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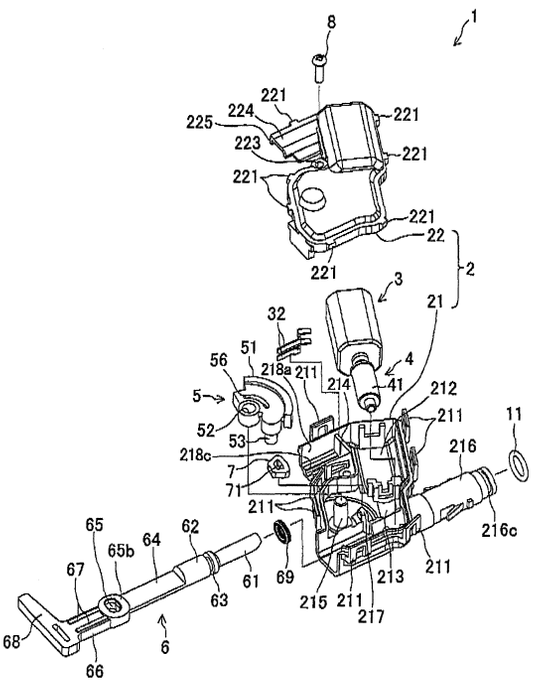
(54) Lid lock apparatus for vehicle

(57) A lid lock apparatus for a vehicle includes a housing (2) including a first body (21) and a second body (22), a drive motor (3), a drive force transmitting mechanism (4, 5), a shaft member (6), one end of the shaft member being engageable with a lid member (91), and a connector holding portion (12) holding an external connector (M). The connector holding portion (12) includes an engagement portion (218a, 218b, 218c), a recess portion (219), and a cover portion (224). The engagement portion (218a, 218b, 218c) includes a bottom wall portion (218c), a first lateral wall portion (218a), and a second lateral wall portion (218b) integrally formed at the first body (21). The recess portion (219) is formed at one of the first lateral wall portion (218a) and the second lateral wall portion (218b). The cover member (224) is integrally formed at the second body (22).

FIG. 1



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Description

FIELD OF THE INVENTION

[0001] This invention relates to a lid lock apparatus for a vehicle,

BACKGROUND

[0002] A known lid lock apparatus for a vehicle is disclosed in JP3079611B. According to the lid lock apparatus disclosed, a shaft member is configured to project from a housing by means of a spring force to engage with a lid member provided at a vehicle body, thereby locking the lid member in a closed state. Then, an electric motor provided within the housing is operated to rotate a worm wheel so that the shaft member moves against the spring force and disengages from the lid member. As a result, the lid member is brought to open.

[0003] According to the aforementioned lid lock apparatus, a connector engagement portion is formed at the housing. A connector terminal connected to the electric motor is attached within the connector engagement portion. The connector terminal is mounted on a terminal fitting portion formed at the connector engagement portion. An external connector is connected to the connector engagement portion so that an electric power is supplied to the electric motor via the external connector.

[0004] Generally, the housing of the lid lock apparatus is constituted by two members (i.e., two housing members) engaging with each other. The aforementioned connector engagement portion is thus formed at either one of the housing members. Therefore, in the process of mounting the connector terminal within the connector engagement portion, four sides of the terminal fitting portion are surrounded by walls of the connector engagement portion. The assembly process of the connector terminal is complicated due to interference of the walls of the connector engagement portion. That is, the assembly process of the connector terminal in one direction is impossible. Further, visibility of the terminal fitting portion is poor. It is complicated for a finger of an operator to reach the connector engagement portion, which leads to a poor mounting ability of the connector terminal.

[0005] In response to the aforementioned issue, it is considered to divide the connector engagement portion into two portions by means of the two housing members. Then, the terminal fitting portion is provided at one of the housing members. The housing members are engageable witch each other after the connector terminal is mounted on the terminal fitting portion. At a time the connector terminal is mounted on the terminal fitting portion, a surrounding of the terminal fitting portion is not completely closed and therefore the mounting performance of the connector terminal is improved.

[0006] However, in a case where the connector engagement portion is formed by the two housing members, horizontal and vertical dimensions of the connector engagement portion are determined on the basis of portions of the respective housing members forming the connector engagement portion. That is, dimensional errors of the portions of the housing members forming the connector engagement portion are accumulated in the horizontal and vertical dimensions of the connector engagement portion. Thus, the dimensional accuracy of the connector engagement portion may decrease, which leads to a poor engagement between the connector engagement portion and the external connector serving as a mating engagement member. Specifically, the housing is manufactured by a molding made of synthetic resin material, which may result in dimension variations of the housing caused by a dimensional error of a molding die or a thermal contraction after the molding.

[0007] A need thus exists for a lid lock apparatus for a vehicle in which reliability of an engagement with an external connector is improved.

SUMMARY OF THE INVENTION

[0008] According to an aspect of the present invention, a lid lock apparatus for a vehicle includes a housing including a first body and a second body fitted to each other, a drive motor accommodated within the housing and held by the first body, a drive force transmitting mechanism accommodated within the housing and operated by receiving a drive force from the drive motor, a shaft member axially movably supported within the housing, one end of the shaft member being engageable with a lid member provided at a vehicle body by projecting from the housing, the other end of the shaft member receiving an operation force of the drive force transmitting mechanism, and a connector holding portion formed at the housing and holding an external connector provided for supplying an electric power to the drive motor. The connector holding portion includes an engagement portion, a recess portion, and a cover portion. The engagement portion holds the external connector by being fitted thereto and including a bottom wall portion integrally formed at the first body, a first lateral wall portion integrally formed to extend from one end of the bottom wall portion, and a second lateral wall portion integrally formed to extend from the other end of the bottom wall portion. The recess portion is formed at one of the first lateral wall portion and the second lateral wall portion and with which an engagement hook of the external connector which is fitted to the engagement portion engages. The cover member is integrally formed at the second body and covering the external connector fitted to the engagement portion.

[0009] According to the aforementioned invention, horizontal and vertical dimensions of the engagement portion are determined by the three wall portions formed at the first body. Thus, accumulation of dimensional errors of the first body and the second body in the dimensions of the engagement portion is prevented, thereby improving the dimensional accuracy of the engagement

portion. Further, the dimensions of the recess portion with which the engagement hook of the external connector engages are also determined by the first body. Thus, the accumulation of the dimensional errors of the first body and the second body in the dimensions of the recess portion is prevented, thereby improving the reliability of the engagement of the external connector, In addition, in the process of mounting a connector terminal within the connector holding portion, at least one of the walls defining the connector holding portion is opened. Thus, the connector terminal is mounted on the engagement portion through the opening portion thereof. The mounting performance of motor terminals is enhanced accordingly.

[0010] The drive force transmitting mechanism includes an output gear supported within the housing so as to be rotatable by means of an operation of the drive motor. In addition, the housing includes a tightening device between a rotational center of the output gear and the connector holding portion for tightening the first body and the second body to each other.

[0011] Thus, by means of the single tightening device, the first body and the second body are tightened at the rotational center of the output gear and at the connector holding portion at a time. An opening (separation) between the first body and the second body caused by a load generated in the axial direction at the rotational center of the output gear is prevented. The connector holding portion formed by the first body and the second body is strongly tightened to thereby improve the dimensional accuracy of the connector holding portion.

[0012] The tightening device includes a screw for tightening the first body and the second body to each other.

