

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This present invention relates to a fitting member, for example, for fixing and supporting a connector extending from a solenoid valve or the like of a variable capacity type compressor at a predetermined position.

2. Description of the Related Art

[0002] In a variable capacity type compressor including a solenoid valve which is controlled to switch on and off by external electric signals, for example, a connector on the solenoid valve side is attached to a mounting portion disposed on the outer surface of the compressor at a predetermined position so that the connector can be connected to an external controller. When the connector is attached to the mounting portion, a bracket is used as a fitting member.

[0003] The bracket is formed by bending a metal plate into a crank shape in cross-section, and a through hole is formed at the proximal end portion while the connector is fitted to the distal end portion of the bracket. The inner surface of the proximal end portion of this bracket and the inner surface of its center portion extending perpendicular to the inner surface of the proximal end portion are brought in contact with the mounting portion, a bolt is engaged in a female threaded hole of the mounting portion inserted through the through hole and so that the connector can be fixed to and supported by the mounting portion. Incidentally, the diameter of the through hole of the bracket is somewhat greater than the diameter of the male screw portion of the bolt so that the bolt can be easily inserted there-through.

[0004] In the bracket described above, only the two surfaces of the bracket, that is, the inner surface of its proximal end portion and the inner surface of its center portion, are brought into contact with the mounting portion, and the diameter of the through hole is greater than the diameter of the male screw portion of the bolt for easy assembly, so the bracket is likely to be undesirably displaced when the bolt is fastened. Therefore, when the bolt is fastened, the inner surface of the center portion comes off from the mounting portion and the bracket is likely to turn with the turning bolt to thereby create a positioning error from a predetermined position. As a result, the connector is fixed in many cases at a position apart from a desired positioning range. In addition, when the bolt is fastened while a connection terminal is sandwiched between the inner surface of the proximal end portion of the bracket and the head of the bolt, the connection terminal is also likely to turn with the turning bolt. Consequently, a connecting wire

extending from the connection terminal is likely to undergo disconnection.

SUMMARY OF THE INVENTION

[0005] In view of the problems of the prior art described above, the object of the present invention is to provide a fitting member capable of fixing and supporting a connector to a predetermined position by preventing a positioning error at the time of fitting.

[0006] Another object of the present invention is to provide a fitting member which can prevent damage of a connecting wire at the time of fastening of a bolt.

[0007] A fitting member to be supported by and fitted to a mounting portion having a threaded hole. According to the present invention, the fitting member comprises: a base portion having a bolt hole, the base portion being adapted to be rested against the mounting portion and secured to the mounting portion by a bolt extending through the bolt hole and engaged in the threaded hole. The fitting member further comprises at least two engagement portions formed integrally with the base portion so as to intersect a plane extending perpendicular to an axis of the bolt hole and coming into contact and engagement with the outer surface of the mounting portion in mutually different directions when the bolt is attached to the mounting portion.

[0008] According to this arrangement, at least two engagement portions restrict their mutual movements and prevent the positioning error of the fitting member at the time of fitting, so the connector can be fixed to and supported by the mounting portion at the predetermined position thereof.

[0009] Preferably, the base portion has a restriction member extending in a direction substantially parallel to the axis of the bolt hole and disposed in a surface of the base portion in the proximity of the bolt hole.

[0010] According to this arrangement, the restriction portion is disposed, so that when the ground terminal or the like is connected to the fitting member, the rotation of the ground terminal during the bolt fastening operation and disconnection of the wire can be prevented.

[0011] Preferably, the base portion and each of the engagement portions are integrally formed with each other by a metal sheet bent by substantially right angles at predetermined positions.

[0012] According to this arrangement, the weight of the fitting member can be reduced and the fitting member can be produced easily.

[0013] Preferably, the engagement portions have restriction surfaces simultaneously coming into surface contact with a portion of the mounting portion with the base portion in contact with another portion of the outer surface of the mounting portion when the engagement portion is attached to the mounting portion.

[0014] According to this arrangement, the positioning error of the fitting member to the mounting portion

can be reliably prevented without need for supporting the fitting member by fingers, etc, and the bolt fastening operation can be executed under the state where the fitting member is kept stable.

[0015] Preferably, a support portion capable of supporting a connector is integrally with at least one of the engagement portions.

