(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 842 700 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
04.03.2015 Bulletin 2015/10

(21) Application number: **13782354.8**

(22) Date of filing: **08.03.2013**

(51) Int Cl.:
B26B 19/48 *(2006.01)* ***B26B 19/38*** *(2006.01)*
H01R 4/48 *(2006.01)* ***H01R 13/40*** *(2006.01)*

(86) International application number:
PCT/JP2013/001493

(87) International publication number:
WO 2013/161157 (31.10.2013 Gazette 2013/44)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **27.04.2012 JP 2012103400**

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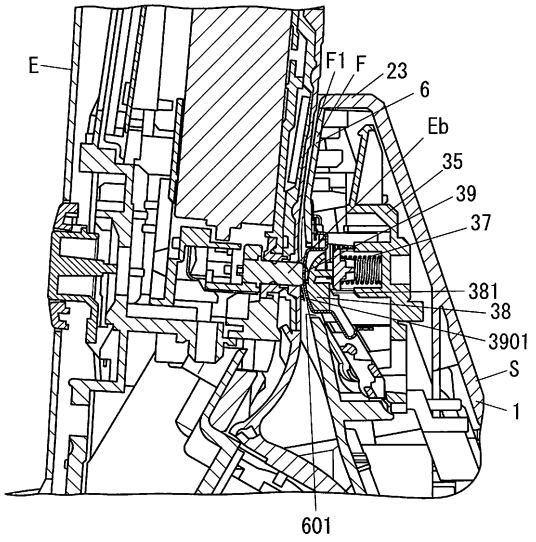
(54) CONNECTION DEVICE FOR ELECTRICAL APPARATUS

(57) A connection device **1** according to the invention includes a conducting part **39** which comes into contact with a terminal **Eb** projecting from an outer surface of an electrical apparatus **E** to establish an electrical connection for charging or communication, and a housing **H.** The housing **H** includes a wall part **F.** A hole **601** which exposes the conducting part **39** is formed in the wall part **F** of the housing **H.** An outer surface **3901** of the conducting part **39** is located closer to an inside of the housing **H** than an outer surface **F1** of the wall part **F,** or at the same surface level as the outer surface **F1** of the wall part **F.**

FIG. 1



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Description

TECHNICAL FIELD

[0001] The invention relates to a connection device which establishes an electrical connection for charging or communication to an electrical apparatus.

BACKGROUND ART

[0002] There have been proposed an connection device for charging or communication to an electrical apparatus for example, JP 4842398 B2, which establishes an electrical connection by a terminal of the electrical apparatus being brought into contact with a conducting part of the connection device. In this document, the terminal of the electrical apparatus projects from its surface as well as, the conducting part of the connection device is biased by a spring and also projects from its surface. When the electrical apparatus is pressed to the side of the connection device, the terminal comes into contact with the conducting part and presses the conducting part backward against the spring bias. Therefore, the electrical apparatus establishes the electrical connection with a maintained contact pressure.

[0003] However, because the conducting part that is a metallic member is projected from a surface of the connection device, there is a problem that, when the electrical apparatus is attached to the connection device, the projected conducting part may damage part of the electrical apparatus which is not the terminal.

[0004] There is a case where the electrical apparatus is an electric shaver, the connection device is a cleaning device for clearing a shaving head of the electric shaver, the shaving head of the electric shaver is to be inserted deep in a cleaning part of the connection device, and the terminal and the conducting part are configured to be connected to each other in the inserted state. In this case, parts of the electrical apparatus which possibly touch the projected conducting part are especially increased, and accordingly, chances of the parts of the electrical apparatus being damaged by touching the projecting conducting part are increased.

DISCLOSURE OF THE INVENTION

[0005] With the foregoing in the view, it is an object of the present invention to provide a connection device for an electrical apparatus which can prevent the electrical apparatus from being damaged by a conducting part.

[0006] A connection device **(1)** for an electrical apparatus **(E)** of the present invention includes: a conducting part **(39)** which comes into contact with a terminal **(Eb)** projecting from an outer surface of the electrical apparatus **(E)** to establish an electrical connection for charging or communication; and a housing **(H).** The housing **(H)** includes a wall part **(F).** A hole **(601)** which exposes the conducting part **(39)** is formed in the wall part **(F)** of the housing **(H).** An outer surface **(3901)** of the conducting part **(39)** is located closer to an inside of the housing **(H)** than an outer surface **(F1)** of the wall part **(F),** or at the same surface level as the outer surface **(F1)** of the wall part **(F).**

[0007] In an embodiment of the present invention, it is preferable that a sectional configuration parallel to one direction, of the wall part **(F)** is in a convex shape **(C1)** and a vertex **(T)** of the convex shaped wall part **(F)** projects outward, and the conducting part **(39)** is on an end of the vertex **(T).**

[0008] In an embodiment of the present invention, it is preferable that the sectional configuration parallel to the one direction, of the conducting part **(39)** is in a convex shape **(C2),** and a vertex **(T1)** of the convex shaped conducting part **(39)** projects outward.

[0009] In an embodiment of the present invention, the one direction is an installation direction of the electrical apparatus **(E)** to the connection device **(1).** In the connection device **(1),** the wall part **(F)** includes a long groove **(60)** that extends in the one direction, in an area surrounding the conducting part **(39).** It is preferable that the conducting part **(39)** is positioned inside the long groove **(60).**

[0010] In an embodiment of the present invention, it is preferable that a concave surface **(61),** which is located at the same surface level as the outer surface **(3901)** of the conducting part **(39),** is provided in a surface near the conducting part **(39)** which is on an end of a vertex **(T)** on the wall part **(F).**

[0011] In the present invention, because compared to surrounding walls, the conducting part is not projected, the conducting part is less likely to damage a surface of the electrical apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a sectional view of an essential part of a cleaning device for an electrical apparatus according to an embodiment of the present invention;

FIG. 2 is a vertical sectional view of a state where the electrical apparatus is installed to the cleaning device according to the embodiment;

FIG. 3 is a perspective view of a state where the electrical apparatus is installed to the cleaning device according to the embodiment;

FIG. 4 is a perspective view of the cleaning device according to the embodiment;

FIG. 5 is a vertical sectional view of an essential part of the cleaning device according to the embodiment;

FIG. 6 is an exploded perspective view of an essential part of the cleaning device according to the embodiment;

FIG. 7 is a horizontal sectional view of the cleaning device according to the embodiment;

FIG. 8 is a horizontal sectional view of a state where

the electrical apparatus is installed to the cleaning device according to the embodiment; and

FIG. 9 is a perspective view of an essential part of a variation of the cleaning device according to the embodiment.

EMBODIMENT FOR CARRYING OUT THE INVENTION

[0013] Followings are detailed description according to an embodiment of the present invention based on drawings.