[0013] Thus, without using special equipment, the first body and the second body are easily tightened.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The foregoing and additional features and characteristics of the present invention will become more apparent from the following detailed description considered with the reference to the accompanying drawings, wherein:

[0015] Fig. 1 is an exploded perspective view of a lid lock apparatus for a vehicle according to an embodiment;

[0016] Fig. 2 is a front view of the lid lock apparatus shown in Fig. 1 in a locked position when viewed in a direction where a cover is provided;

[0017] Fig. 3 is a front view of the lid lock apparatus shown in Fig. 2 when viewed in a direction where a body is provided;

[0018] Fig. 4 is a cross-sectional view taken along line IV-IV shown in Fig. 2;

[0019] Fig. 5 is a cross-sectional view taken along line V-V shown in Fig. 2;

[0020] Fig. 6 is a cross-sectional view taken along line VI-VI shown in Fig. 2;

[0021] Fig. 7 is a bottom view of a worm wheel according to the embodiment;

[0022] Fig. 8 is a left lateral view of the lid lock apparatus shown in Fig. 2;

[0023] Fig. 9 is a perspective view of the lid lock apparatus shown in Fig. 2; and

[0024] Fig. 10 is a front view of the lid lock apparatus shown in Fig. 2 in an unlocked state when viewed in a direction where the body is provided.

DETAILED DESCRIPTION

[0025] A lid lock apparatus 1 according to an embodiment will be explained with reference to Figs. 1 to 10. In Fig. 4, a vertical direction corresponds to a thickness direction of a housing. As illustrated in Fig. 1, the lid lock apparatus 1 includes an actuator housing 2 serving as a housing constituted by a body 21 serving as a first body and a cover 22 serving as a second body. The housing 2 accommodates therein an electric motor 3 serving as a drive motor, a worm 4 serving as a drive force transmitting mechanism, a worm wheel 5 serving as the drive force transmitting mechanism and an output gear, a lock shaft 6 serving as a shaft member, and a wheel stopper 7. The body 21 and the cover 22 are both made of synthetic resin material. The body 21 and the cover 22 engage with each other after accommodating therein the electric motor 3, the worm 4, the worm wheel 5, the lock shaft 6 and the wheel stopper 7 so as to be united by means of an engagement between engagement pieces 211 of the body 21 and respective engagement projections 221 of the cover 22.

[0026] An output shaft 31 (see Fig. 2) of the electric motor 3 is press-fitted to the worm 4 so that the worm 4 is rotatable by the electric motor 3. The worm 4 is made of a metallic material or a synthetic resin material. Teeth are formed at an outer peripheral surface 41 of the worm 4. After the output shaft 31 of the electric motor 3 is press-fitted to the worm 4 (i.e., the electric motor 3 and the worm 4 are integrally connected to each other), the electric motor 3 and the worm 4 are accommodated within a motor receiving portion 212 and a worm receiving portion 213 of the body 21, respectively. A pair of motor terminals 32, 32 is fixed to a terminal holding portion 214 of the body 21 for supplying an electric power so that the motor terminals 32 are electrically connected to the electric motor 3.

[0027] The worm wheel 5 is made of a synthetic resin material of which an outer peripheral surface 51 is formed into a substantially fan shape forming an arc shape. A pivot bore 52 is formed, penetrating through the worm wheel 5 in a thickness direction thereof. The worm wheel 5 includes an engagement pole 53 projecting downward as illustrated in Fig. 1. The worm wheel 5 further includes a first stopper wall 54 and a second stopper wall 55 as illustrated in Fig. 7. Specifically, the flat-shaped first stopper wall 54 is provided in the vicinity of the engagement pole 53 so as to extend downward. The second stopper wall 55 is provided in the vicinity of the pivot bore 52 so

as to extend in the direction same as the first stopper wall 54. Further, a slit 56 having an arc shape is formed between the first stopper wall 54 and the second stopper wall 55 so as to penetrate through the worm wheel 5 in the thickness direction thereof concentrically with the pivot bore 52.

[0028] The worm wheel 5 is rotatably mounted on the body 21 about a wheel shaft 215 that engages with the pivot bore 52 of the worm wheel 5. The wheel shaft 215 projects from an inner surface of the body 21. Teeth are formed at the outer peripheral surface 51 of the worm wheel 5 so as to engage with the teeth of the worm 4.

[0029] The lock shaft 6 is integrally formed into an elongated shape by a synthetic resin material, The lock shaft 6 includes a lock portion 61 and a support portion 62. The lock portion 61, which is formed at an end of the lock shaft 6, engages with a lid 91 serving as a lid member for covering a fuel opening provided at a vehicle body 9. The lock portion 61 is formed into a column shape and of which an end is formed by a tapered portion 61a (see Figs. 2 to 4). The support portion 62 arranged adjacent to the lock portion 61 is also formed into a column shape having a larger diameter than that of the lock portion 61. The support portion 62 includes a ring groove 63 where a seal ring 69 made of a synthetic rubber material is attached.

[0030] As illustrated in Fig. 4, the lock portion 61 and the support portion 62 of the lock shaft 6 are inserted into a shaft holding portion 216 of the body 21 so as to be axially movable. The shaft holding portion 216 is formed into a substantially cylindrical shape having a stepped portion. The shaft holding portion 216 includes a small diameter portion 216a and a large diameter portion 216b at an inner periphery. The lock portion 61 penetrates through the small diameter portion 216a of the shaft holding portion 216 while the support portion 62 is guided by the large diameter portion 216b via the seal ring 69, thereby preventing the lock shaft 6 from inclining and thereby enhancing a sealing performance of the lock shaft 6 relative to the housing 2.

[0031] A relief portion 64 is formed at a substantially center of the lock shaft 6 across a predetermined distance. In order to arrange the worm wheel 5 on top of the relief portion 64, the relief portion 64 is formed into such a shape that an upper half of the support portion 62 in a thickness direction in Fig. 4 is cut out, i.e., the relief portion 64 is formed into a half-moon shape in a cross section as illustrated in Fig. 5. The relief portion 64 is substantially half the size of the support portion 62 in a vertical direction in Fig. 4 (a vertical dimension of the relief portion 64 in Fig. 4 is smaller than an outer diameter of the seal ring 69 or the lock portion 61). The center of gravity (i.e., center axis) of the relief portion 64 is prevented from matching a guide center P of the support portion 62. According to the aforementioned structure, a height of the lid lock apparatus 1 (which corresponds to the vertical direction in Fig, 4 and the thickness direction) is reduced to thereby achieve the downsizing of the lid lock apparatus 1.

[0032] An interlock bore 65 is formed in the rear of the relief portion 64 (i.e., a side of the relief portion 64 opposite from the support portion 62), penetrating through the lock shaft 6 in the thickness direction. The engagement pole 53 formed at the worm wheel 5 is inserted into the interlock bore 65 so as to be in parallel with the wheel shaft 215 serving as a rotational shaft of the worm wheel 5, As illustrated in Fig. 2, the interlock bore 65 is elongated so as to be engageable with the engagement pole 53 in response to a rotation of the worm wheel 5.

[0033] As illustrated in Fig. 4, a small diameter portion 65a is formed at an inner peripheral surface of the interlock bore 65 in the vicinity of the guide center P that passes through a radial center of the support portion 62. The small diameter portion 65a extends radially inwardly so that the interlock bore 65 and the engagement pole 53 engage with each other. The small diameter portion 65a is formed at least at a straight portion L (see Fig. 2), where the engagement pole 53 makes contact, in the inner peripheral surface of the interlock bore 65 having an oval shape. According to the present embodiment, because a height of the relief portion 64 is lower than the guide center P, a padding 65b is formed around an upper opening portion of the interlock bore 65 and then the small diameter portion 65a is formed.

[0034] A flat portion 66 is formed in the rear (i.e., left side in Fig. 2) of the interlock bore 65 of the lock shaft 6. A pair of ribs 67 (see Fig. 1) is formed at each side surface (front and rear surfaces) of the flat portion 66. The ribs 67 formed at the front and rear surfaces of the flat portion 66 are sandwiched by the body 21 and the cover 22. Thus, the lock shaft 6 is also guided by the housing 2 via the flat portion 66. A handle 68 for a manual operation in case of a malfunction of the motor 3, and the like is formed at a rear side (i.e., left side in Fig. 2) of the lock shaft 6. According to the aforementioned structure, the lock shaft 6 is accommodated within the housing 2 so as to be movable in the axial direction (left and right direction in Fig. 2) while engaging with the worm wheel 5.