[0016] According to this arrangement, the connector can be easily supported and fitted in the proximity of the mounting portion.

[0017] Preferably, the restriction member comprises a restriction protuberance integrally formed with the base portion to protrude therefrom.

[0018] This construction makes it possible to produce easily the fitting member having the restriction portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The present invention will become more apparent from the following description of the preferred embodiments, with reference to the accompanying drawings, in which:

Fig. 1 is a cross-sectional view showing a compressor;

Fig. 2 is a perspective view of the bracket attached to a housing of the compressor;

Fig. 3A is a front view of the bracket;

Fig. 3B is a plan view of the bracket of Fig. 3A;

Fig. 4A is a plan view showing the bracket with the bolt inserted into a bolt insertion hole of the bracket and a ground terminal loosely fitted thereto;

Fig. 4B is a plan view of the bracket with the ground terminal engaged with the restriction protuberance;

Fig. 5A is a perspective view showing another form of the bracket;

Fig. 5B is a perspective view of the bracket of Fig. 5A; and

Fig. 6 is a perspective view showing still another form of the bracket.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The embodiment of the present invention will be explained with reference to the drawings, in which a fitting member is embodied as one attaching a connector for an external regulating valve in a variable capacity type compressor for a car air conditioner.

[0021] As shown in Fig. 1, a compressor 11 is shown, in which a solenoid valve 13 as an external regulating valve is controlled to switch on and off by electric signals delivered from a control unit 12 outside the compressor 11, so that the change in the capacity of the compressor 11 is controlled.

[0022] That is, a communication passage 16 is defined in the compressor 11 so as to extend through a

cylinder block 17, a rear housing 18 and a valve plate 19 for communicating a discharge chamber 14 with a crank chamber 15. The solenoid valve 13 described above is arranged at an intermediate position in this communication passage 16 in such a manner that it is incorporated in the rear housing 18, and is electrically connected to the control unit 12 through a connector 51, which is described later.

[0023] In the variable capacity type compressor 11 in this embodiment, when the solenoid valve 13 is controlled to switch on and off by the electric signals from the control unit 12 in accordance with any change in the cooling load, the pressure inside the crank chamber 15 is changed appropriately. Consequently, the angle of inclination of a swash plate 20 increases and decreases based on the pressure change in the crank chamber 15, thereby changing a reciprocating stroke of a piston 10. As a result, the discharge capacity is variably controlled.

[0024] On the other hand, a angular mounting portion 41 is so formed as to swell out from the outer surface of the rear housing 18 of the compressor 11, as shown in Fig. 2. A female threaded hole 41a is provided in the upper surface of the corner of this mounting portion 41, and a bracket 42 as a fitting member is attached to this corner by a bolt 43.

[0025] As shown in Figs. 2 to 4B, the bracket 42 is formed by bending one metal plate having a predetermined shape (a substantial L-shape in this embodiment) at a plurality of positions (three positions in this embodiment). In other words, the bracket 42 has a proximal end portion or base portion 44 having a bolt hole 44a formed therein for inserting the shaft portion of the bolt 43 and a center portion 45 functioning as an engagement portion is bent at right angles downward at one side edge of the base portion 44. A support portion 46 is bent at right angles upward at the distal end of the center portion 45. The base portion 44, the center portion 45 and the support portion 46 together define a crank shape in cross-section. A hold portion 47, that functions also as an engagement portion, is bent at right angles downward at the other side edge of the base portion 44 in such a fashion that the hold portion 47 is positioned on a plane which is perpendicular to planes on which the base portion 44 and the center portion 45 exist, respectively.

[0026] When the bracket 42 is attached to the mounting portion 41, the inner surface of each of the base portion 44, the center portion 45 and the hold portion 47 engages with the upper surface and with its two side surfaces of the mounting portion 41. When the bolt 43 is meshed, the base portion 44, the center portion 45 and the hold portion 47 restrict mutually their movements, so that their inner surfaces function as restriction surfaces to prevent positioning errors of the bracket 42 at the time of fastening of the bolt 43.

[0027] As shown in Fig. 2, two wires 50a and 50b branch and extend from the distal end of a bundled wire 49, the proximal end of which is connected to the sole-

noid valve 13 of the compressor 11. The cylindrical connector 51 is connected to the distal end of one wire 50a of these wires 50a and 50b, and a disk-like ground terminal 52 having a round hole at the center thereof is connected to the distal end of the other wire 50b. The peripheral surface of the connector 51 is joined to and supported by the distal edge of the support portion 46 and a wire, not shown, extending from the control unit 12 is connected to the connector 51 at this position.

