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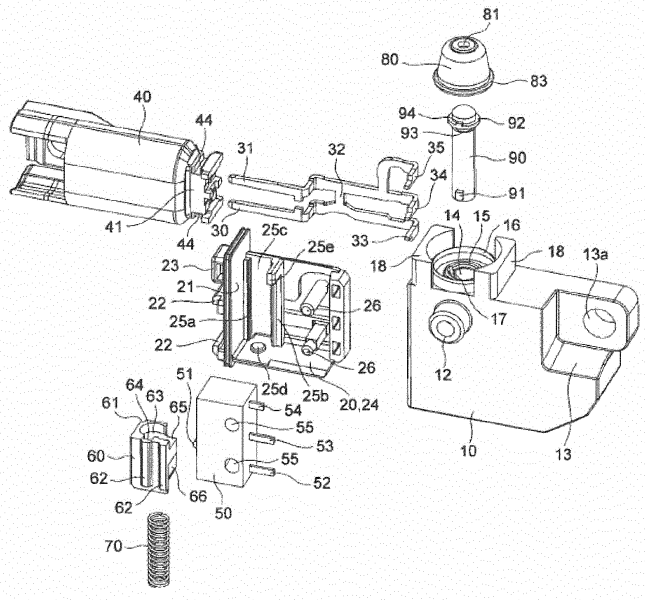
(54) **SWITCH**

(57) The present invention provides a high-productivity switch wherein a press button can be mounted after incorporating internal components into a housing. For this purpose, a press button (90) is inserted into an operating hole (14) in a housing (10) such that an engaging projection (91) provided on the lower end edge portion of the press button (90) is engaged with a first engaging groove (17) provided on the inner periphery surface of the operating hole (14). Further, said engaging projection (91) which passed through said first engaging groove (17) pushes a slider (60) downward while rotating said press button (90). Then, the engaging projection (91) of said press button (90) is engaged with a second engaging groove (64) which is provided on the inner periphery surface of a recessed portion (63) of said slider (60), whereby said slider (60) moves upward and holds said press button (90) in place.

Fig. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to a switch, particularly to a switch in which a press button can be retrofitted to a housing.

BACKGROUND ART

[0002] Conventionally, as a switch having a press button, there has been, for example, a switching device which includes a housing having an accommodating portion, an operating member for receiving pushing operation, a fixed contact constituted by a metal common contact and a metal switching contact vertically arranged in the accommodating portion, a movable contact having a contact portion which contacts on or separates from the switching contact, and a snap-action mechanism for driving the movable contact when the operating member is pushed to a prescribed position (refer to Patent Document 1).

[0003] Patent Document 1: Japanese Unexamined Patent Publication No. 2010-73662

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] However, as apparent from Fig. 2, the above-described switching device requires an upper case 21 preassembled with the operating member 5 to be assembled to a lower case 22. Accordingly, the assembly work involves a lot of efforts and requires skill, and there is a problem of productivity.

[0005] It is an object of the present invention to provide a high-productivity switch, in which a press button can be retrofitted to a housing preassembled with internal components.

MEANS FOR SOLVING THE PROBLEM

[0006] In order to solve the above-described problems, a switch according to the present invention, includes a housing having an operating hole, a press button inserted into the operating hole in the housing in a vertically reciprocating manner, a slider that is supported in a vertically reciprocating manner and is biased upward in the housing, the slider having a recessed portion that is provided on an upper end surface and is pushed down by a lower end portion of the press button, and a built-in switch having an operating button driven by the slider pushed down by the press button. The switch is configured such that an engaging projection provided on a lower end edge portion of the press button is engaged and inserted into a first engaging groove provided on an inner periphery surface of the operating hole in the housing, the slider is pushed down by the engaging projection which passed through the first engaging groove while rotating the press button, and the engaging projection of the press button is engaged with a second engaging groove provided on an inner periphery surface of the recessed portion of the slider, so that the slicer moves upward and holds the press button in place.

EFFECT OF THE INVENTION

[0007] According to the present invention, when the second engaging groove of the slider is engaged with the engaging projection of the press button, the press button is unable to return to the original position. As a result, the engaging projection of the press button does not come out of the first engaging groove in the housing, and the press button does not come out of the housing. Accordingly, the press button can easily be retrofitted to the housing in which internal components has been incorporated, thereby achieving a high-productivity switch.

[0008] As one embodiment of the present invention, the slider may be biased upward by a spring member accommodated in the housing.

[0009] According to the present embodiment, since the slider accommodated in the housing is biased upward, the occurrence of rattling of the slider is reduced.

[0010] Further, as another embodiment of the present invention, an axis center of the first engaging groove and an axis center of the second engaging groove may not be collinear.

[0011] According to the present embodiment, the axis center of the first engaging groove and the axis center of the second engaging groove are shifted in position from each other when seen from the upper surface, and the upward movement of the slider does not allow the press button to return to the original position, so that the press button does not come out of the housing.