[0035] A stopper holding portion 217 that extends towards the worm wheel 5 is formed at a portion of the body 21 facing the worm wheel 5. The wheel stopper 7 is assembled on the stopper holding portion 217. The wheel stopper 7 is made of synthetic rubber material such as ethylene propylene (EP) and ethylene propylene diene methylene terpolymer (EPDM) serving as an elastic member having excellent heat resistance and weathering resistance. As illustrated in Fig. 1, the wheel stopper 7 is formed into a ring shape having a fan-shaped outline. The stopper holding portion 217 is inserted into an inner peripheral portion 71 of the wheel stopper 7. The wheel stopper 7 is mounted on the stopper holding portion 217 in a snapping manner by surrounding an outer peripheral surface of the stopper holding portion 217.

[0036] As illustrated in Fig. 6, when the worm wheel 5 rotates in a state to be mounted on the body 21, the slit 56 of the worm wheel 5 is positioned to face the wheel stopper 7. A stopper holder 222 is formed in a projecting

manner at a portion of the cover 22 where the stopper holder 222 is inserted into the slit 56. The stopper holder 222 inserted into the slit 56 extends from an inner surface of the cover 22 to an upper end surface of the wheel stopper 7 in Fig. 6 (i.e., an end surface of the wheel stopper 7 away from the body 21). In a case where the wheel stopper 7 is lifted up relative to the stopper holding portion 217 because of a contact of the worm wheel 5 with the wheel stopper 7 at a time the worm wheel 5 rotates, the stopper holder 222 makes contact with the upper end surface of the wheel stopper 7 to thereby prevent the wheel stopper 7 from disengaging from the stopper holding portion 217.

[0037] According to the present embodiment, a small gap is formed between the stopper holder 222 and the wheel stopper 7. Alternatively, the stopper holder 222 may constantly press the upper end surface of the wheel stopper 7. In addition, as illustrated in Fig. 6, the stopper holder 222 faces a portion of the wheel stopper 7 close to the rotational center of the worm wheel 5 (i.e., the wheel shaft 215) relative to the stopper holding portion 217.

[0038] After component parts constituting the lid lock apparatus 1 are accommodated in the boy 21, the engagement pieces 211 of the body 21 engage with the engagement projections 221 of the cover 22 to thereby fit the cover 22 onto the body 21 as a unit. Next, a tapping screw 8 serving as a tightening device and a screw is inserted into the wheel shaft 215 serving as the rotational center of the worm wheel 5 and a screw bore 223 (see Fig. 10) formed at the cover 22 between the wheel shaft 215 and a female connector portion 12 which will be explained later.

[0039] Afterwards, the tapping screw 8 is tightened to the body 21 through a thread cutting for tightening the body 21 and the cover 22, thereby completing the lid lock apparatus 1. The electric motor 3, the worm 4, the worm wheel 5, and the lock shaft 6 are held by the body 21 and the cover 22 without looseness accordingly. A waterproofing ring 11 made of a synthetic rubber material is attached to a seal groove 216c formed at the shaft holding portion 216 of the body 21 and thereafter the lid lock apparatus 1 is mounted on the vehicle body 9.

[0040] As illustrated in Fig. 8, the female connector portion 12 serving as a connector holding portion is provided at a side surface of the housing 2 of the completed lid lock apparatus 1. The female connector portion 12 is connected to an external connector M (i.e., a male connector, see Fig. 9) for supplying electric power to the electric motor 3. The female connector portion 12 includes first and second connector lateral walls 218a and 218b serving as first and second lateral wall portions, integrally formed at the body 21 and facing each other. The female connector portion 12 further includes first and second connector longitudinal walls 218c and 224 serving as a bottom wall portion and a cover portion, respectively. The first and second connector longitudinal walls 218c and 224, facing each other, are integrally formed at the body 21 and the cover 22, respectively. According to such structure, the female connector portion 12 is formed to surround the motor terminals 32. In Fig. 8, the walls of the female connector portion 12 formed by the body 21 are indicated by a shaded area.

[0041] As illustrated in Fig. 9, the first and second connector lateral walls 218a and 218b are formed at both ends of the connector longitudinal wall 218c. The first and second connector lateral walls 218a, 218b, and the first connector longitudinal wall 218c form an engagement portion according to the embodiment. The second connector longitudinal wall 224 is configured to cover the external connector M that is fitted to the first and second connector lateral walls 218a, 218b, and the first connector longitudinal wall 218c.

[0042] That is, a position of a fitting portion where the body 21 and the cover 22 that constitute the housing 2 is fitted to each other is adjusted and determined so that the first and second connector lateral walls 218a, 218b, and the first connector longitudinal wall 218c are formed only at the body 21 while the second longitudinal wall 224 is formed at the cover 22 in the female connector portion 12. Thus, horizontal and vertical dimensions of the female connector portion 12 to which the external connector M is fitted are determined only by lengths of the walls 218a, 218b, and 218c formed at the body 21. In Fig. 8, an engagement piece 225 of the cover 22 that engages with the first connector lateral wall 218a has a guide function for the first connector lateral wall 218a and does not influence dimensions of the female connector portion 12.

[0043] As illustrated in Fig. 9, an engagement opening 219 serving as a recess portion where an engagement hook of the external connector M engages in a case where the external connector M is fitted to the female connector portion 12 is formed at the second connector lateral wall 218b of the female connector portion 12. The engagement opening 219 is a rectangular-shaped opening that penetrates through the second connector lateral wall 218b. The engagement opening 219 is formed only at the body 21 (i.e., the engagement opening 219 is defined, being surrounded only by the body 21).

[0044] As illustrated in Fig. 10, in a state where the lock portion 61 disengages from the lid 91 (i.e., the lock portion 61 is in an unlocked state relative to the lid 91), the electric motor 3 is operated for a predetermined time period so as to rotate the worm wheel 5 via the worm 4 in a clockwise direction about the wheel shaft 215 in Fig. 10. Then, the lock shaft 6 that engages with the worm wheel 5 via the engagement between the engagement pole 53 and the interlock bore 65 moves in the axial direction relative to the housing 2, specifically, in the left direction in Fig. 10, so that the lock portion 61 projects from the housing 2 (see Figs. 2 and 3). The lock portion 61 that projects from the housing 2 engages with the lid 91 provided at the vehicle body 9 to thereby retain the lid 91 in the closed state (see Fig. 4). The worm wheel 5 driven to rotate by the worm 4 is stopped by means of

the contact of the first stopper wall 54 with the wheel stopper 7.

[0045] As illustrated in Figs. 2 and 3, in a state where the lock portion 61 engages with the lid 91 (i.e., the lock portion 61 is in a locked state relative to the lid 91), the electric motor 3 is operated for a predetermined time period so as to rotate the worm wheel 5 in an opposite direction from the aforementioned direction (i.e., in a counterclockwise direction in Fig. 2). Then, the lock shaft 6 moves in the axial direction relative to the housing 2, specifically, in the left direction in Fig. 2, so that the lock portion 61 moves closer to the housing 2 (see Fig. 10). The lock portion 61 disengages from the lid 91 so as to open the lid 91, The worm wheel 5 driven to rotate in the clockwise direction in Fig. 2 by the worm 4 is stopped by means of the contact of the second stopper wall 55 with the wheel stopper 7.