[0028] The ground terminal 52 is set so that the diameter of its round hole is greater than the diameter of the shaft portion of the bolt 43, and this shaft portion of the bolt 43 can be passed into the round hole under the loose fitting state. The ground terminal 52, when fitted, is interposed between the upper surface of the base portion 44 and the head of the bolt 43, and its proximal end 52a can engage with the restriction protuberances 48 as a restrictive portion.

[0029] As shown in Figs. 3A and 3B, the restriction protuberance 48 is so formed in a columnar shape as to protrude from the upper surface of the base portion 44 in the proximity of the bolt hole 44a. As shown in Figs. 4A and 4B, the side surface of the proximal end 52a of the ground terminal 52 engages with the peripheral surface of the restriction protuberance 48 when the bolt 43 is meshed while the ground terminal 52 is interposed. In this way, the ground terminal 52 is prevented from turning with the turning bolt 43.

[0030] Now, in order to attach the bracket 42 to the mounting portion 41, the bracket 42 is first positioned to the corner of the mounting portion 41 with the connector 51 mounted to the distal end of the support portion 46 of the bracket 42. Next, the shaft portion of the bolt 43 with the loosely fitted ground terminal 52 is inserted through the bolt hole 44a of the base portion 44 of the bracket 42, and the bolt 43 is engaged with the female threaded hole 41a of the mounting portion 41.

[0031] When the bolt 43 is threadably engaged, the bracket 42 is likely to rotate with the turning bolt 43. In this embodiment, however, the inner surface of each of the base portion 44, the center portion 45 and the hold portion 47 engages with each surface of the corner of the mounting portion 41, and they restrict their movements with one another, with the result that undesirable displacement of the bracket 42 is prevented.

[0032] In addition, when the bolt 43 is threaded to a certain extent as shown in Fig. 4A, the ground terminal 52, is also likely to turn due to its contact with the bolt 43. As shown in Fig. 4B, however, the side surface of the proximal end 52a of the ground terminal 52 engages with the peripheral surface of the restriction protuberance 48 when the ground terminal 52 turns. For this reason, the ground terminal 52 is restricted from turning further by the engagement with the restriction protuberance 48, while the bolt 43 is as such turned and is fastened to the mounting portion 41. In consequence, the bracket 42 can be fixed.

[0033] The effects brought forth by the embodiment

described above are listed below.

(1) In the bracket 42 of this embodiment, the three inner side surfaces of the base portion 44, the center portion 45 and the hold portion 47 come into contact and engage with the mating surfaces of the angular mounting portion 41 in three directions. Therefore, the inner surfaces restrict their movements with one another when the bolt 43 is fastened. Consequently, the bracket 42 is positioned in position so that, its turning with the turning bolt 43 can be prevented and the connector 51 joined to the distal edge of the support portion 46 can be fixed to and supported by the portion near the mounting portion 41.

(2) In the bracket 42 of this embodiment, the restriction protuberance 48 is disposed on the upper surface of the base portion 44. When the ground terminal 52 is about to turn with the turning bolt 43, the restriction protuberance 48 restricts turning of the ground terminal 52. Therefore, breakage of the wire 50b due to turning of the ground terminal at the time of fastening the bolt can be prevented.

(3) In the bracket 42 of this embodiment, the base portion 44, the center portion 45 and the hold portion 47 are formed integrally with each other by bending one metal plate. Therefore, the weight of the bracket 42 can be reduced, and the bracket 42 can be produced easily.

(4) In the bracket 42 of this embodiment, the inner surfaces of the base portion 44, the center portion 45 and the hold portion 47 simultaneously come into surface-contact and engage with the outer surfaces of the corner of the mounting portion 41 in such a manner as to embrace them. Therefore, the inner surfaces function as the restriction surfaces for restricting their mutual movements, and can reliably prevent positioning error of the bracket 42 with respect to the mounting portion 41. Because the bracket 42 need not be supported by fingers or the like, the bolt fastening operation can be executed under the stable holding state.