[0012] As a different embodiment of the present invention, the engaging projection of the press button may be brought into contact with an inner ceiling surface in the housing.

[0013] According to the present embodiment, the press button is sandwiched by the inner ceiling surface in the housing and the slider which is biased upward, and the switch having no rattling can be obtained.

[0014] As still another embodiment of the present invention, a position regulating cutout portion provided on the upper end surface of the slider can be brought into contact with a position regulating piece provided in the housing.

[0015] According to the present embodiment, the position regulating cutout portion provided on the upper end surface of the slider which is biased upward can be brought into contact with the position regulating piece disposed in the housing. Therefore, a state where the slider is always biased upward can be obtained. Accordingly, the present invention has the advantage of providing a switch in which the slider has no rattling and false operation hardly occurs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Figs. 1A and 1B are perspective views of a switch according to the present invention seen from different angles.

Fig. 2 is an exploded perspective view of the switch illustrated in Figs. 1A.

Fig. 3 is an exploded perspective view of the switch illustrated in Figs. 1 B.

Figs. 4A and 4B are sectional views each illustrating before and after operation of the switch illustrated in Figs. 1A and 1B.

Figs. 5A and 5B are a perspective view and a partially sectional perspective view for describing an assembly method of a press button.

Figs. 6A and 6B are partially sectional perspective views for describing the assembly method of the press button following Figs. 5A and 5B.

Figs. 7A and 7B are partially sectional perspective views for describing the assembly method of the press button following Figs. 6A and 6B.

Figs. 8A and 8B are partially sectional perspective views for describing the assembly method of the press button following Figs. 7A and 7B.

Figs. 9A and 9B are partially sectional perspective views for describing the assembly method of the press button following Figs. 8A and 8B.

Figs. 10A and 10B are a longitudinal sectional view and a transverse sectional view for illustrating the press button of the fully assembled switch.

Figs. 11A, 11 Band 11C are sectional views for sequentially describing the assembly method of the press button.

MODE FOR CARRYING OUT THE INVENTION

[0017] Embodiments of a switch according to the present invention will be described with reference to the accompanied drawings in Figs. 1A to 11C.

[0018] As illustrated in Figs. 2 and 3 of the accompanied drawings, a switch according to the present embodiment includes a housing 10, a holder 20 with which contact terminals 30 and 31, a socket 40, a micro switch 50, a slider 60, and a coil spring 70 are assembled and is assembled with the housing 10 from the lateral direction, and a press button 90 which is, in junction with a rubber cap 80, assembled integrally with the housing 10.

[0019] As illustrated in Figs. 2 and 3, the housing 10 has a box-like shape with an opening 11 (Fig. 3) on one side surface thereof. On the front surface of the housing 10, a positioning projected portion 12 is projected and a fit-in step 13 is formed. A threaded hole 13a is provided on the side surface of the fit-in step 13.

[0020] Further, the housing 10 includes an operating hole 14 provided on the upper surface thereof, and also includes a small annular rib 15 and a large annular rib 16 concentrically provided on the opening edge portion of the operating hole 14. A first engaging groove 17 is vertically provided along the inner periphery surface of the small annular rib 15. Furthermore, on the outside of the large annular rib 16, a pair of protection walls 18, 18 is projected which is capable of protecting the press button 90 (to be described later) from external forces.

[0021] The holder 20 includes a side wall 21 which can be assembled from the opening 11 of the housing 10. A pair of engagement nails 22, 22 is projected so as to face each other on the outward surface of the side wall 21, and a pedestal portion 23 is projected to reduce the amount of sealing material required and to enhance the sealing strength.

[0022] Further, the holder 20 includes a base portion 24 having a substantially L-shape in cross section and projecting from the inward surface of the side wall 21, and a guiding projected thread 25a provided at the corner portion of the base portion 24. By providing a separating projected thread 25b in parallel with the guiding projected thread 25a, a guide groove 25c is formed for guiding the slider 60 (to be described later). A positioning projection 25d is provided on the bottom side of the guide groove 25c and on an inner bottom surface of the base portion 24 for positioning the coil spring 70 (to be described later). On the other hand, a position regulating piece 25e is projected toward a horizontal direction from an upper end portion of the separating projected thread 25b.

[0023] On an inner side surface of the base portion 24, a pair of shaft portions 26, 26, is projected for assembling the micro switch 50 (to be described later) therewith. Furthermore, on a proximal portion of the pair of shaft portions 26, 26, cutout grooves 27, 27 (Fig. 3) are provided for fitting the common fixed contact terminal 30 and the movable contact terminal 31 (both to be described later) therein.

[0024] The common fixed contact terminal 30 and the movable contact terminal 31 are press-formed, by punching in a press work integrally with a coupling portion 32 therebetween. From the opposing end portion of the movable contact terminal 31, a constantly-closed fixed contact connecting portion 34 and a constantly-opened fixed contact connecting portion 35 are extended.