[0014] As shown in FIG. 1 to FIG. 7, a connection device **1** according to the embodiment includes: a conducting part **39** which comes into contact with a terminal **Eb** projecting from an outer surface of an electrical apparatus **E** to establish an electrical connection for charging or communication; and a housing **H**. The housing **H** includes a wall part **F.** A hole **601** which exposes the conducting part **39** is formed in the wall part **F** of the housing **H.** An outer surface **3901** of the conducting part **39** is located closer to an inside of the housing **H** than an outer surface **F1** of the wall part **F,** or at the same surface level as the outer surface **F1** of the wall part **F.**

[0015] The connection device 1 according to the embodiment is a cleaning device that is configured to establish an electrical connection to the electrical apparatus **E,** which is a rechargeable electrical apparatus such as an electric shaver (a reciprocating electric shaver for example), to clean a cleaned part (blade head for example) **Ea** of the electrical apparatus **E.** The rechargeable electrical apparatus may be an electric shaver such as a reciprocating electric shaver, a mobile phone or a rechargeable microphone.

[0016] In the connection device **1,** the housing **H** is configured by parts such as a base **11,** a lateral cover **15,** a front cover **16,** and a top-face cover **2.** A cleaning part **20** has an opening on a top surface of the top-face cover **2** in order to insert the cleaned part (the blade head) **Ea,** of the electrical apparatus **E** in inverted position.

[0017] As shown in FIG. 2, the connection device **1** includes: in its inside, a container **7** for storing cleaning liquid; a pump **P** which is configured so as to circulate the cleaning liquid between the container **7** and a cleaning part **52;** and a heating unit and a fan motor for drying the cleaned part (blade head) **Ea** after a cleaning process. The connection device **1** has a support part **S.** The support part **S** includes the conducting part **39,** and the conducting part **39** is configured to establish an electrical connection to the electrical apparatus **E.**

[0018] The container **7** with the cleaning liquid is positioned in the base **11.** The terminal **Eb** of the connection device **1** is electrically connected to the electrical apparatus **E** at the conducting part **39** of the support part **S** as soon as the cleaned part (blade head) **Ea** of the electrical apparatus **E** is inserted into the cleaning part **20.** When the pump **P** is activated, the pump **P** supplies the cleaning liquid in the container **7** to the cleaning part **20.** Also, the cleaning part **20** includes an overflow part **53.** Cleaning liquid overflowing the cleaning part **20** is returned to the container **7** which is located below the cleaning part **20,** through the overflow part **53.** While the blade head **Ea** being cleaned, the blade head **Ea** of the electrical apparatus **E** is activated through sending of signals and charging from the cleaning device **1** to the electrical apparatus **E** through the conducting part **39.** This enables to clean the blade head **Ea** more quickly and effectively.

[0019] The cleaning part **20** is positioned on a first side in a first direction (front side in a front-back direction in FIG.3) in the cleaning device **1,** and the first side defines a front side of the cleaning device **1** for example.

[0020] As shown in FIG. 3 and FIG. 4, the support part **S** includes a support block **6** and a back-part cover **23** which the top-face cover **2** has. The support block **6** is positioned on a second side in the first direction (back side in a front-back direction of the cleaning part **20** in the drawing), and in the first direction, the back-part cover **23** is positioned closer to the second side than the support block **6.** The back-part cover **23** covers the second side of the support block **6.** Further, in a second direction (for example, a vertical direction of the cleaning device **1** in FG.4), the support part **S** is formed so as to rise from the top-face cover **2.**

[0021] Also, as shown in FIG.2 to FIG.4, the support block **6** of the support part **S** and the back-part cover **23** are part of the housing **H.**

[0022] As shown in FIG.5, in the connection device **1** according to the embodiment, a sectional configuration parallel to the second direction, of the wall part **F,** is shaped in a convex shape **C1.** A vertex **T** of the convex shaped wall part **F** projects outward, and the conducting part **39** is on an end of the vertex **T.** Further the second direction corresponds to "one direction" in the present invention.

[0023] In particular, in a cross section parallel to the second direction (longitudinal plane), the outer surface **F1** of the wall part **F** of the support block **6** projects forward and shaped in the convex shape **C1** including the vertex **T.** The hole **601** is provided near the vertex **T** of the wall part F and the outer surface **3901** of the conducting part **39** is exposed by the hole **601.**

[0024] As shown in FIG.5 to FIG. 8, the conducting part **39** is positioned in front of a movable terminal block **38.** The movable terminal block **38** and the conducting part **39** are biased toward the wall part **F** side by a spring **37** positioned behind the movable terminal block **38** and the conducting part **39.** Also, a stopper **40** is configured so as to limit amounts of the movable terminal block **38** and the conducting part **39** projecting toward the wall part **F** side by the spring bias (spring elastic). Further, a supporting base **35** is provided inside of the support block **6** so as to hold internal members such as the spring **37** and the stopper **40.**

[0025] As shown in FIG. 5, in the connection device **1** according to the embodiment, the sectional configuration parallel to the second direction (one direction), of the con-

ducting part **39** is in a convex shape **C2.** A vertex **T1** of the convex shaped conducting part **39** projects outward. Also, each conducting part **39** curves forward.

[0026] FIG. 6 shows an essential part of the support block **6.** Both the stopper **40** and the spring **37** are positioned behind (the second side in the first direction) the movable terminal block **38** and the conducting part **39.** The spring **37** is provided between the stopper **40** and the supporting base **35.** In this case, the spring **37** is positioned inside of a guide provided on the supporting base **35.** Also, the stopper **40** includes a projection **40a** extracted from an inner surface **401** to the supporting base **35.** The projection **40a** projects into an inner hollow of the spring **37.** Hence, the spring **37** is retained between the stopper **40** and the supporting base **35.**

[0027] As shown in FIG. 1, the amount of the projection of the stopper **40** is limited by the movable terminal block **38** (see a projection-control part **381** in the drawing for detail).

[0028] As shown in FIG. 7, in the sectional configuration of the wall part **F** parallel to a third direction, the outer surface **F1** of the wall part **F** of the support block **6** includes a curved shape **CV.** Here, the third direction defines a right-left direction of the cleaning device **1** shown in for example FIG.4.

[0029] In the wall part **F** of the support block **6,** as shown in FIG. 7, the more than two (three in the drawing) conducting parts **39** are provided in predefined intervals in the third direction. Those conducting parts **39** can individually retract in the first direction against the bias of the spring **37.**

[0030] Further, as shown in FIG. 4, the connection device **1** according to the embodiment includes a long groove **60** extending in the second direction, in an area surrounding the conducting part **39** of the wall part **F,** and the conducting part **39** is positioned inside this long groove **60.**

[0031] Further, more than two (three in drawing) long grooves **60** are provided in predefined intervals in the wall part **F** along the third direction.