[0046] According to the present embodiment, three walls among the first and second connector lateral walls 218a, 218b facing each other, and the first and second connector longitudinal walls 218c, 224 facing each other are formed at the body 21. Thus, the horizontal and vertical dimensions of the female connector portion 12 are determined only by lengths of the three walls 218a, 218b, and 218c formed at the body 21. Accumulation of dimensional errors of the body 21 and the cover 22 in the dimensions of the female connector portion 12 is prevented and therefore the dimensional accuracy of the female connector portion 12 is improved. The external connector M is easily fitted to the female connector portion 12 accordingly. In addition, in the process of mounting a connector terminal within the female connector portion 12, a space for one of the walls (wall 224) defining the female connector portion 12 is opened. Thus, the mounting performance of the motor terminals 32 is enhanced.

[0047] The engagement opening 219 where the engagement hook of the external connector M engages in a case where the external connector M is fitted to the female connector portion 12 is formed at the housing 2. The engagement opening 219 is formed only at the body 21. Accordingly, the dimensions of the engagement opening 219 are also determined only by the body 21. The dimensional accuracy of the engagement opening 219 is enhanced without being influenced by the accumulation of the dimensional errors of the body 21 and the cover 22. The engagement hook of the external connector M easily engages with the engagement opening 219 accordingly.

[0048] Further, the tapping screw 8 is provided at the housing 2 between the rotational center of the worm wheel 5 and the female connector portion 12 so as to tighten the body 21 and the cover 22. The body 21 and the cover 22 are tightened at the rotational center of the worm wheel 5 and at the female connector portion 12 at the same time by means of the single tapping screw 8. In the lid lock apparatus 1, a load is generated in the axial direction at the rotational center of the worm wheel 5 (i.e., in a direction for separating the body 21 and the cover 22) because the worm wheel 5 is driven to rotate by the worm 4. In addition, the body 21 and the cover 22 are required to be securely tightened so as to smoothly fit the external connector M to the female connector portion 12.

[0049] In response to the aforementioned requirement, the rotational center of the worm wheel 5 in the housing 2 and the female connector portion 12 are tightened by the tapping screw 8 to thereby restrain the body 21 and the cover 22 from separating from each other at the rotational center of the worm wheel 5. In addition, the dimensional accuracy of the female connector portion 12 is enhanced. Further, because the body 21 and the cover 22 are tightened by the tapping screw 8, the body 21 and the cover 22 are easily tightened without a usage of a special equipment.

[0050] The embodiment is not limited to have the aforementioned structure and is modified as below. That is, three walls forming the female connector portion 12 may be formed at the cover 22 while one wall forming the female connector portion 12 may be formed at the body 21. The three walls forming the female connector portion 12 are not necessarily collectively formed at one of the body 21 and the cover 22. As long as influences of dimensional errors of a molding die, thermal contraction after molding, and the like are not present and an effect for improving the dimensional accuracy of the female connector portion 12 is present, a portion of the three walls may be formed at the other one of the body 21 and the cover 22 based on a separation of the molding die for the housing 2, and the like.

[0051] A structure for transmitting a rotational force of the electric motor 3 to the lock shaft 6 is not limited to the worm 4 and the worm wheel 5. Various gear mechanisms or link mechanisms are applicable. The external connector serving as a female connector may be fitted to a male connector formed at the housing 2. In addition, means for tightening the body 21 and the cover 22 are not limited to the screw member and may be heat welding, and the like. Further, the lid lock apparatus according to the embodiment is not limited to cover a fuel opening and may be applicable to lock a trunk lid for a vehicle in a closed state.

Claims

1. A lid lock apparatus for a vehicle (1), comprising:

a housing (2) including a first body (21) and a second body (22) fitted to each other;
a drive motor (3) accommodated within the housing (2) and held by the first body (21);
a drive force transmitting mechanism (4, 5) accommodated within the housing (2) and operated by receiving a drive force from the drive motor (3);
a shaft member (6) axially movably supported

within the housing (2), one end of the shaft member (6) being engageable with a lid member (91) provided at a vehicle body (9) by projecting from the housing (2), the other end of the shaft member (6) receiving an operation force of the drive force transmitting mechanism (4, 5); and
a connector holding portion (12) formed at the housing (2) and holding an external connector (M) provided for supplying an electric power to the drive motor (3); wherein
the connector holding portion (12) includes an engagement portion (218a, 218b, 218c), a recess portion (219), and a cover portion (224),
the engagement portion (218a, 218b, 218c) holding the external connector (M) by being fitted thereto and including a bottom wall portion (218c) integrally formed at the first body (21), a first lateral wall portion (218a) integrally formed to extend from one end of the bottom wall portion (218c), and a second lateral wall portion (218b) integrally formed to extend from the other end of the bottom wall portion (218c),
the recess portion (219) being formed at one of the first lateral wall portion (218a) and the second lateral wall portion (218b) and with which an engagement hook of the external connector (M) which is fitted to the engagement portion (218a, 218b, 218c) engages,
the cover member (224) being integrally formed at the second body (22) and covering the external connector (M) fitted to the engagement portion (218a, 218b. 218c).

2. The lid lock apparatus (1) according to claim 1, wherein
the drive force transmitting mechanism (4, 5) includes an output gear (5) supported within the housing (2) so as to be rotatable by means of an operation of the drive motor (3), and
the housing (2) includes a tightening device (8) between a rotational center of the output gear (5) and the connector holding portion (12) for tightening the first body (21) and the second body (22) to each other.

3. The lid lock apparatus (1) according to claim 2, wherein the tightening device (8) includes a screw for tightening the first body (21) and the second body (22) to each other.