[0025] It is to be noted that in assembling the switch, either the constantly-closed fixed contact connecting portion 34 or the constantly-opened fixed contact coupling portion 35 is to be cut out as needed, and the contact terminals are used with the coupling portion 32 being cut out.

[0026] The socket 40 has a cylindrical shape, to which a connector (not illustrated) can be inserted. As illustrated in Figs. 4A and 4B, the socket 40 includes a pair of terminal holes 42, 43 through which the common fixed contact terminal 30 and the movable contact terminal 31 can be inserted into a connecting portion 41 that is provided at one side of the socket 40, and a pair of engaging grooves 44, 44 (Figs. 2 and 3) provided so as to face each other across the pair of terminal holes 42, 43.

[0027] The micro switch 50, on one side-surface thereof, has an operating button 51 capable of slidably moving toward the direction of an axis center, and on the other side-surface thereof, has a common fixed contact terminal 52, a constantly-closed movable contact terminal 53, and a constantly-opened movable contact terminal 54, in a projected manner. Further, the micro switch 50 includes a pair of shaft holes 55, 55 provided so as to pass through the front and rear surfaces thereof.

[0028] As illustrated in Fig. 2, the slider 60 is a planar-shaped molded product which slidably fits in the guide groove 25c. The slider 60 includes a cutout portion 61 which fits in the guiding projected thread 25a formed at a corner portion on the rear side thereof, and includes a pair of sliding projected threads 62, 62 arranged in a line at a side surface on the front side thereof for reducing the contacting area. Further, on an upper surface thereof, the slider 60 has a recessed portion 63 in which a lower end portion 95 of the press button 90 (to be described later) is fitted. The recessed portion 63 includes a second engaging groove 64 provided on an inner periphery surface thereof, and includes a position regulating cutout portion 65 provided by cutting out a portion thereof. Immediately below the position regulating cutout portion 65, an operating tapered surface 66 is provided. Furthermore, on a lower end surface of the slider 60, a fitting hole 67 (Fig. 3) in which the coil spring 70 can be fitted is provided.

[0029] Although the first engaging groove 17 and the second engaging groove 64 are provided in a position shifted by 90 degrees from each other when seen from the upper surface, it is adequate unless they are collinear. They may be shifted in position, for example, by 45 degrees, 60 degrees, 120 degrees, or 180 degrees from each other.

[0030] The rubber cap 80 is a truncated-cone-shaped cylinder having an upper opening 81 with a smaller diameter and a lower opening 82 with a larger diameter, and includes an annular rib 83 provided on the outer peripheral edge portion of the lower opening 82. The annular rib 83 has a diameter which can be fitted into a gap between the small annular rib 15 and the large annular rib 16 in the housing 10.

[0031] The press button 90 has a cross-sectional shape which can be inserted to the operating hole 14 in the housing 10, includes an engaging projection 91 projecting at the lower end edge portion, and an engaging annular rib 92 that is projected at the upper end edge portion. The engaging annular rib 92 includes an annular narrow-neck portion 93 provided on the proximal portion thereof, and an indexing projection 94 provided on a position corresponding to the engaging projection 91. It is to be noted that a lower end portion 95 of the press button 90 has a dome-like shape that bulges downward in order to prevent uneven contact.

[0032] Next, an assembly method of the switch according to the present embodiment will be described. For convenience of description, a case where the constantly-closed movable contact connecting portion 34 is cut out and the constantly-opened movable contact connecting portion 35 is left as is will be described.

[0033] First, the cleaved common fixed contact terminal 30 and the movable contact terminal 31 are respectively inserted into the terminal holes 42 and 43 of the socket 40 to perform positioning, and subsequently, the pair of engaging grooves 44, 44 of the socket 40 are engaged with the pair of engagement nails 22, 22 of the holder 20 for sliding therealong. Then, the common fixed contact terminal 30 and the movable contact terminal 31 are fitted in the corresponding cut out grooves 27, 27 of the holder 20.

[0034] Then, the pair of shaft holes 55, 55 of the micro switch 50 are inserted into the pair of shaft portions 26 of the holder 20, and a common fixed contact connecting portion 33 and constantly-opened movable contact connecting portion 35 are soldered to the common fixed contact terminal 52 and the movable contact terminal 54. Further, the slider 60 preassembled with the coil spring 70 is assembled with the guide groove 25c of the holder 20. At this time, the position regulating cutout portion 65 of the slider 60 is brought into contact with the position regulating piece 25e of the holder 20 to be temporarily stopped. Furthermore, the holder 20 is inserted from the opening 11 in the housing 10, and subsequently a sealing material (not illustrated) is injected into the outward surface of the side wall 21 and is solidified therein for sealing the outward surface.