[0032] In the connection device **1,** the conducting part **39** is positioned inside of the long groove **60** formed in the wall part **F** of the support block **6** in the third direction (longitudinal direction). In the conducting part **39,** the vertex **T1** of the convex shape **C2** (the outer surface **3901** of the conducting part **39**) is provided at the same surface level as the outer surface **F1** of the wall part **F.** In the example of FIG. 4, a recess is provided in a part (upper part) of the central long groove **60,** and the hole **601** is provided in other part. In this way, the outer surface **3901** of the conducting part **39** is exposed by the hole **601.** Further, an upper end side surface of the conducting part **39** is substantially at the same surface level as the recess. In short, the upper end side surface of the conducting part **39** is located at the same surface level as the recess, or behind the recess. When the terminal **Eb** is in contact with the outer surface **3901** of the conducting part **39** along the longitudinal direction, the conducting part **39** is configured to shift sufficiently in the front-back direction in response to a connecting position with the terminal **Eb** and the projection amount of the spring **37.** Therefore, it is possible to improve accuracy of charging or communication that is performed between the conducting part **39** and the terminal **Eb.** Further, there is a possibility of damaging the outer surface of the electrical apparatus **E,** if the conducting part **39** is projected from the outer surface **F1** of the wall part **F.** Hence, it is preferable that the vertex **T1** of the conducting part **39** is at the same surface level as the outer surface **F1** of the wall part **F.** As shown in FIG. 1, the conducting part **39** includes the convex shape **C2,** and further the recess and the upper end surface of the conducting part **39** are substantially at the same surface level as each other. For this reason, the conducting part **39** can be shifted sufficiently in the forward-back direction, and further, it is possible to decrease chances of **the** terminal **Eb** being hooked to an inner surface of the hole **601** upon attaching and removing of the electrical apparatus **E.** Therefore, it is possible to decrease chances of the terminal **Eb** being hooked to the inner surface of the hole **601** and suppress the damage of terminal **Eb** for example, when the electrical apparatus **E** is positioned into the connection device **1** or the electrical apparatus **E** is removed from the connection device **1.** Also, when the blade head **Ea** of the electrical apparatus **E** is inserted in the cleaning part **20,** the outer surface **F1** of the wall part **F** of the support block **6** comes into contact with the outer surface of the electrical apparatus **E,** and it is possible to suppress the possibility of the conducting part **39** damaging the outer surface of the electrical apparatus **E** by providing the outer surface **3901** of the conducting part **39** at the same surface level as the outer surface **F1,** and positioning the conducting part **39** behind the outer surface **F1.**

[0033] Further, the terminal **Eb** of the electrical apparatus **E** being in contact with the conducting part **39,** projects above the outer surface of the electrical apparatus **E.** However, the conducting part **39** is located near the vertex **T** of the outer surface **F1** of the support block **6,** and further, when the blade head **Ea** of the electrical apparatus **E** is inserted in the cleaning part **20,** the terminal **Eb** comes in contact with the conducting part **39** after passing on the long groove **60** provided in the wall part **F** of the support block **6** in the third direction. Therefore, it is possible to suppress possibility of the terminal **Eb** damaging the outer surface **F1** of the wall part **F** of the support block **6.**

[0034] Note that, as shown in FIG. 1 and FIG. 8, a contact pressure between the terminal **Eb** and the conducting part **39** is maintained by the terminal **Eb** pressing the conducting part **39** against the spring **37.** Further, since in longitudinal plan the conducting part **39** includes the convex shape **C2,** the conducting part **39** can give optimum operational feeling when the electrical apparatus **E** is positioned. Furthermore, the electrical apparatus **E** smoothly enters a state where maximum pressure from elastic bias of the spring **37** is given when the terminal

Eb of the electrical apparatus E slides and comes into contact with the conducting part **39**.

[0035] A variation of the connection device according to the embodiment is shown in FIG. 9. A basic configuration of the variation is similar to the above mentioned embodiment. However, the variation shown in FIG. 9 is different in that concave surfaces **61,** each of which is for leveling an outer surface **F1** of a wall part **F** with a surface of a conducting part **39,** are provided. On both lateral sides of each long groove **60** provided in the wall part **F,** two concave surfaces **61** are respectively provided so as to correspond to a vertex **T** of a convex shape **C1** which projects to the front of the outer surface **F1** of the wall part **F** of a support block **6.** The concave surfaces **61** can prevent occurrence of an uneven surface caused by a difference between a curvature of the convex shape **C1** of the outer surface **F1** which is located on the wall part **F** of the support block **6** and a curvature of a convex shape **C2** projecting to front of the conducting part **39.** Further, by providing the concave surfaces **61** on the both lateral sides of each long groove **60,** the wall part **F,** providing the conducting part **39,** can include a plan with reduced uneven surface between the convex shape **C1** and the convex shape **C2** in the right-left direction. This can reduce a terminal **Eb** being hooked to an inside surface of a hole **601** when the terminal **Eb** is slid in the right-left direction. Furthermore, the wall part **F** including the plan with reduced uneven surface as mentioned above, allows communization of more than two (three in the figure) parts provided in the support block **6** such as the conducting part **39.** In addition, it is possible to notify a user of the position of the conducting part **39** in a way so that the user can identify the position of the conducting part **39** instinctively. As well as that, the concave surfaces **61** can accommodate a change of a shape of the conducting part **39** or position of a terminal **Eb** of the electrical apparatus **E** through changing a shape or position of the concave surfaces **61**.

Claims

1. A connection device for an electrical apparatus, comprising:

a conducting part which comes into contact with a terminal projecting from an outer surface of the electrical apparatus to establish an electrical connection for charging or communication; and
a housing,
wherein the housing comprises:

a wall part; and
a hole which exposes the conducting part and is formed in the wall part of the housing, and
wherein an outer surface of the conducting part is located closer to an inside of the housing than an outer surface of the wall part, or at the same surface level as the outer surface of the wall part.

2. The connection device for the electrical apparatus of claim 1,
wherein a sectional configuration parallel to one direction, of the wall part is in a convex shape,
wherein a first vertex of the convex shaped wall part projects outward, and
wherein the conducting part is on an end of the vertex.

3. The connection device for the electrical apparatus of claim 2,
wherein the sectional configuration parallel to the one direction, of the conducting part is in a convex shape, and
wherein a second vertex of the convex shaped conducting part projects outward.

4. The connection device for the electrical apparatus of claim 2 or 3, wherein the one direction is an installation direction of the electrical apparatus to the connection device,
wherein the wall part includes a long groove that extends in the one direction, in an area surrounding the conducting part, and
wherein the conducting part is positioned inside the long groove.

