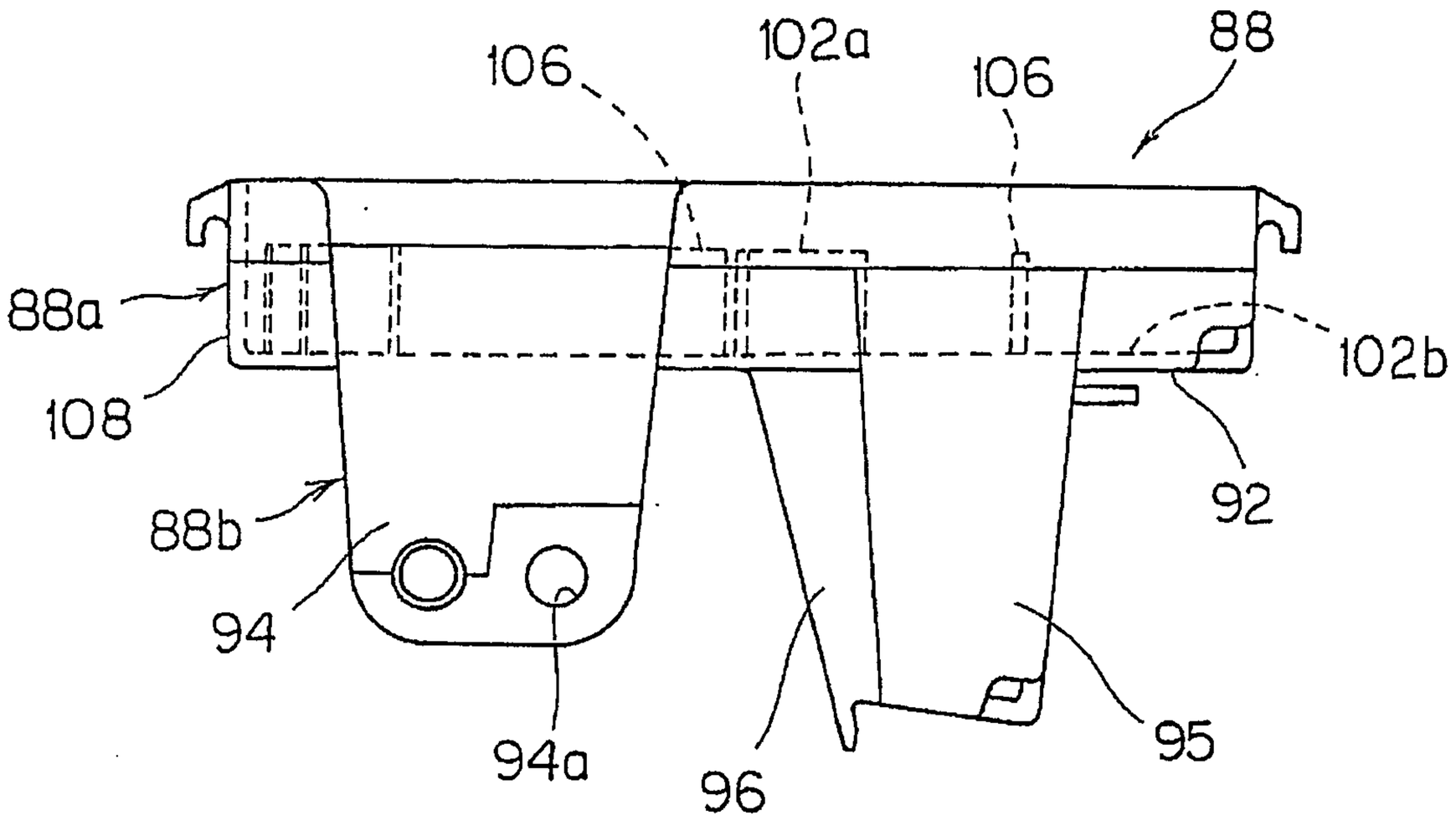


FIG. 6