FIG. 1

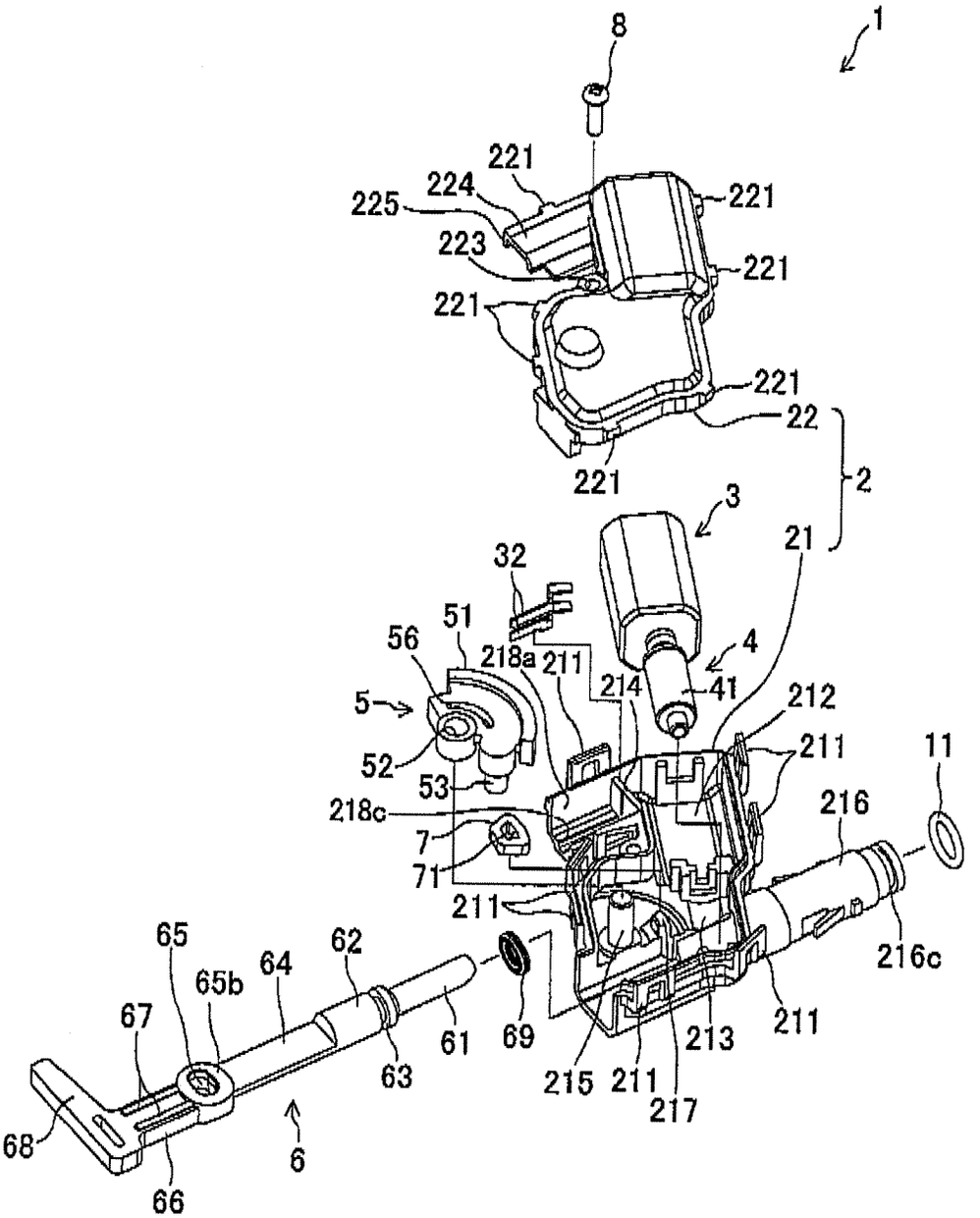
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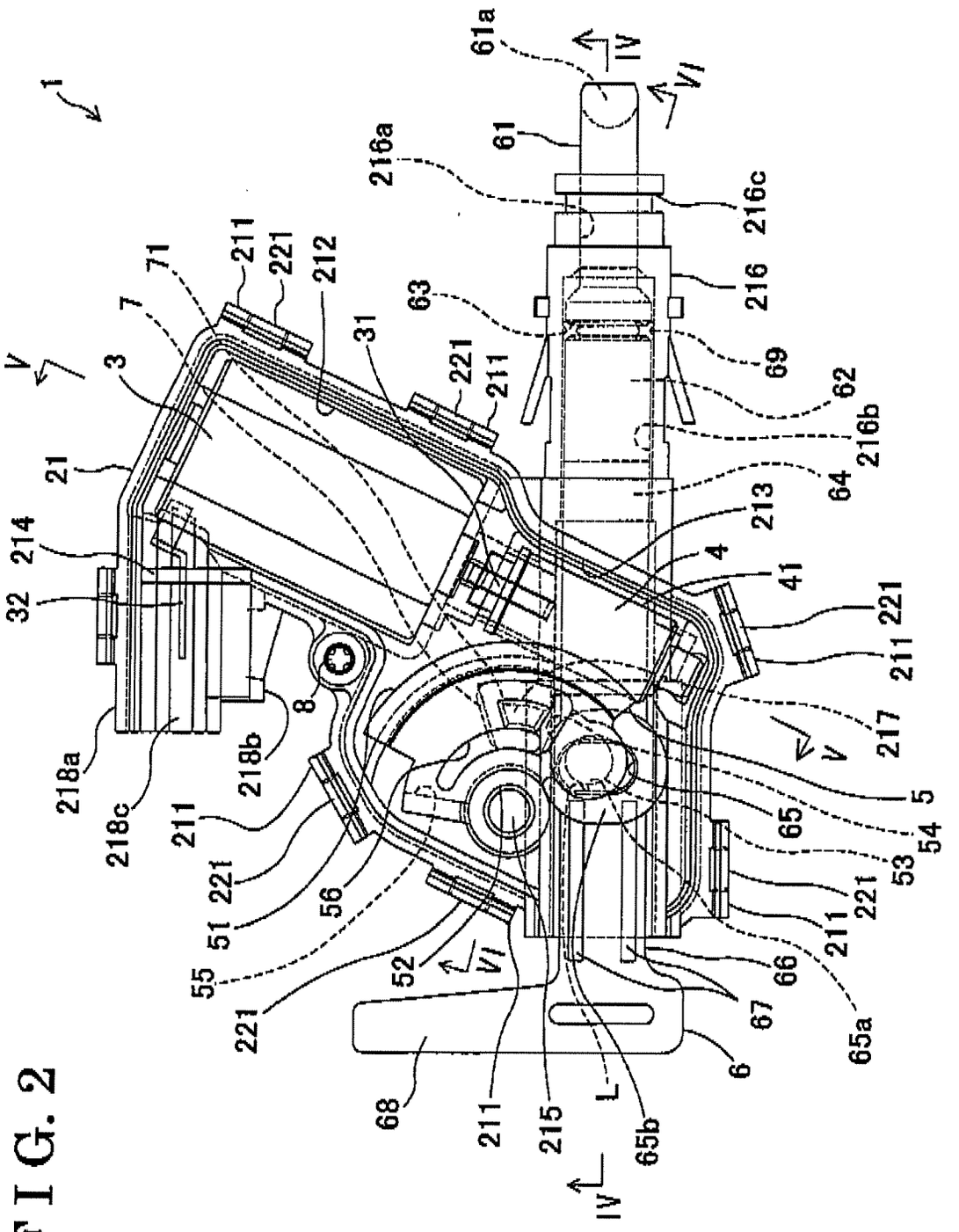
FIG. 2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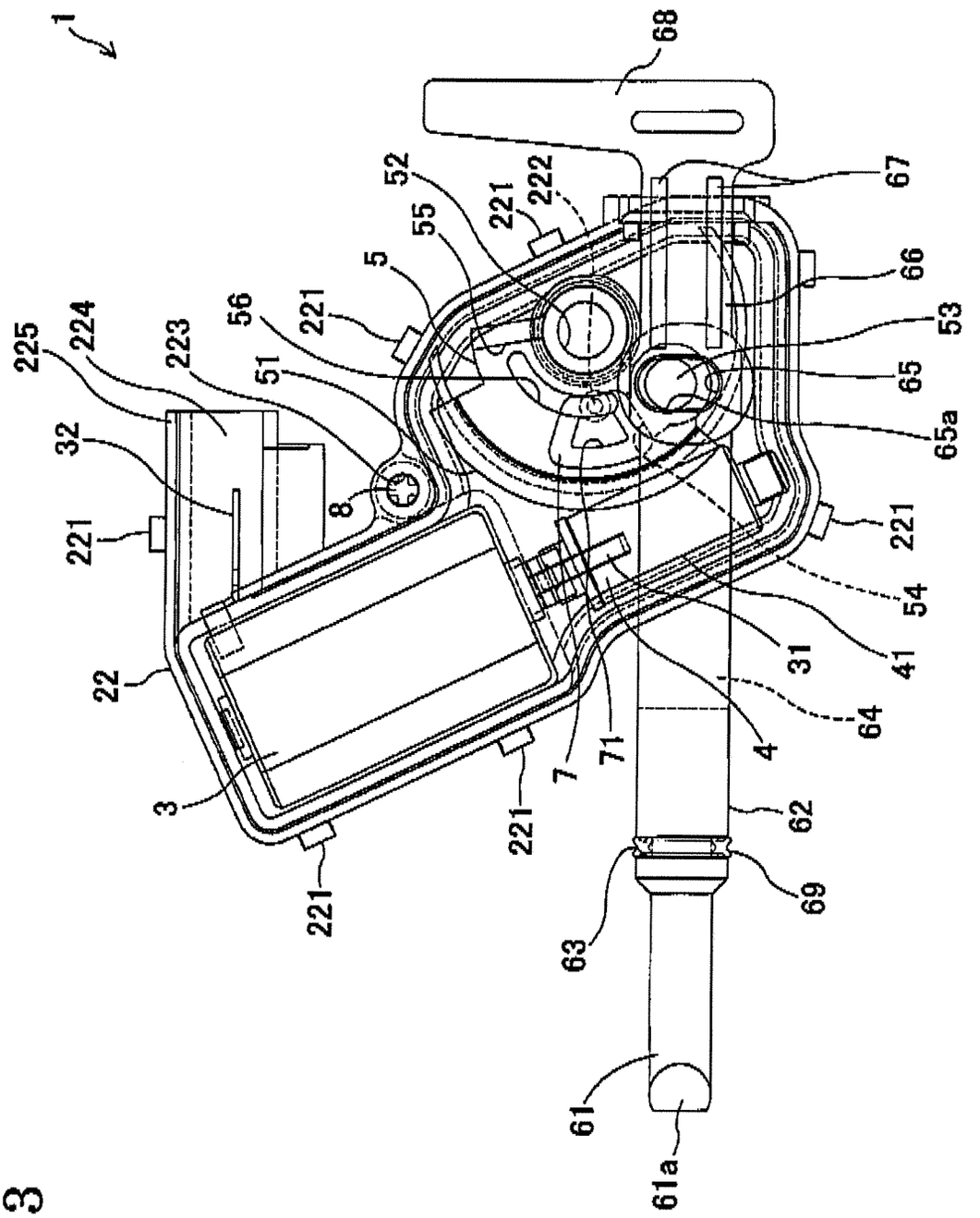