5. The connection device for the small electrical apparatus of any one of claims 1 to 4, wherein a concave surface, which is located at the same surface level as the outer surface of the conducting part, is provided in a surface near the conducting part which is on an end of a vertex on the wall part.

FIG. 1

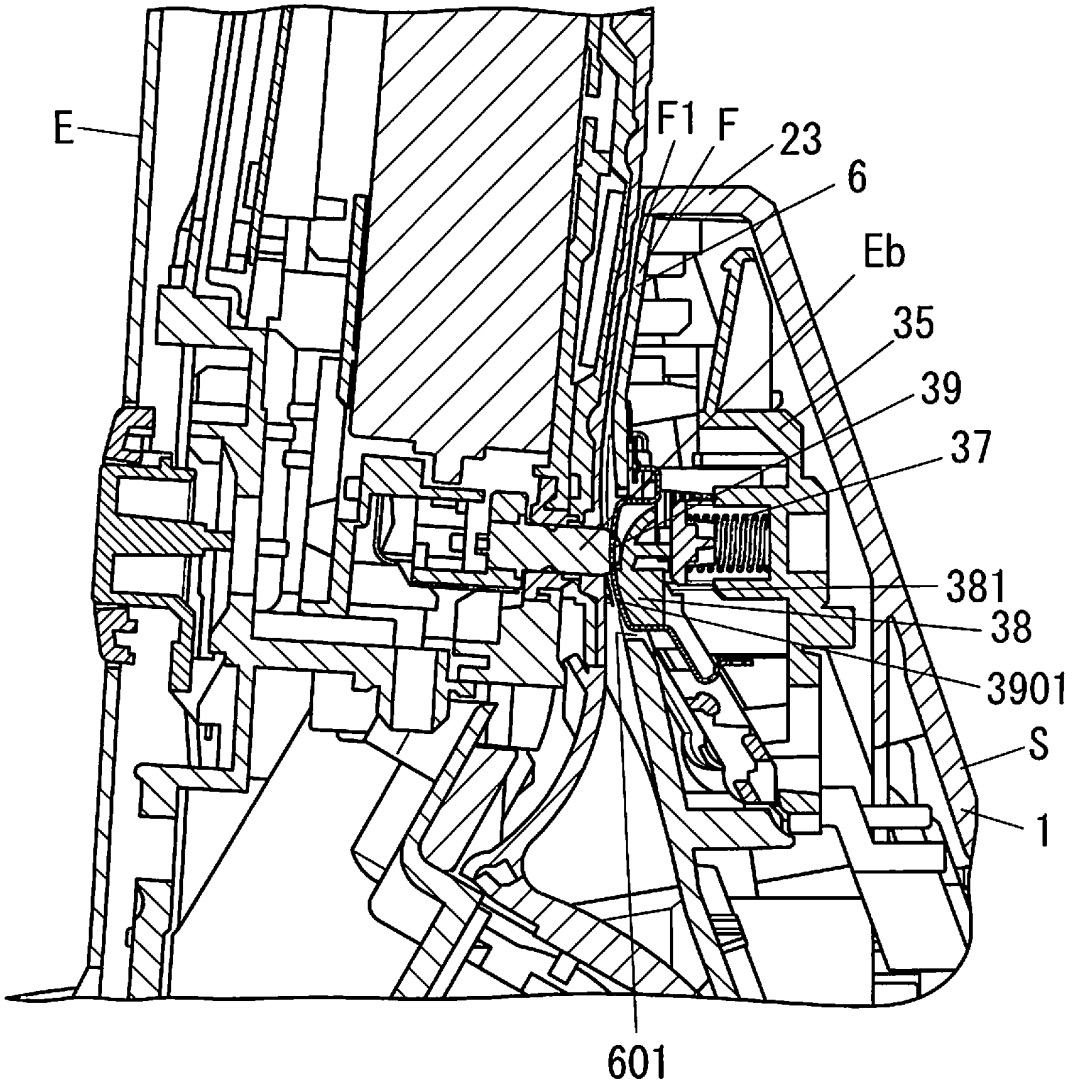