[0035] After that, as illustrated in Figs. 5A and 5B, the lower end portion 95 of the press button 90 is press fitted into the rubber cap 80 from the upper opening 81, and the narrow-neck portion 93 of the press button 90 is engaged with the upper opening 81 of the rubber cap 80 to hold the press button 90 in place. Then, the engaging projection 91 of the press button 90 is fitted and inserted into the first engaging groove 17 provided in the operating hole 14 in the housing 10 (Fig. 11A). Furthermore, against the spring force of the coil spring 70, the slider 60 is pushed down by the engaging projection 91 of the press button 90 (Figs. 11B, 6A and 6B), after the engaging projection 91 passes through the first engaging groove 17 (Figs. 7A and 7B), the engaging projection 91 of the press button 90 rotates toward the second engaging groove 64 of the slider 60 (Figs. 8A and 8B). When the engaging projection 91 is engaged with the second engaging groove 64 of the slider 60, the slider 60 is pushed upward by the spring force of the coil spring 70, so that the position of the slider 60 is regulated (Figs. 9A and 9B). Further, the engaging projection 91 of the press button 90 is brought into contact with the inner ceiling surface 10a in the housing 10, so that the position of the press button 90 is regulated (Figs. 10A and 10B). With this configuration, due to the engagement of the slider 60 with the second engaging groove 64, the press button 90 is unable to rotate, and thus is held in place. Finally, the annular rib 83 of the rubber cap 80 is sealed by thermally caulking the large annular rib 16.

[0036] It is to be noted that after completion of the assembly, the slider 60 and the position regulating piece 25e of the holder 20 are not in contact with each other (Fig. 11C). Further, in Figs. 4A and 11C, although the tapered surface 66 of the slider 60 and the operating button 51 of the micro switch 50 appear to be in contact with each other, there is a microgap between the tapered surface 66 and the operating button 51, and they are thus not in contact with each other.

[0037] In the present embodiment, since the slider 60 is biased upward by the spring force of the coil spring 70, no rattling is generated. Further, in the completely assembled switch, the tapered surface 66 of the slider 60 is not contact with the operating button 51 of the micro switch 50, which offers the advantage of preventing the occurrence of false operation due to vibration, or the like.

[0038] Next, an operation method of the switch will be described.

[0039] First, as illustrated in Fig. 4A, in non-load state, since the slider 60 is biased upward by the spring force of the coil spring 70, and the press button 90 is also biased upward with the slider 60 interposed between the press button 90 and the coil spring 70, rattling is not generated in the slider 60. Further, since there is a microgap between the operating tapered surface 66 of the slider 60 and the operating button 51 of the micro switch 50, the operating tapered surface 66 and the operating button 51 are not brought into contact with each other.

[0040] Then, as illustrated in Fig. 4B, when the press button 90 pushes down the slider 60 against the spring force of the coil spring 70, the operating tapered surface 66 of the slider 60 pushes the operating button 51 of the micro switch 50, so that the constantly-opened movable contact (not illustrated) is brought into contact with the common fixed contact.

[0041] After that, when the pushing force on the press button 90 is released, the slider 60 is pushed upward by the spring force of the coil spring 70. Accordingly, when the load on the operating button 51 of the micro switch 50 is released, the operating button 51 returns to the original state, so that the constantly-opened movable contact (not illustrated) is separated from the common fixed contact.

[0042] It is to be noted that the engaging projection 91 of the press button 90 is locked to the inner ceiling surface 10a of the housing 10 (Figs. 10A and 10B), so that the press button 90 does not come out of the housing 10, and the slider 60 is brought in contact with the press button 90, and the position of the slider 60 is regulated to have the press button 90 returned to the original state (Fig. 4A).

[0043] Further, in the above-described embodiment, for convenience of description, there has been described a case where the press button 90 is vertically operable from the operating hole 14 provided on the upper surface of the housing 10. However, the present invention is not necessarily restricted to this. It is obvious that for example, a configuration may be employed, in which the press button 90 is operable from an operating hole provided on the side surface, the front surface, or the bottom surface of the housing 10.

INDUSTRIAL APPLICABILITY

[0044] The switch according to the present invention is not limited to the switch described above, and may obviously be applied also to other switches.