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67
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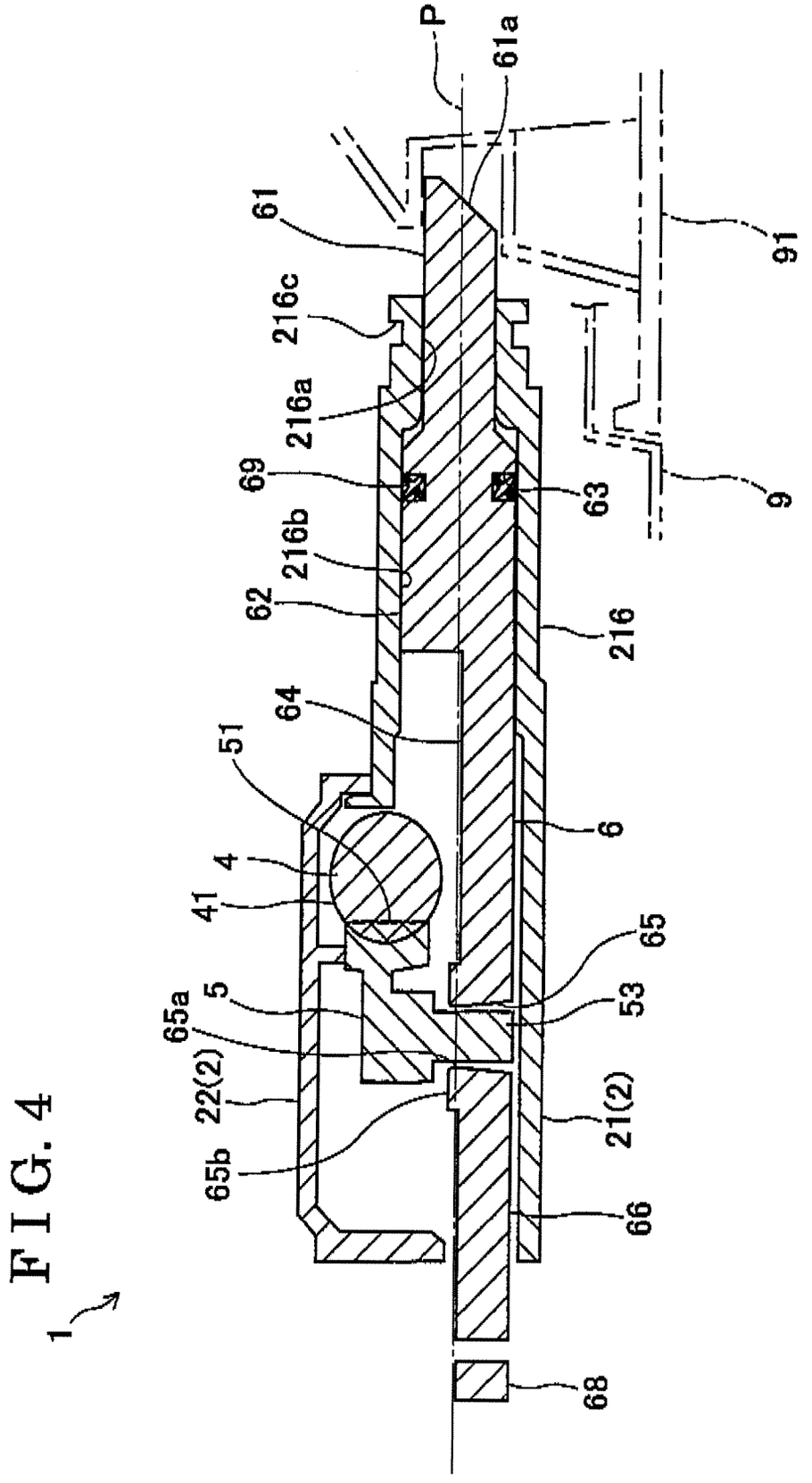
55
221
222
5
66
56
221
53
225
224
223
51
65
65a
32
8
221
221
54
22
31
41
64
4
71
7
3
221
62
221
69
63
61
61a