FIG. 2

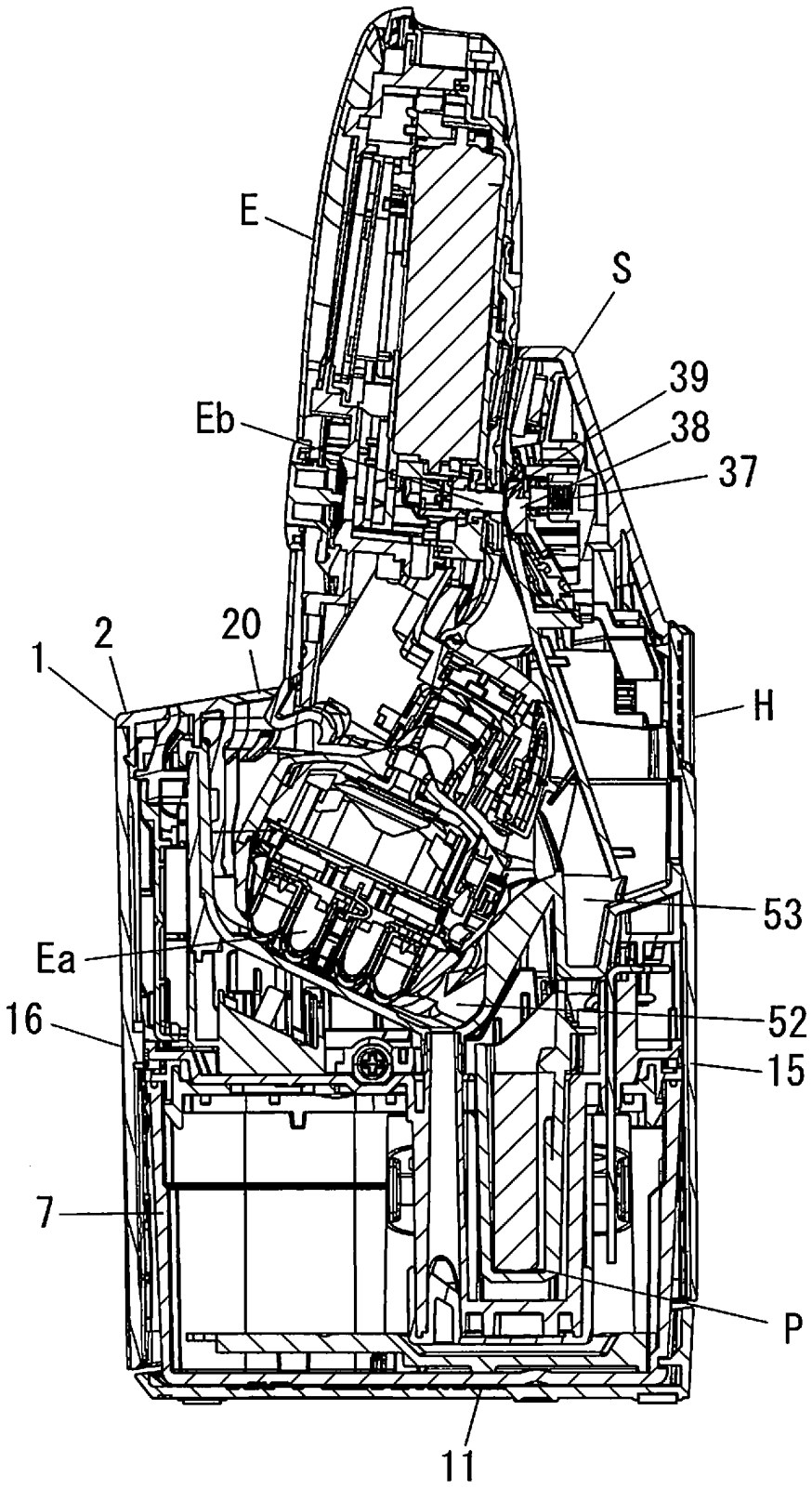

FIG. 3

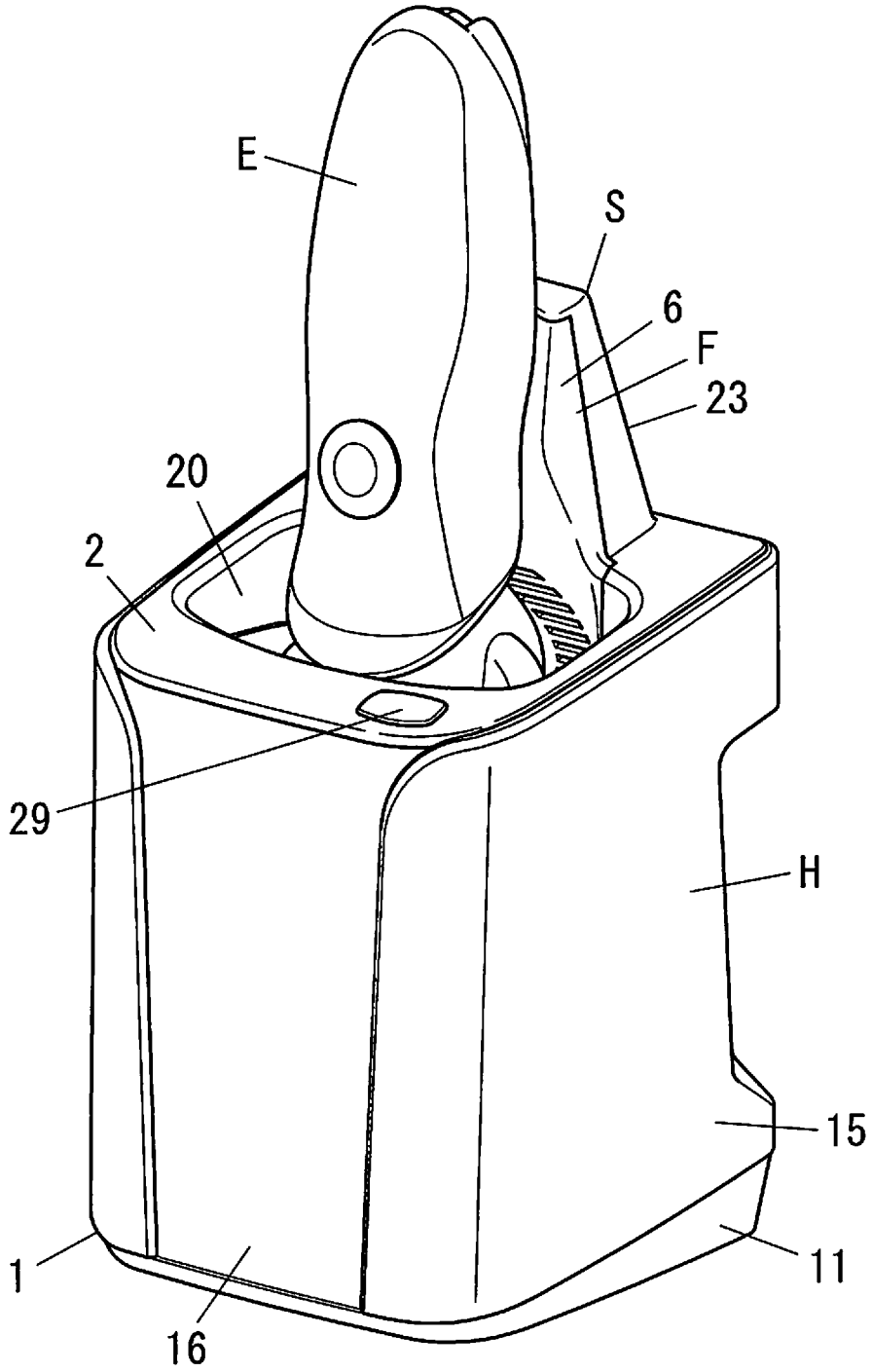

FIG. 4

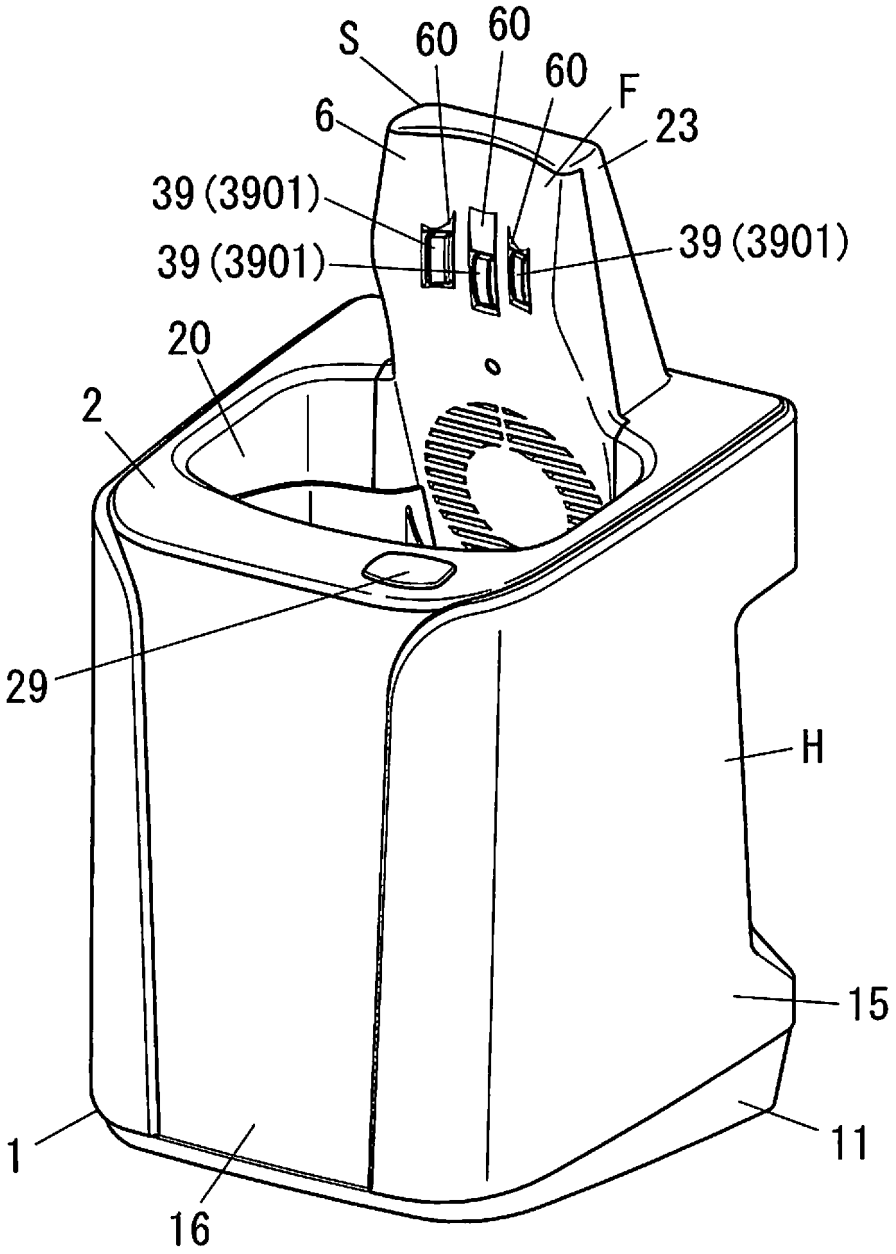

FIG. 5

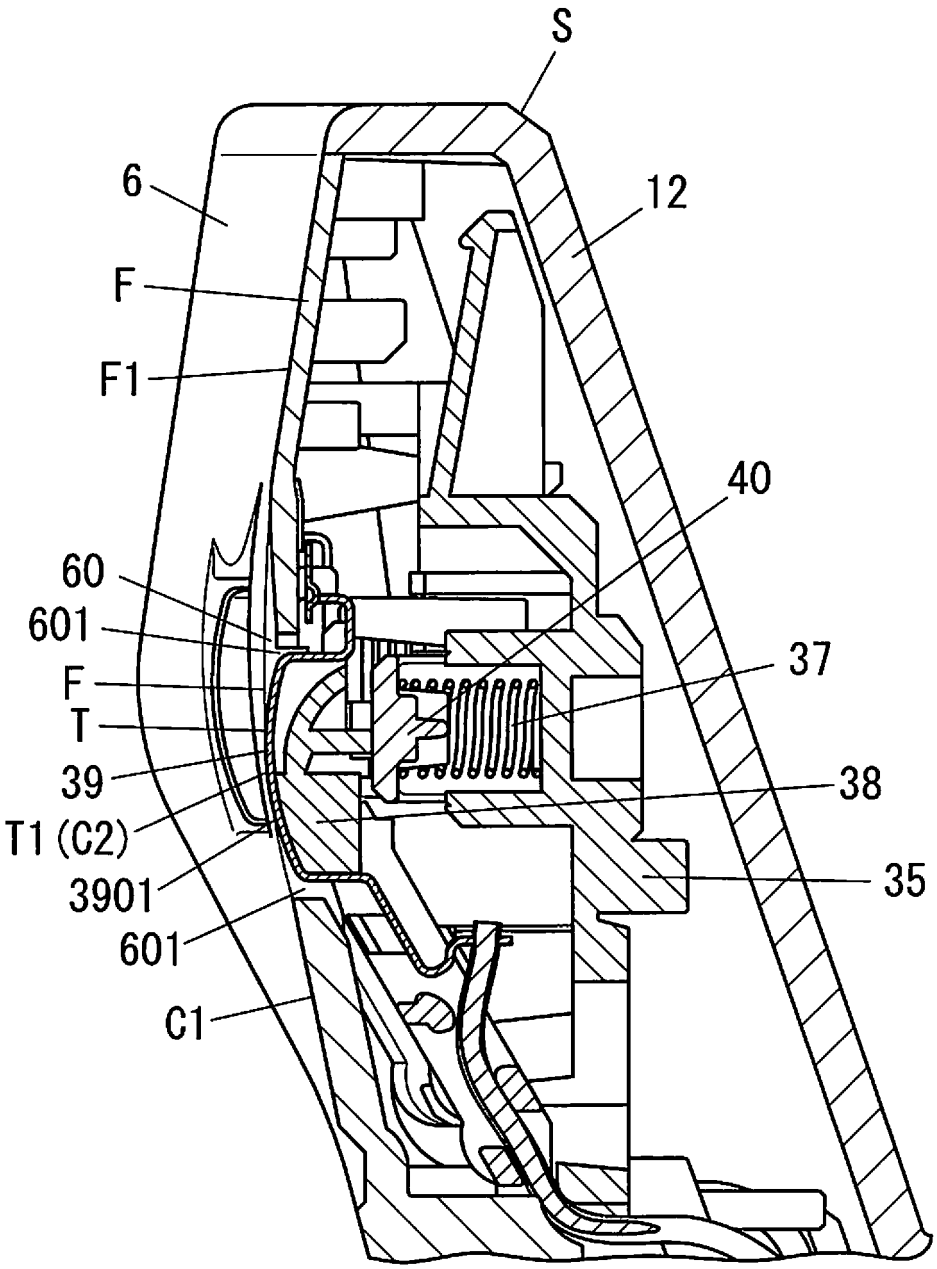