DESCRIPTION OF SYMBOLS

[0045]

10: Housing
10a: Inner ceiling surface
11: Opening
14: Operating hole
17: First engaging groove
20: Holder
21: Side wall
24: Base having substantially L-shaped cross section
25a: Guiding projected thread
25b: Separating projected thread
25c: Guide groove
25e: Position regulating piece
30: Common fixed contact terminal
31: Movable contact terminal
40: Socket
50: Micro switch
51: Operating button
60: Slider
63: Recessed portion
64: Second engaging groove
65: Position regulating cutout portion
66: Operating tapered surface
70: Coil spring
80: Rubber cap
90: Press button
91: Engaging projection
92: Engaging annular rib
95: Lower end portion

Claims

1. A switch comprising:

a housing having an operating hole;
a press button inserted into the operating hole in the housing in a vertically reciprocating manner;
a slider that is supported in a vertically reciprocating manner and is biased upward in the housing, the slider having a recessed portion that is provided on an upper end surface of the slider and is pushed down by a lower end portion of

the press button; and
a built-in switch having an operating button driven by the slider that is pushed down by the press button,
wherein an engaging projection provided on a lower end edge portion of the press button is engaged with and inserted into a first engaging groove provided on an inner periphery surface of the operating hole in the housing, the slider is pushed down by the engaging projection that passes through the first engaging groove while rotating the press button, and the engaging projection of the press button is engaged with a second engaging groove provided on an inner periphery surface of the recessed portion of the slider, so that the slider moves upward and holds the press button in place.

2. The switch according to claim 1, wherein the slider is biased upward by a spring member accommodated in the housing.

3. The switch according to claim 1 or claim 2, wherein an axis center of the first engaging groove and an axis center of the second engaging groove are not collinear.

4. The switch according to any one of claims 1 to 3, wherein the engaging projection of the press button is brought into contact with an inner ceiling surface of the housing.

5. The switch according to any one of claims 1 to 4, wherein a position regulating cutout portion provided on the upper end surface of the slider is brought into contact with a position regulating piece disposed in the housing.