(5) In the bracket 42 of this embodiment, the support portion 46 is bent and formed at the distal side edge of the center portion 45, and is integrated with the base portion 44, the center portion 45 and the hold portion 47. Therefore, the connector 51 can be supported and fixed easily near the mounting portion 41.

(6) In the bracket 42 of this embodiment, the restriction protuberance 48 is so formed as to protrude in a columnar shape. Therefore, the side surface of the proximal end 52a of the ground terminal 52 can be reliably engaged with the peripheral surface of this restriction protuberance 48, and turning of the ground terminal 52 at the time of fastening the bolt 43 can be restricted easily and reliably.

(7) In the bracket 42 of this embodiment, the restric-

tion protuberance 48 is to be formed as to protrude in the proximity of the insertion hole 44a and is positioned within the turning range of the ground terminal 52. Therefore, the restriction protuberance 48 can be reliably engaged with the ground terminal 52.

(8) The bracket 42 of this embodiment is used for fixing and supporting the connector 51, that is used for electrically connecting the solenoid valve of the compressor 11 of the car to the control unit 12, to a predetermined position of the outer surface of the compressor 11. Therefore, when the bracket 42 is fitted inside the engine room, this bracket eliminates need for supporting it by fingers or the like, when the bolt fastening operation is carried out at the mounting portion 41 that does not generally have a sufficient space. Therefore, the fitting operation becomes easier and the fitting operation time can be shortened.

[0034] Incidentally, the embodiment given above can be modified in the following manner.

[0035] For example, the hold portion 47 may be bent at the side edge of the base portion 44, opposite to the side edge of the base portion 44 at which the center portion 45 exists, in the same direction as the center portion 45, as shown in Fig. 5A, so that the bracket 42 formed in this way may straddle the mounting portion 41 and be fixed thereto.

[0036] Alternatively, in the bracket 42 having the same construction as described above, a second hold portion 54 as a further engagement portion is further bent and formed at the side edge of the base portion 44 opposite the side edge of the base portion 44 at which the center portion 45 exists, as shown in Fig. 5B. The bracket 42 may be thus fitted to the mounting portion 41 by engaging the four inner surfaces, of the base portion 44, the center portion 45, the hold portion 47 and the second hold portion 54 with the mounting portion 41.

[0037] The bracket 42 obtained by changing the position of the hold portion 47 or adding the second hold portion 54 can obtain the same effects (1) to (8) of the embodiment given above. In the case of the bracket 42 including three engagement portions by adding the second hold portion 54, the engagement portions mutually restrict more reliably their movements. Therefore, the positioning error of the bracket 42 can be prevented more reliably and more effectively.

[0038] The hold portion 47 is not particularly limited to the one that has the same area as that of the base portion 44 or the center portion 45. For example, it may be a small hold pawl 55 so formed as to protrude from one of the side edges of the base portion 44, as shown in Fig. 6. This construction too, can obtain the effect of positioning error prevention of the bracket 42, and its construction is much more simplified than the embodiment given above. Since the material cost can thus be reduced, the production cost can be decreased.

[0039] The restriction portion is not particularly limited to the exemplified restriction protuberance 48. For example, it may be formed of a columnar pin fitted or welded to the base portion 44, or may be formed by cutting out and bending a part of the metal plate (a part of the base portion 44).

[0040] The bracket 42 as the fitting member is not particularly limited to the fitting member for the connector for the external regulating value in the compressor 11, but may be a fitting member for fixing a connector extending from a fuel regulator of a vehicle, for example, to a predetermined position.

[0041] The bracket 42 may be modified into a construction in which the support portion 46 and the connector 51 are omitted and only the ground terminal 52 is provided to, it to a predetermined position of the mounting portion 41.

Claims

1. A fitting member to be supported by and fixed to a mounting portion having a threaded hole, said fitting member comprising:

a base portion having a bolt hole, said base portion being adapted to be rested against said mounting portion and secured to said mounting portion by a bolt extending through said bolt hole and engaged in said threaded hole; and at least two engagement portions formed integrally with said base portion so as to intersect a plane extending perpendicular to an axis of said bolt hole and coming into contact and engagement with said outer surface of said mounting portion in mutually different directions when said fitting member is attached to said mounting portion.

2. A fitting member according to claim 1, wherein said base portion has a restriction member extending in a direction substantially parallel to the axis of said bolt hole and disposed in a surface of said base portion in the proximity of said bolt hole.