FIG. 6

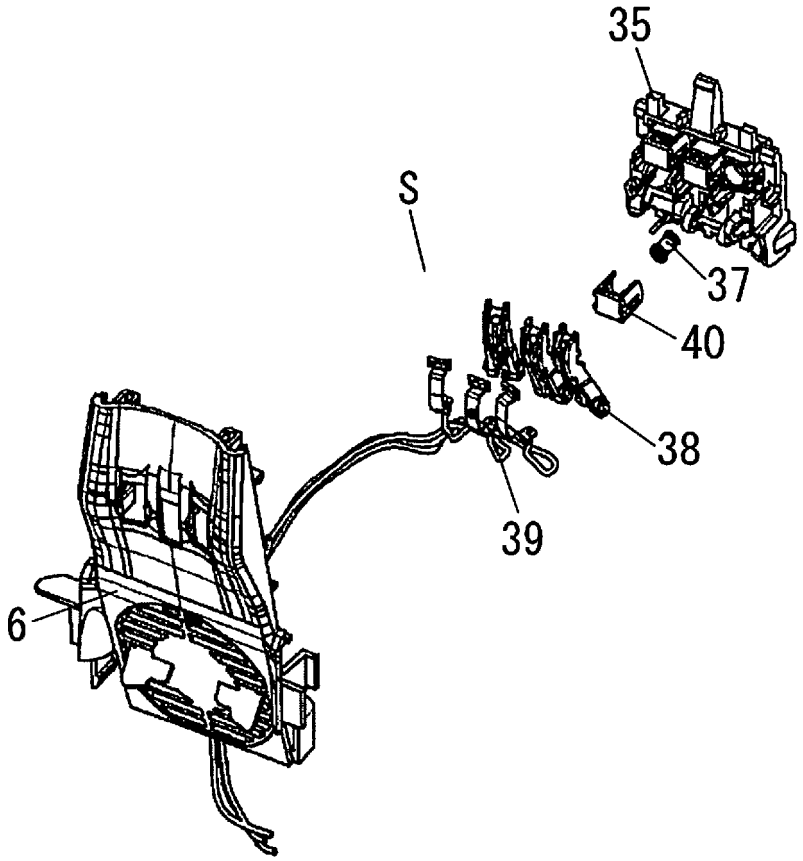

FIG. 7

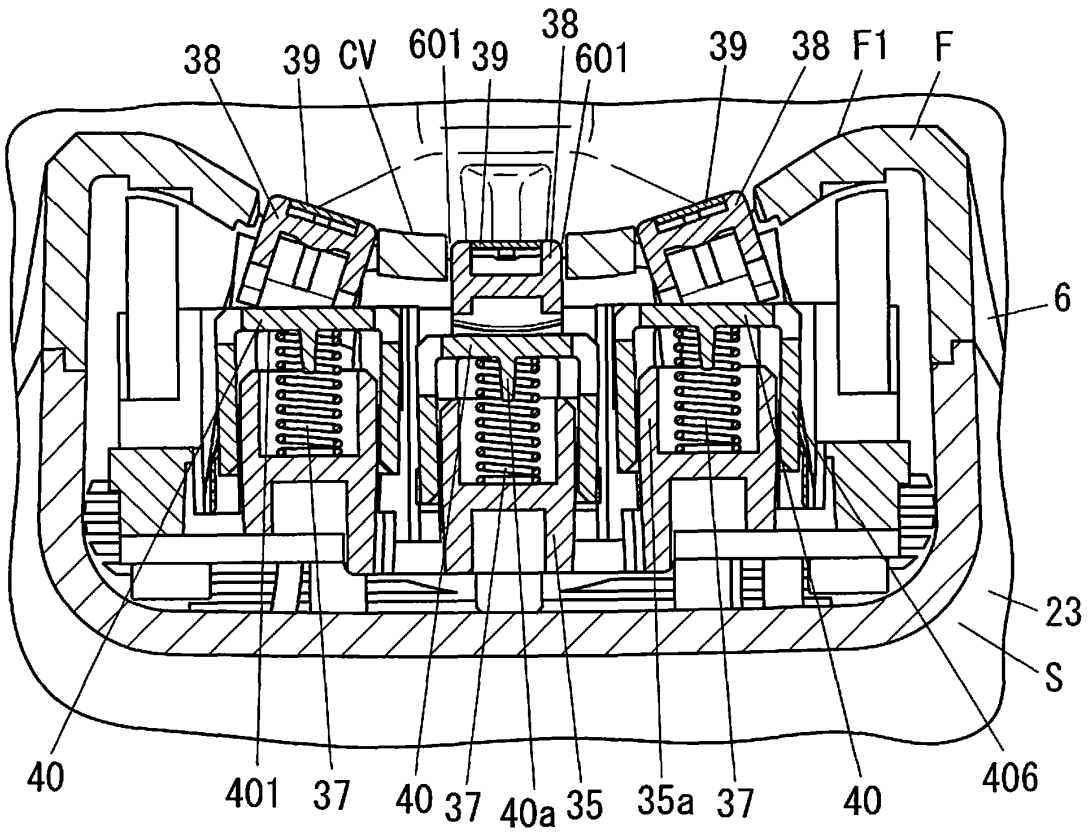
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FIG. 8