Fig. 1

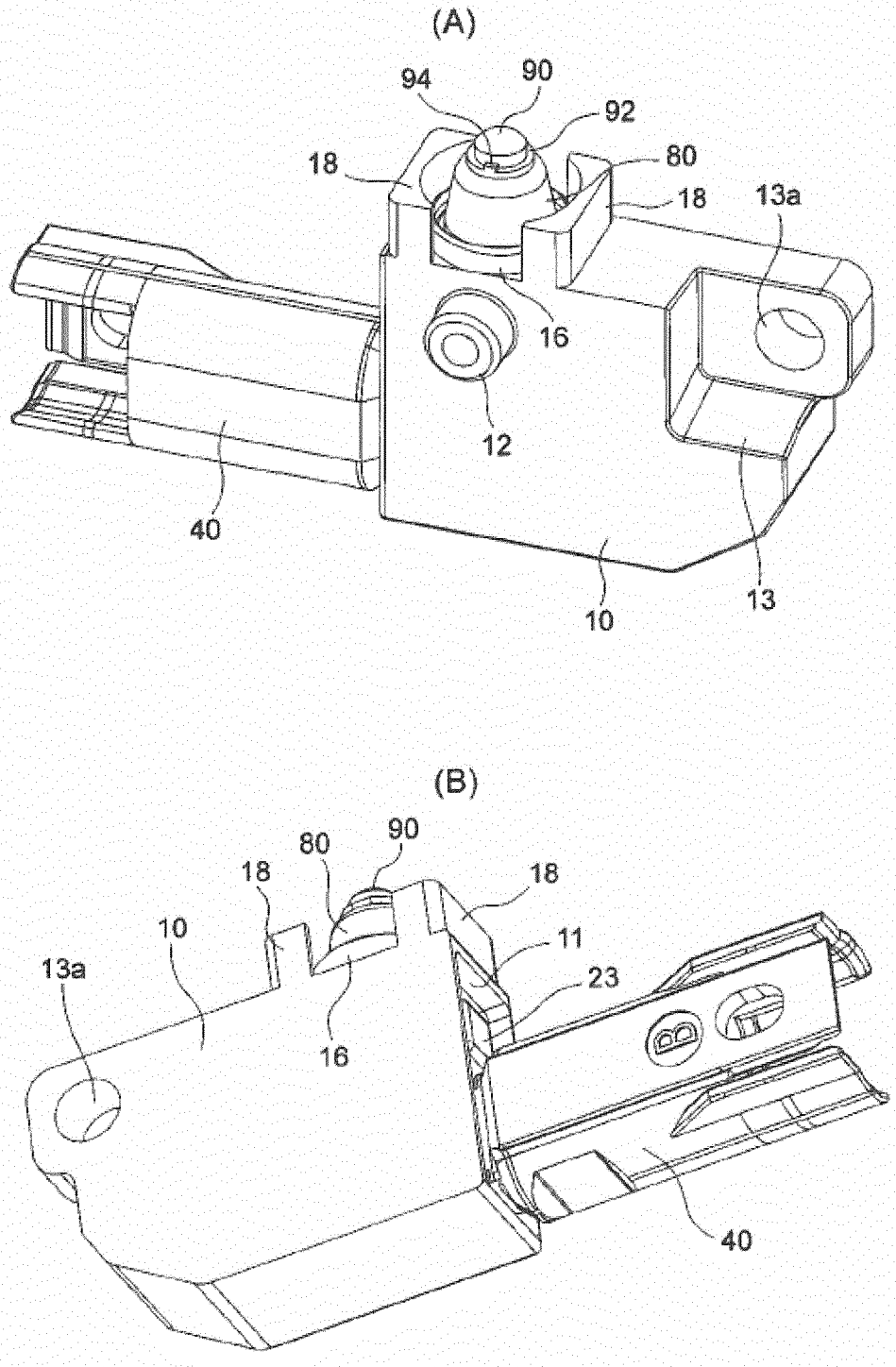

Fig. 2

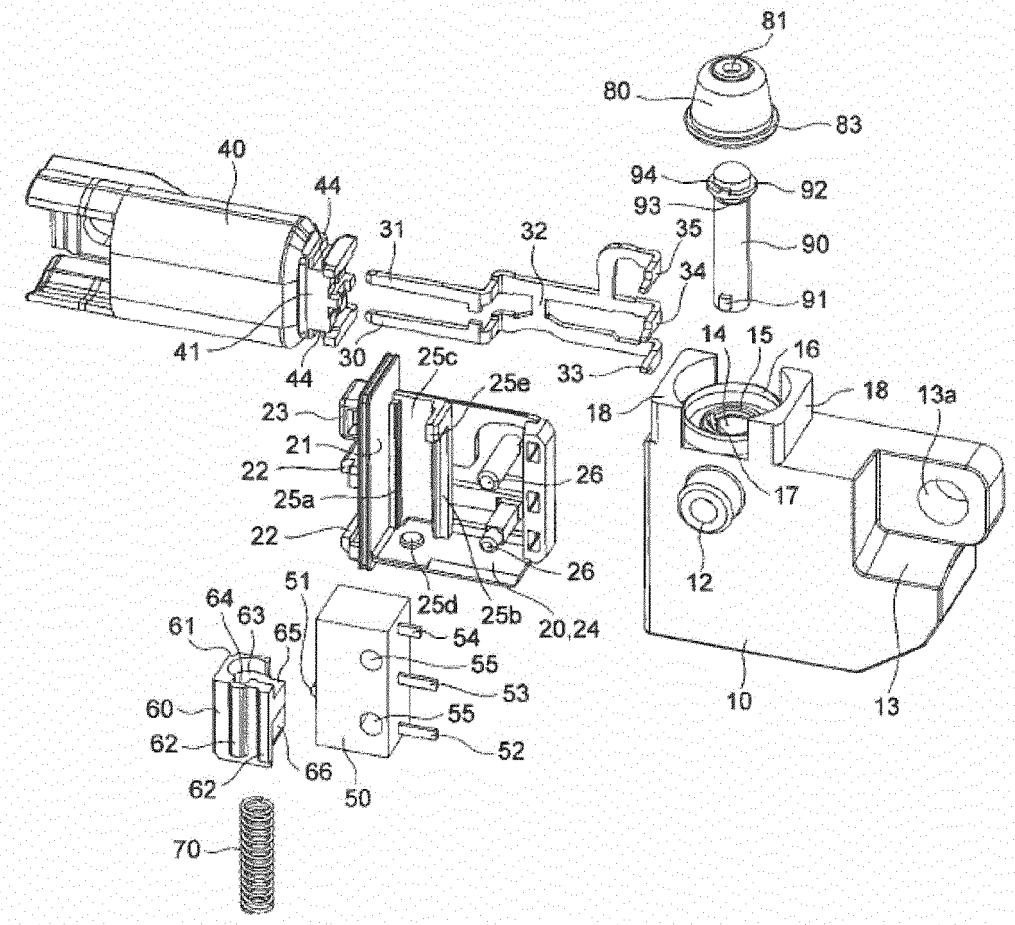
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Fig. 3