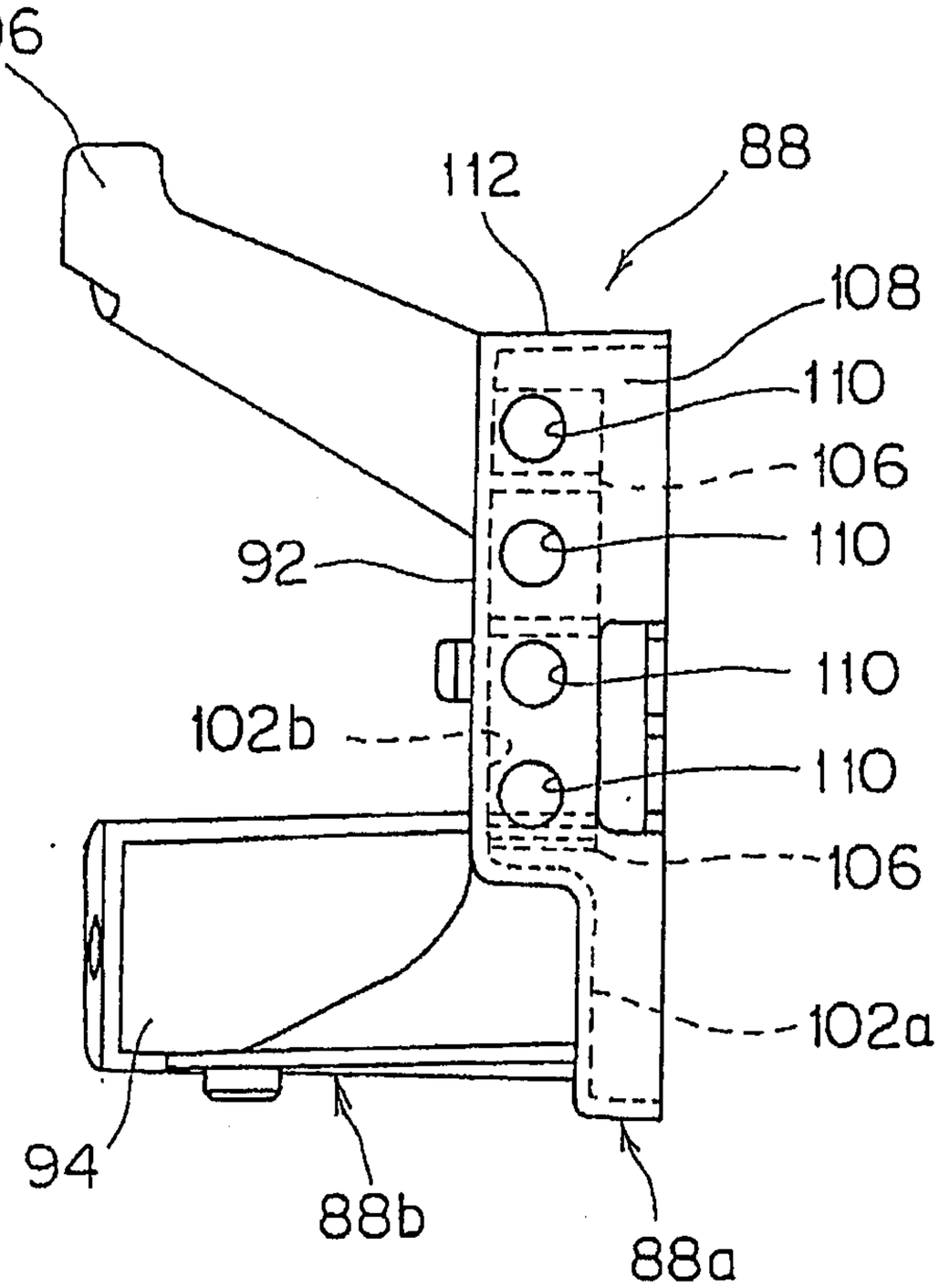
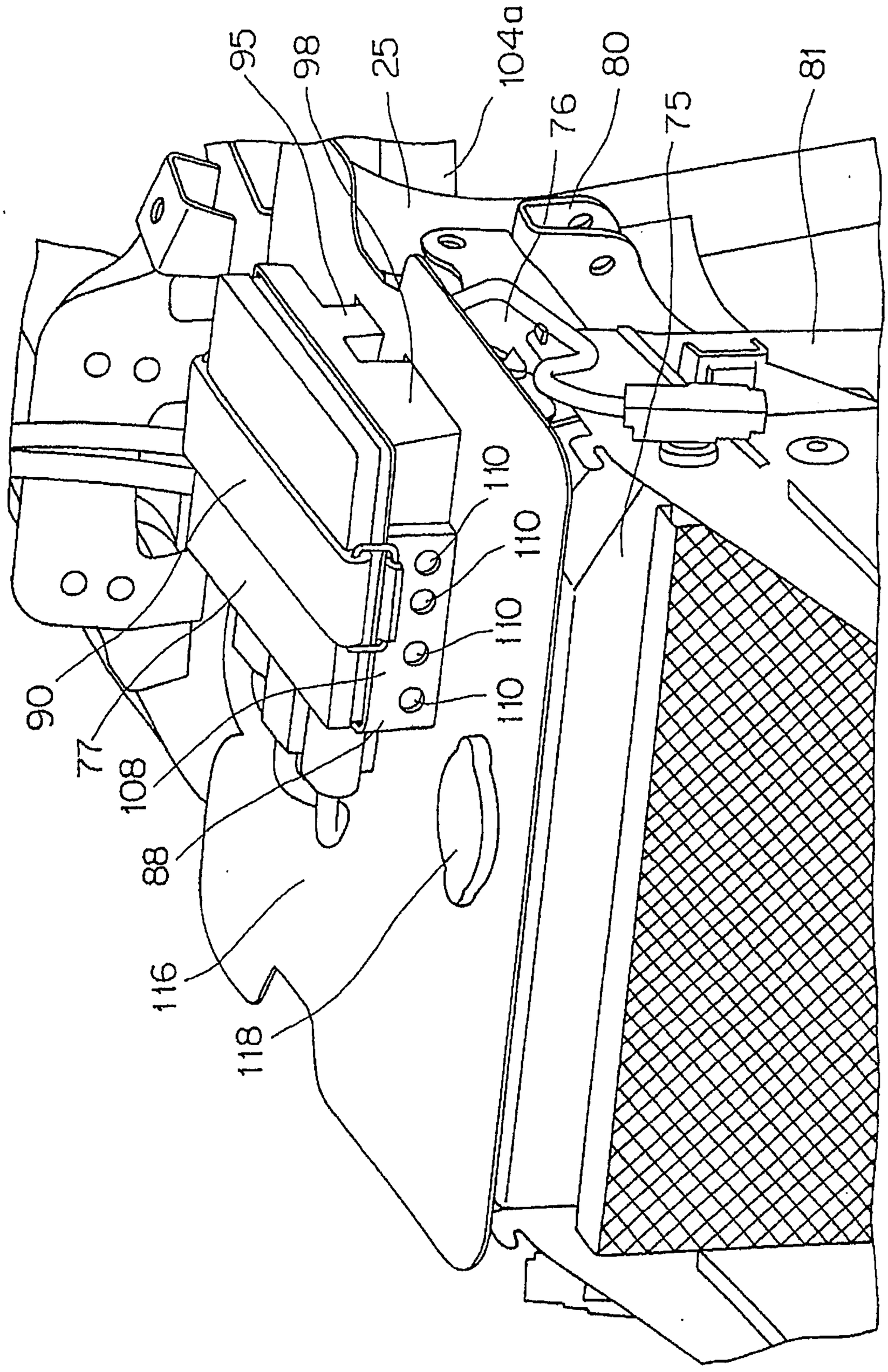