3. A fitting member according to claim 1, wherein said base portion and each of said engagement portions are integrally formed with each other by a metal sheet bent by substantially right angles at predetermined positions.

4. A fitting member according to claim 1, wherein said engagement portions have restriction surfaces simultaneously coming into surface contact with a portion of the outer surface of said mounting portion with said base portion in contact with another portion of the outer surface of said mounting portion when said fitting member attached to said mounting portion.

5. A fitting member according to claim 1, further comprising a support portion capable of supporting a connector integrally formed with at least one of said engagement portions.

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6. A fitting member according to claim 2, wherein said restriction member comprises a restriction protuberance integrally formed with the base portion to protrude therefrom.

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Fig. 1

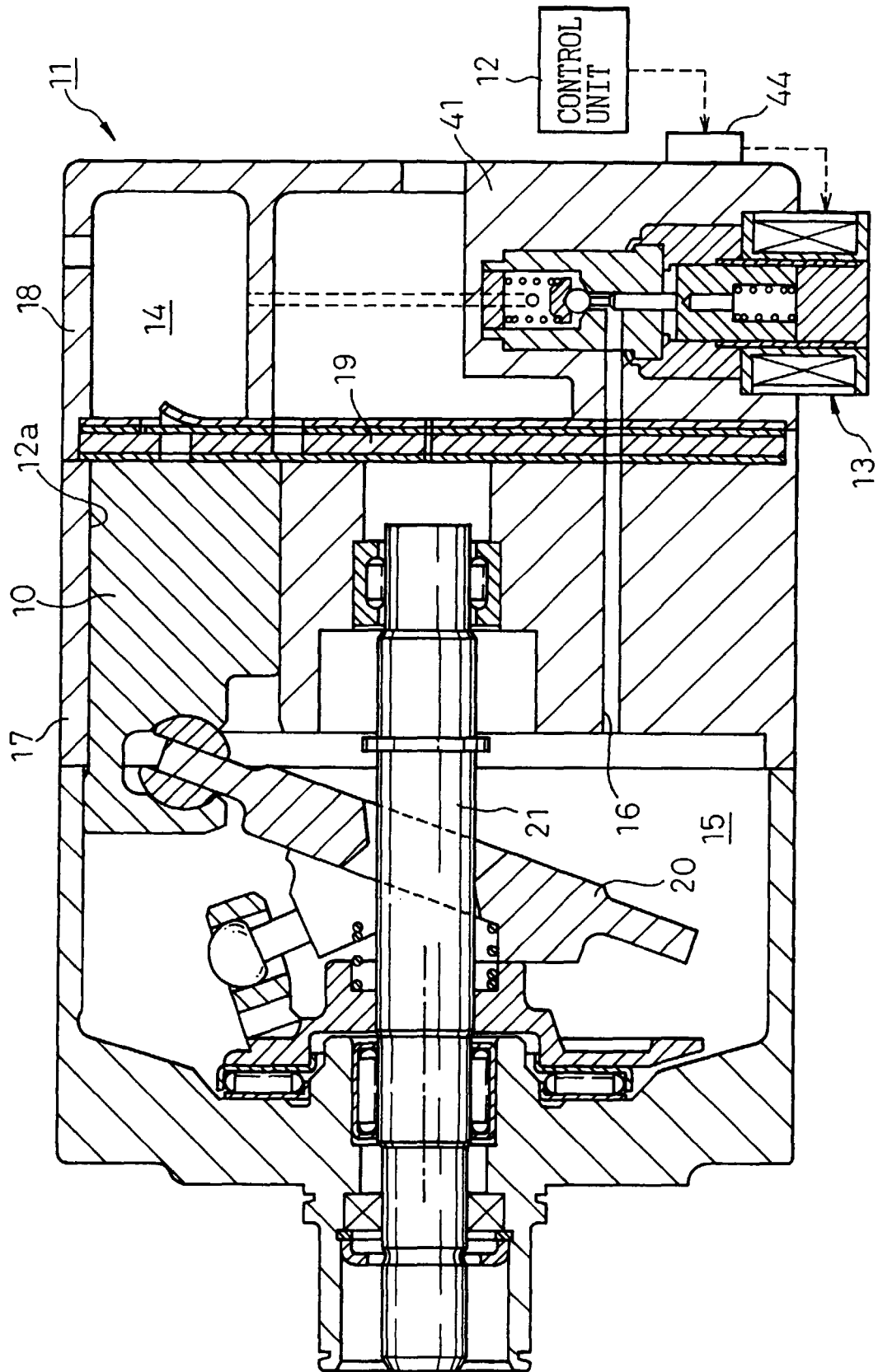


Fig.2

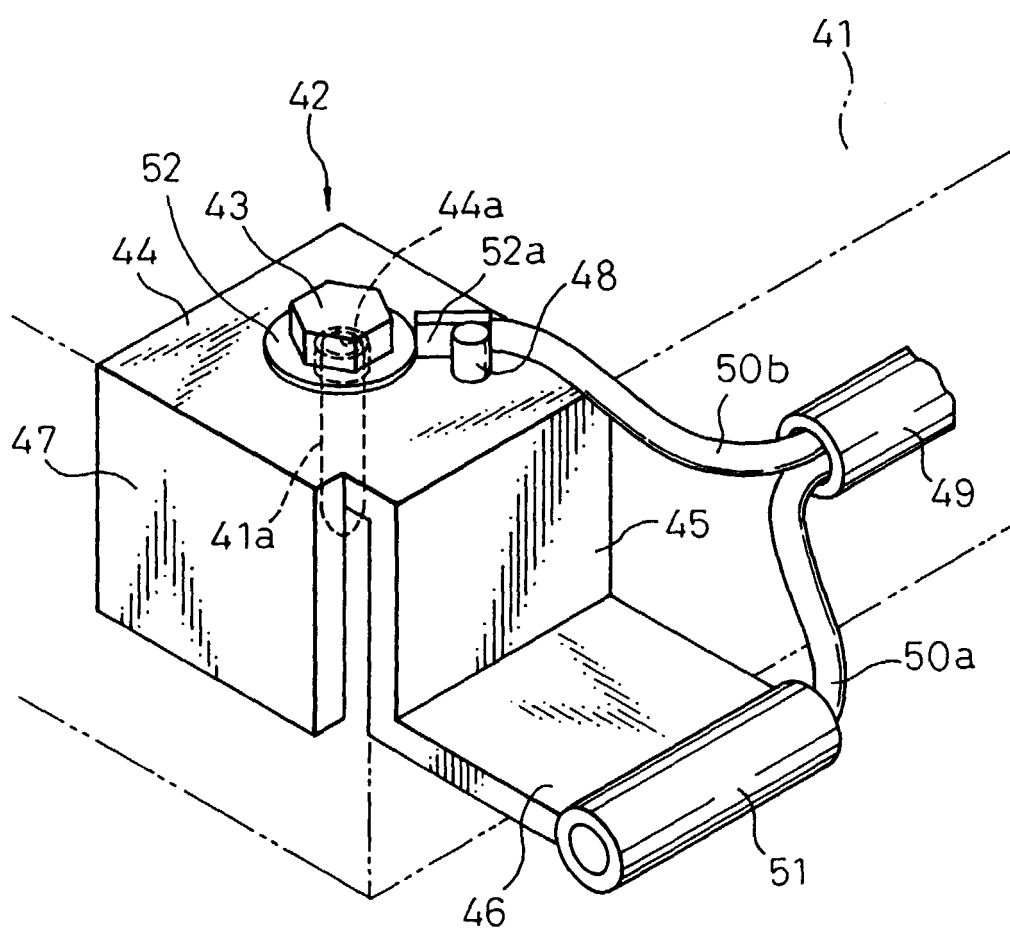


Fig.3A

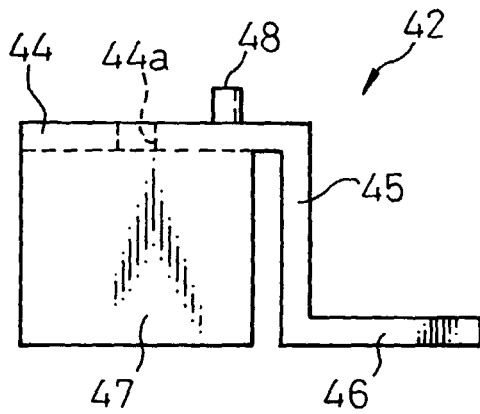


Fig.3B

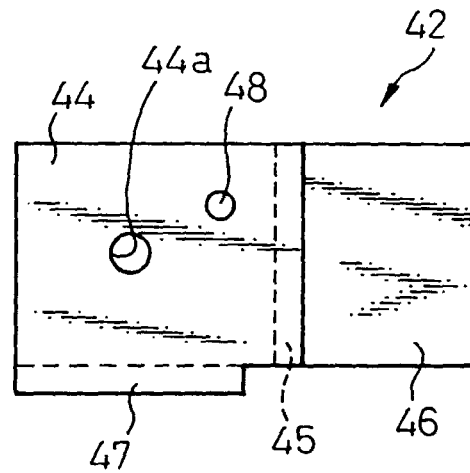


Fig.4A

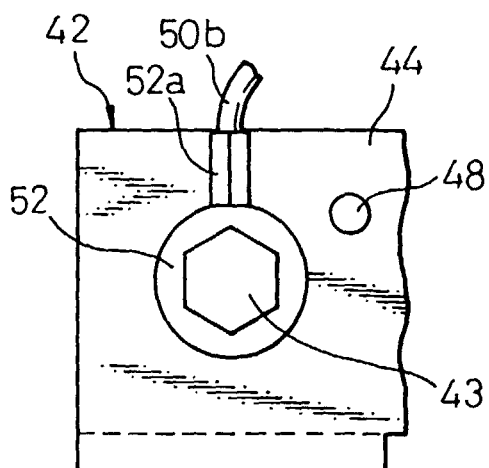


Fig.4B

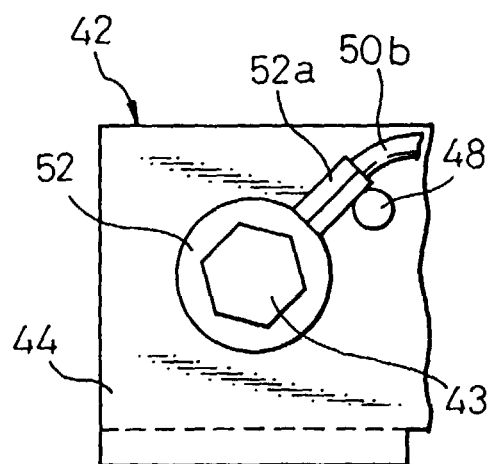


Fig. 5A

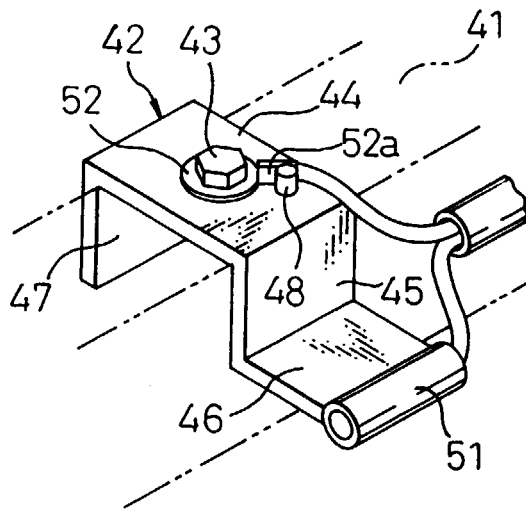


Fig. 5B

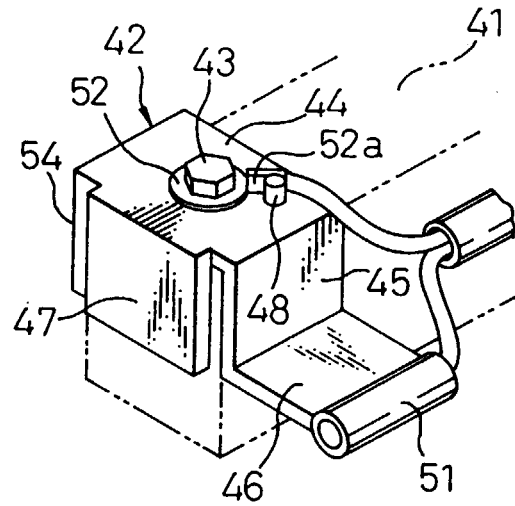


Fig. 6