FIG. 3

FIG. 4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P
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61
91
216c
216a
69
63
9
216b
62
216
64
51
6
4
41
65
65a
5
53
22(2)
21(2)
65b
66
68

FIG. 5

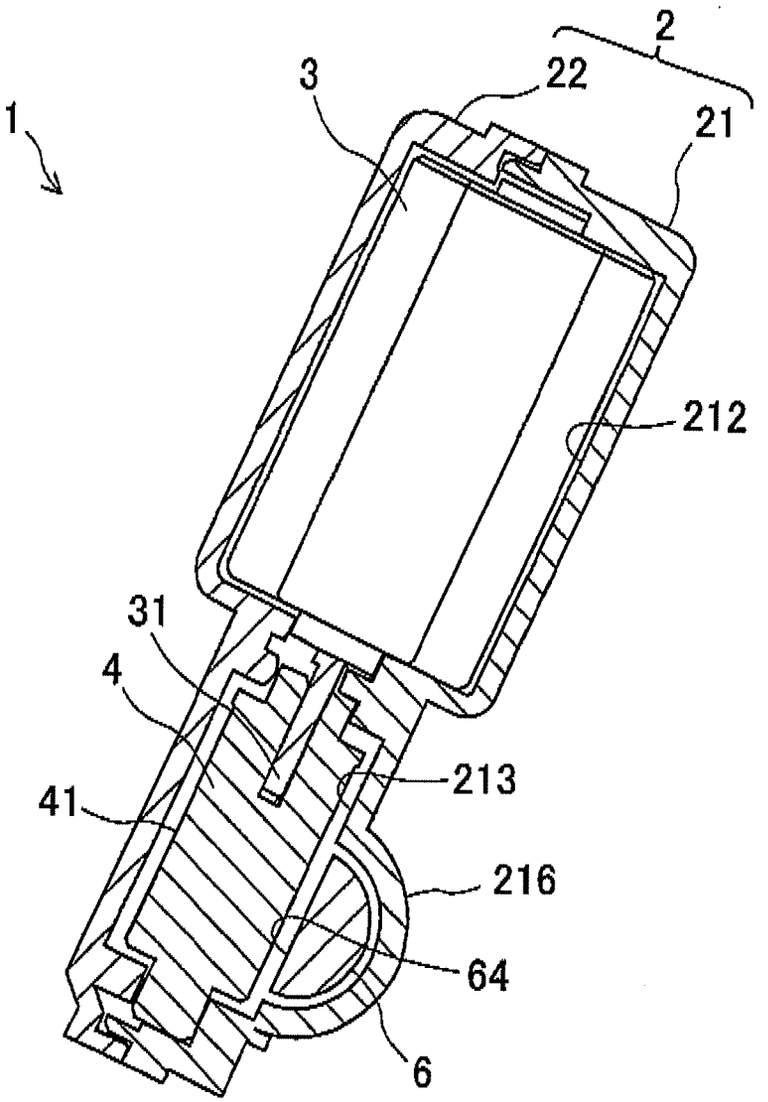


FIG. 6

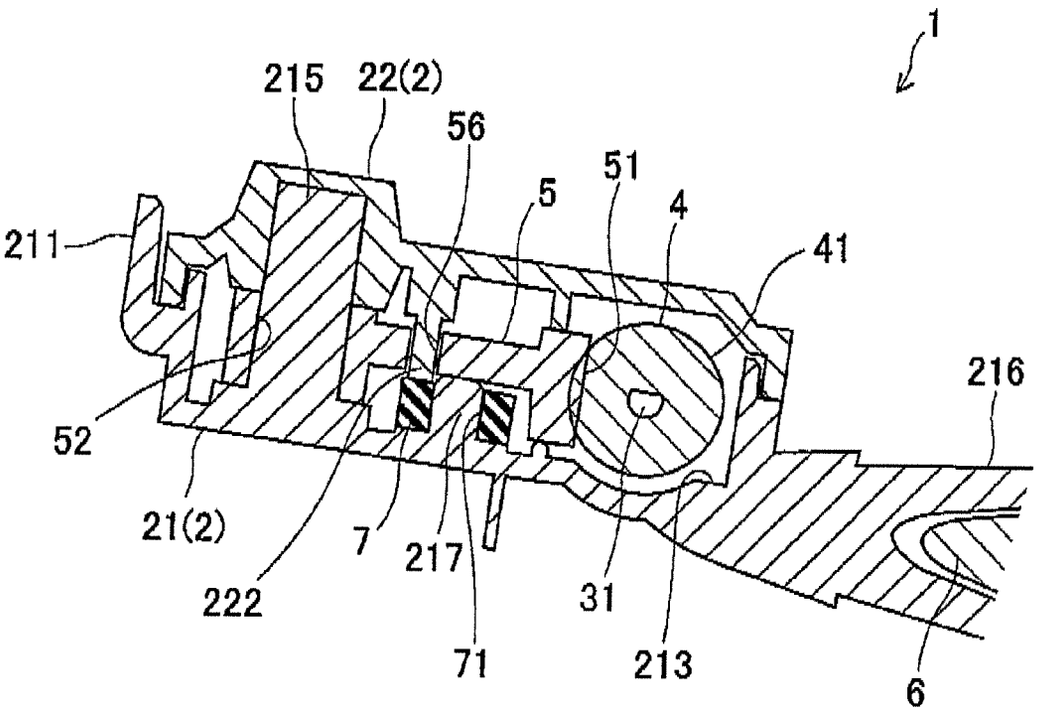
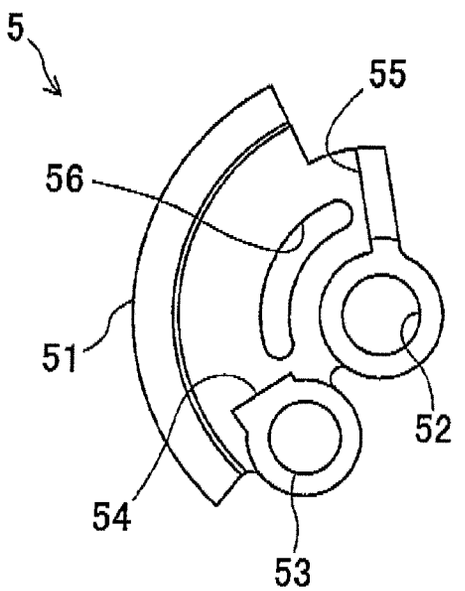

1
215
22(2)
56
5
51
4
41
211
216
52
21(2)
7
217
222
31
71
213
6

FIG. 7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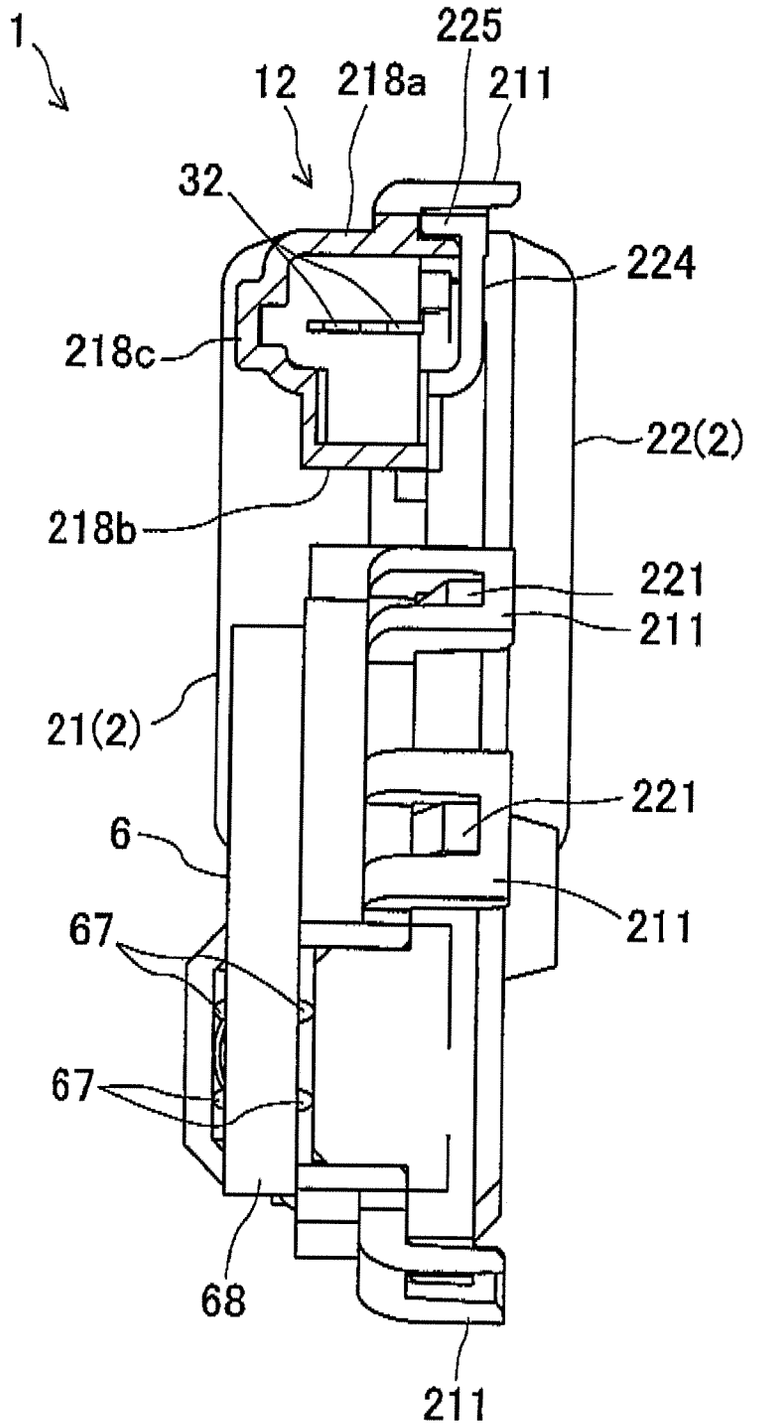
52
54
53