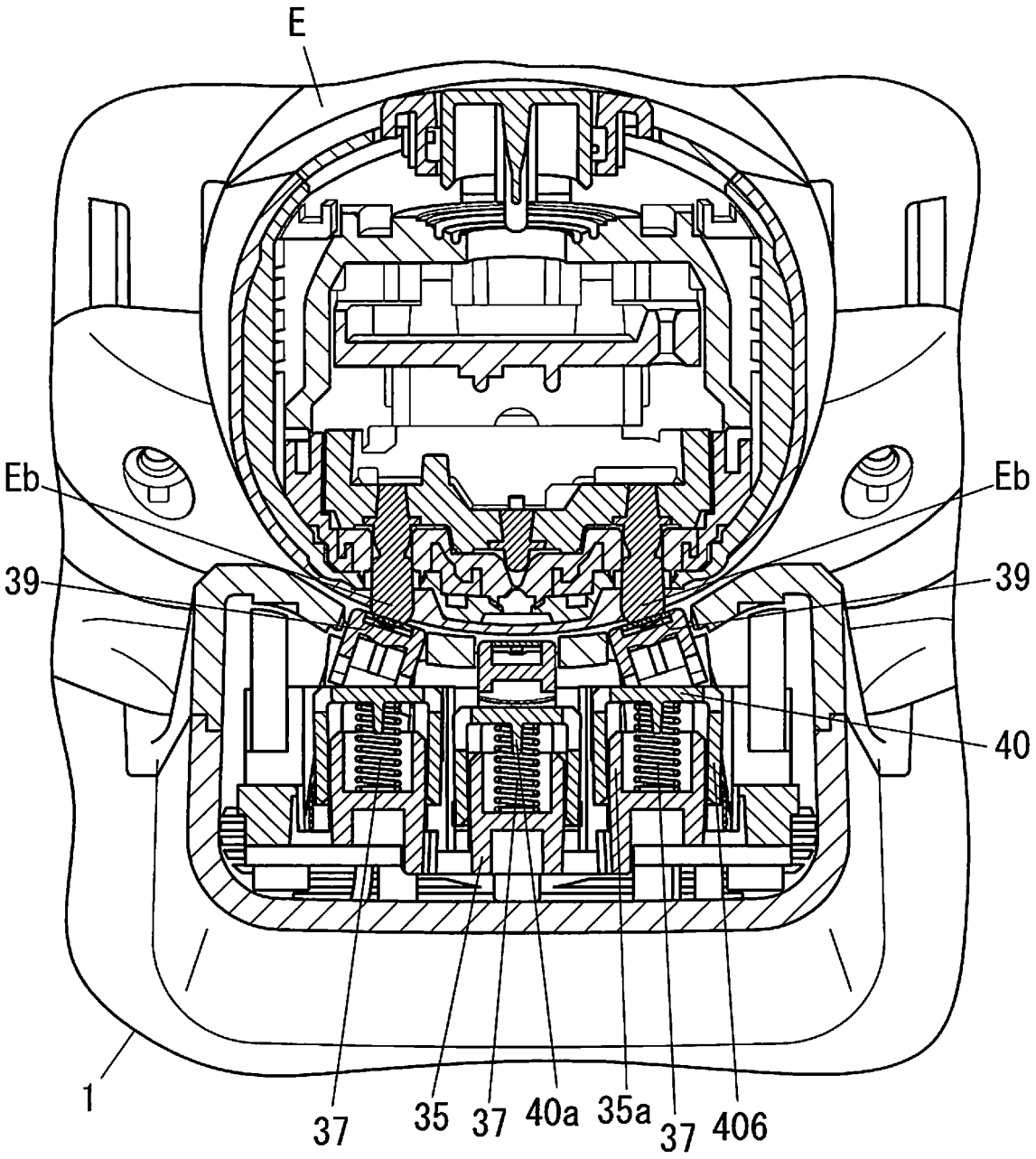
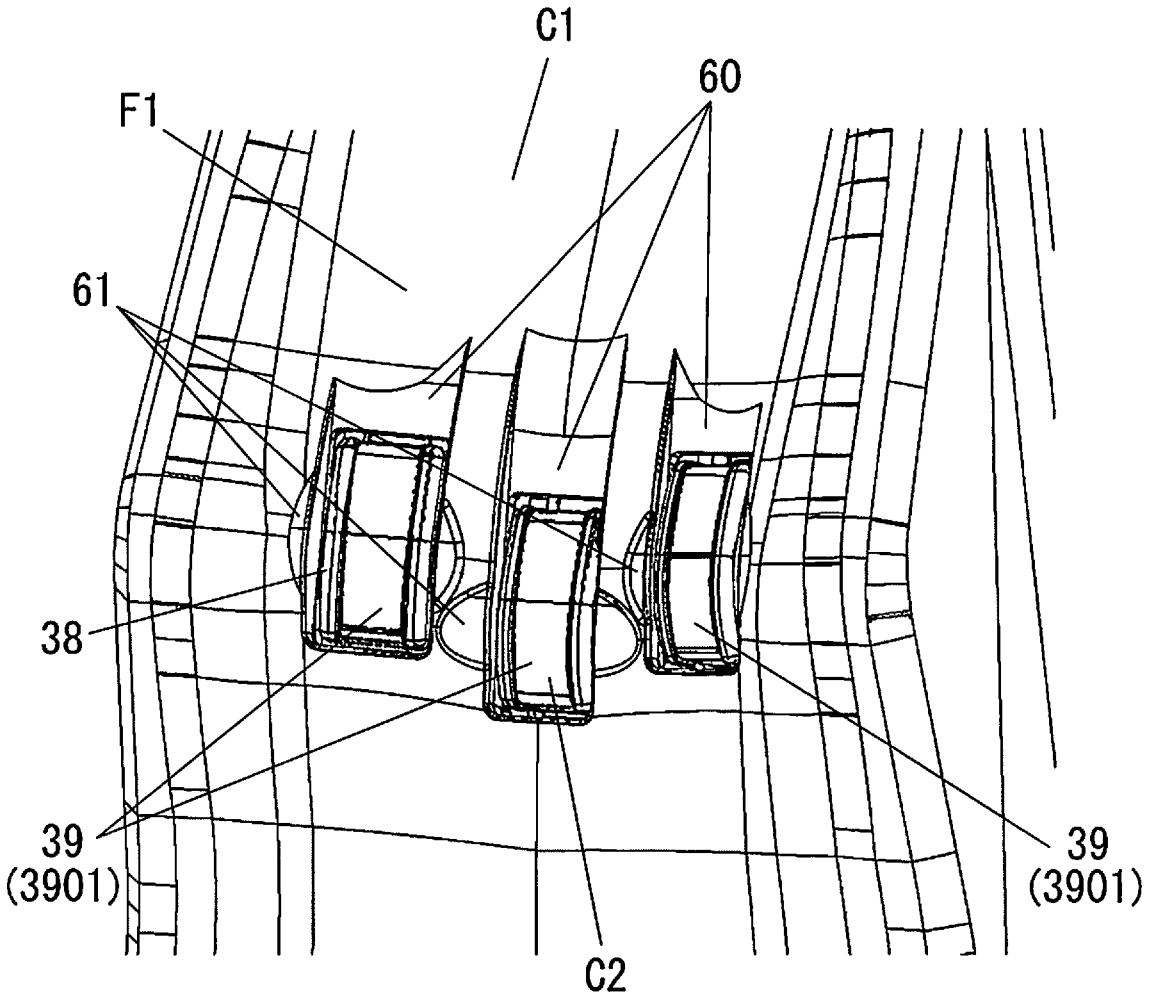


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/001493

A. CLASSIFICATION OF SUBJECT MATTER
B26B19/48(2006.01)i, *B26B19/38*(2006.01)i, *H01R4/48*(2006.01)i, *H01R13/40*(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B26B19/00-19/48, A45D27/00-27/48, H01R4/48, H01R13/40

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013
Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2009-261628 A (Panasonic Electric Works Co., Ltd.), 12 November 2009 (12.11.2009), paragraphs [0026] to [0030]; fig. 3 to 4 (Family: none)	1 2-4 5
Y	JP 2009-240048 A (Panasonic Electric Works Co., Ltd.), 15 October 2009 (15.10.2009), paragraphs [0010] to [0014]; fig. 1 to 3 & WO 2009/119312 A1	2-4

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 May, 2013 (30.05.13)	11 June, 2013 (11.06.13)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/001493

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-162203 A (Panasonic Electric Works Co., Ltd.), 29 July 2010 (29.07.2010), paragraphs [0019] to [0024]; fig. 2 to 3, 5 & US 2010/0181965 A1 & EP 2209179 A2 & CN 101783520 A	2-4
Y	JP 2010-162168 A (Panasonic Electric Works Co., Ltd.), 29 July 2010 (29.07.2010), paragraphs [0021] to [0023]; fig. 1 to 2 (Family: none)	2-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4842398 B **[0002]**