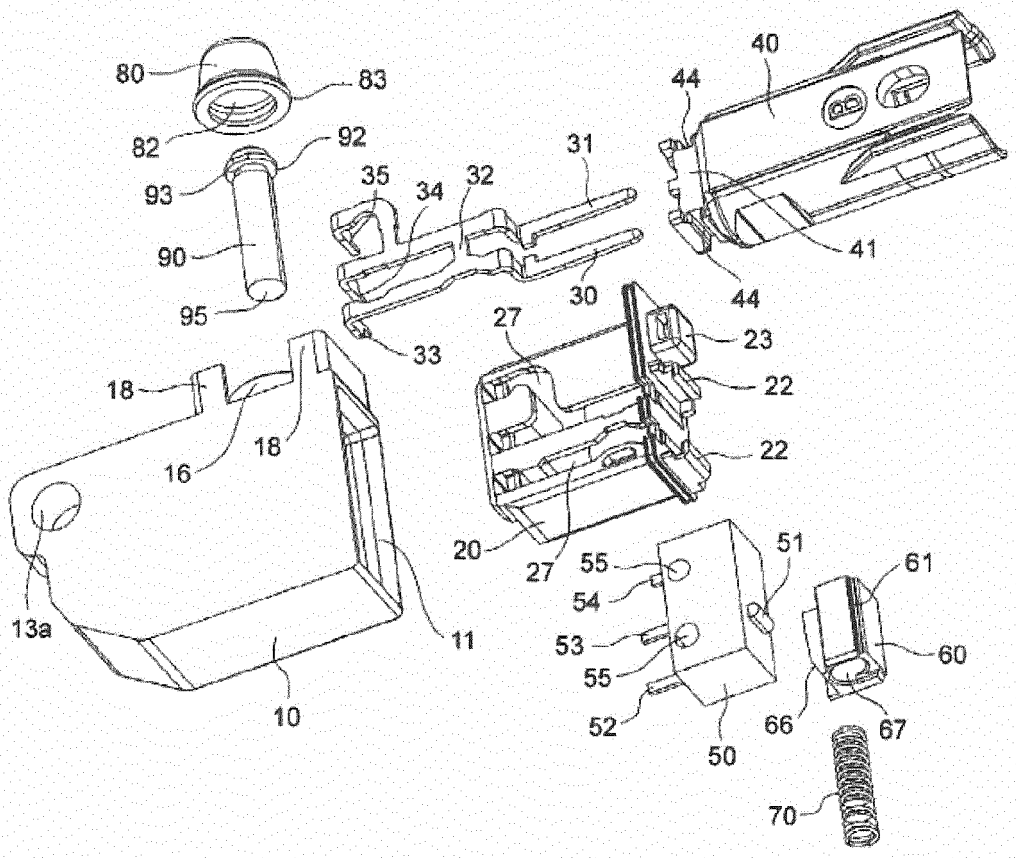
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Fig. 4

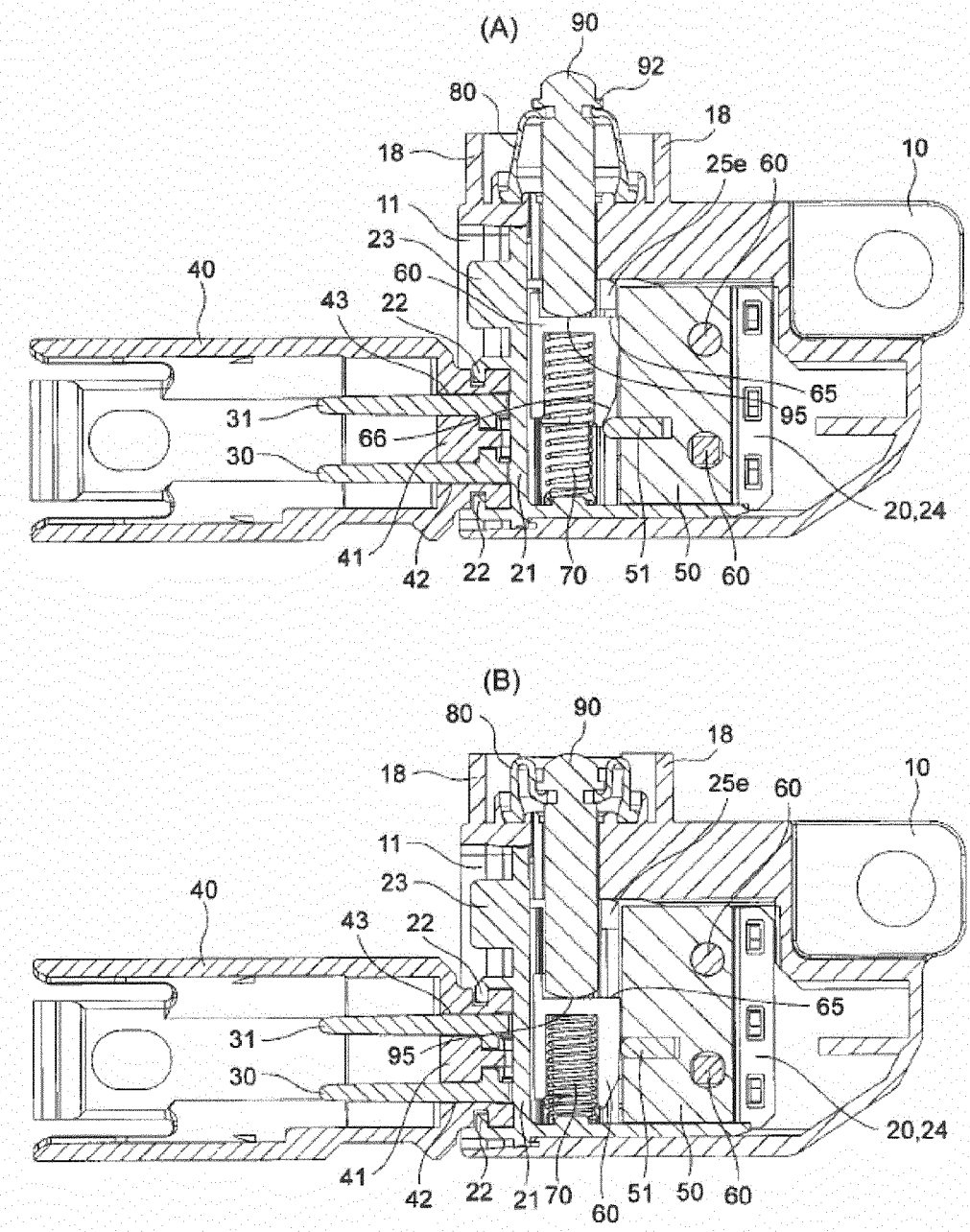
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Fig. 5