FIG. 8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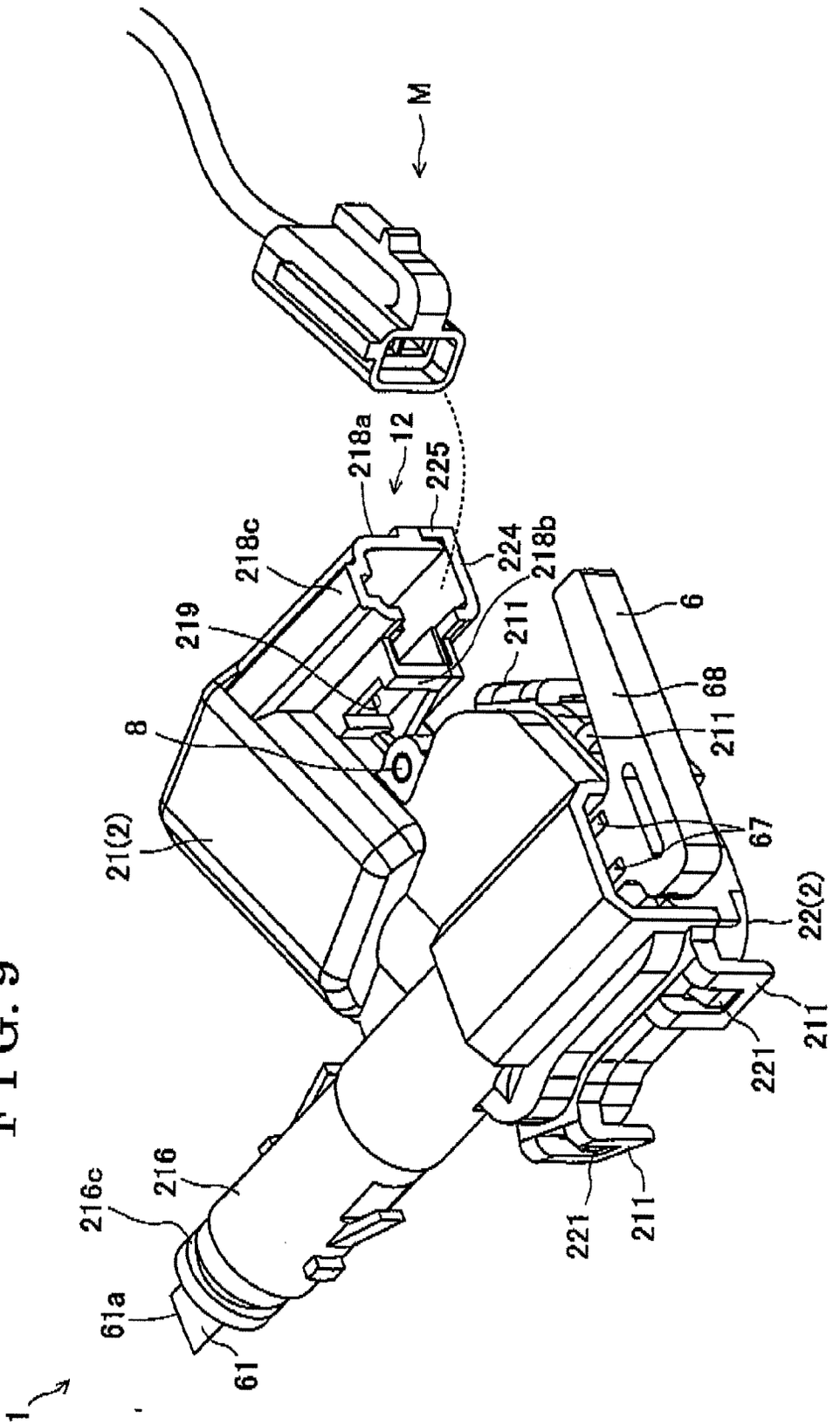
225
12
218a
211
32
224
218c
22(2)
218b
221
211
21(2)
221
6
211
67
67
68
211

FIG. 9


M
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218b
218c
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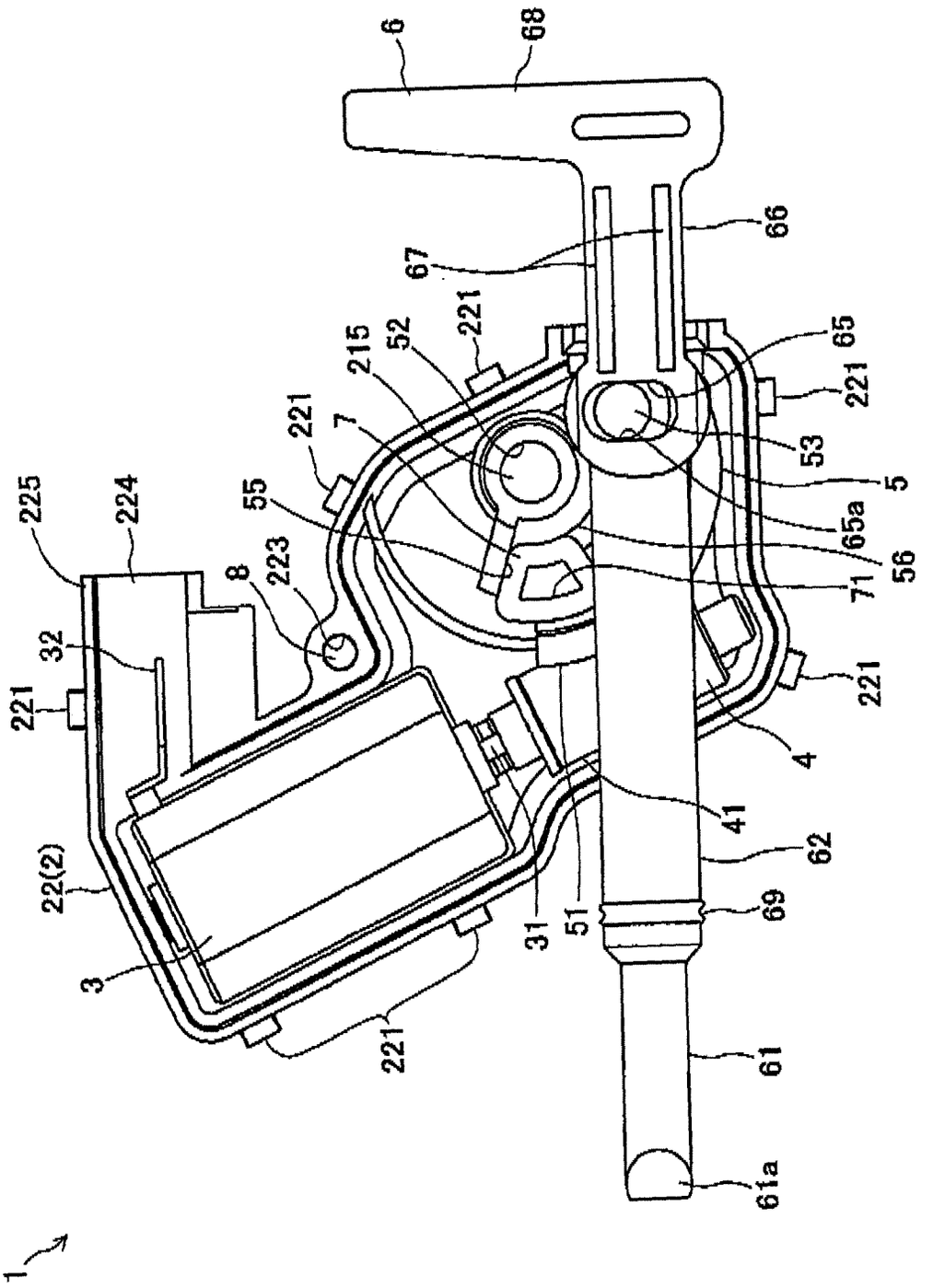
67
21(2)
22(2)
211
221
221
211
216
216c
61a
61
1

FIG. 10


6
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67
221
215
52
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7
53
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224
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65a
56
8
223
71
32
221
221
4
41
22(2)
62
31
51
69
3
221
61
61a
1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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