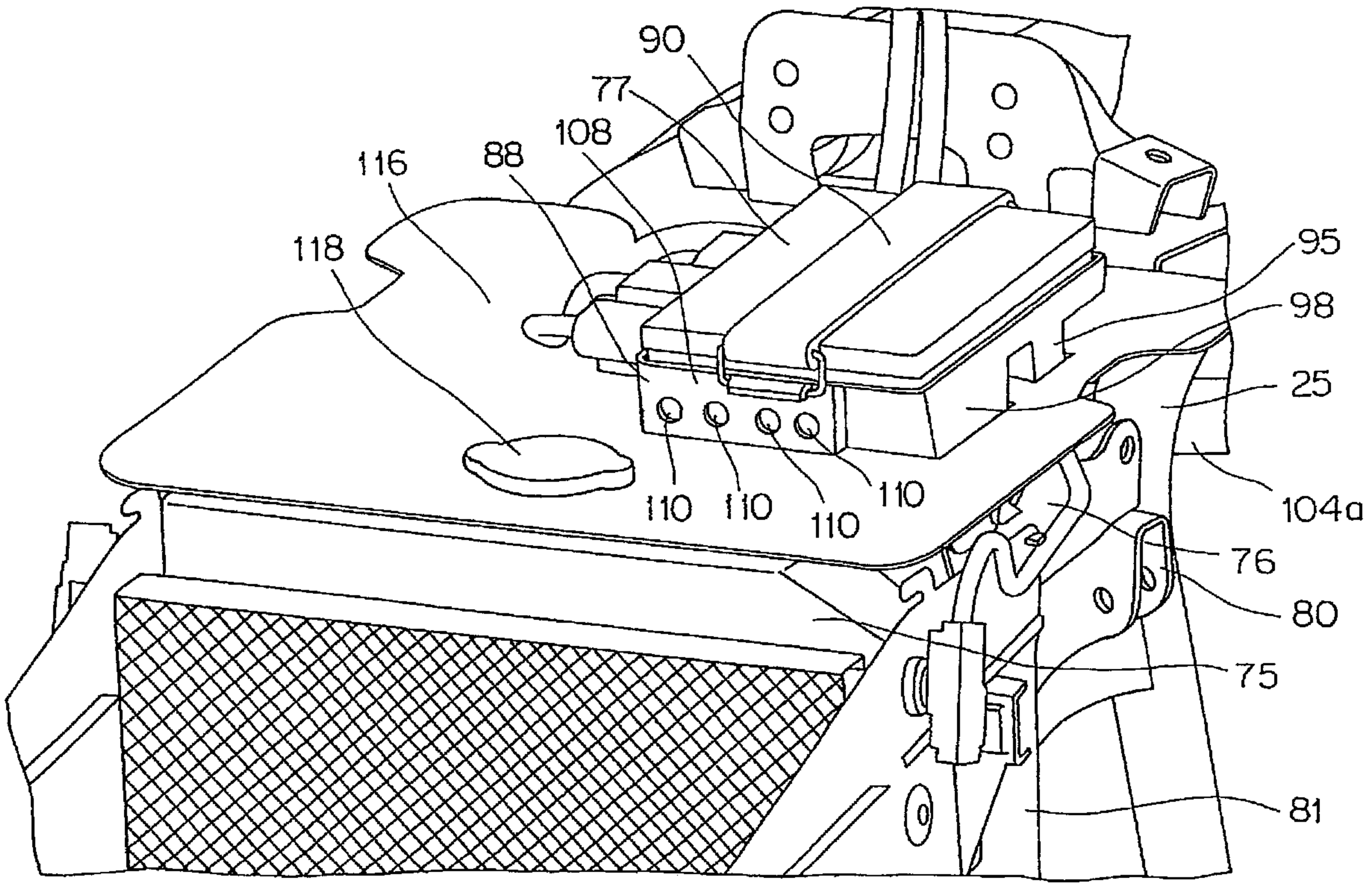


FIG. 7

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