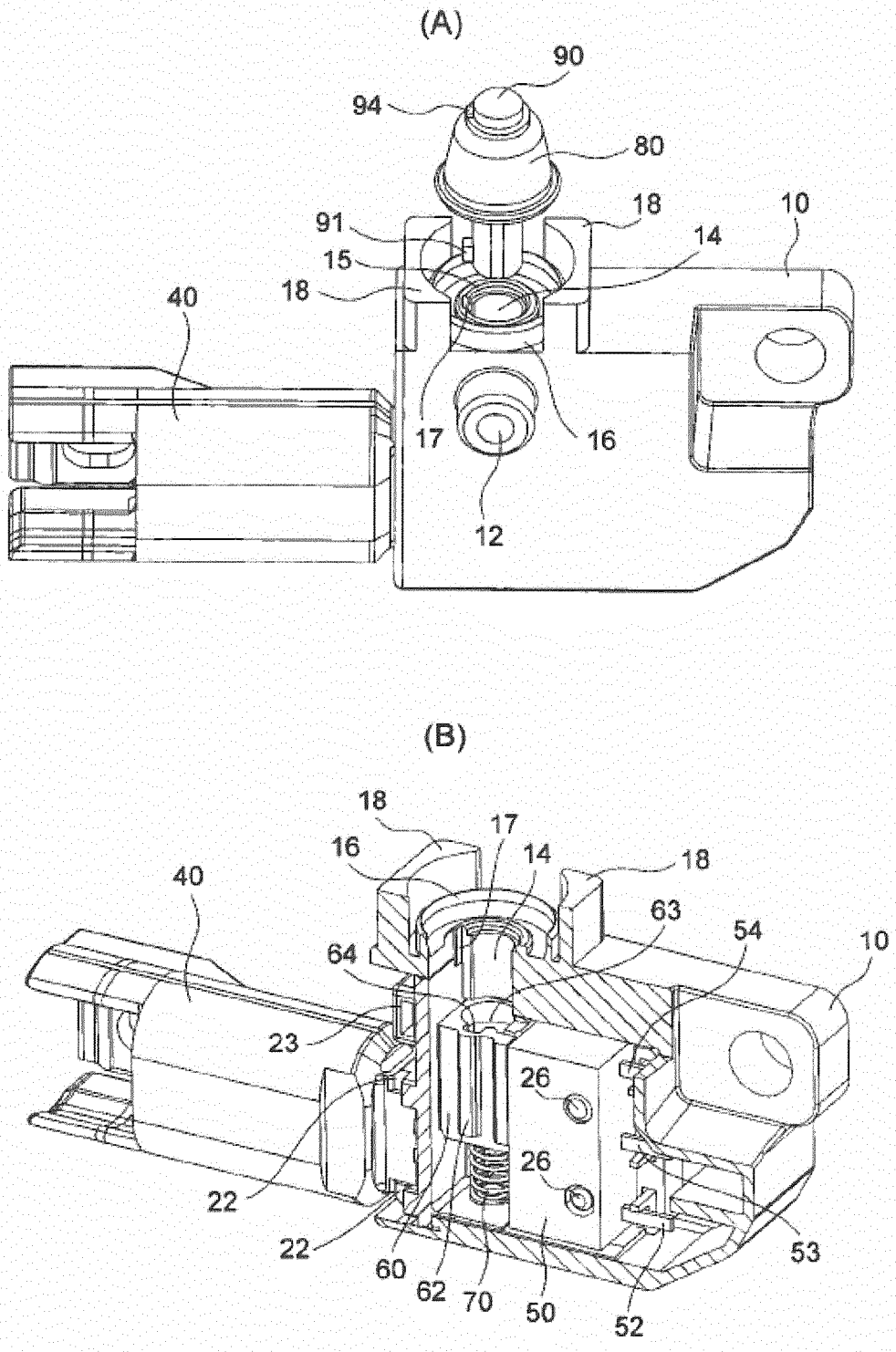
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Fig. 6

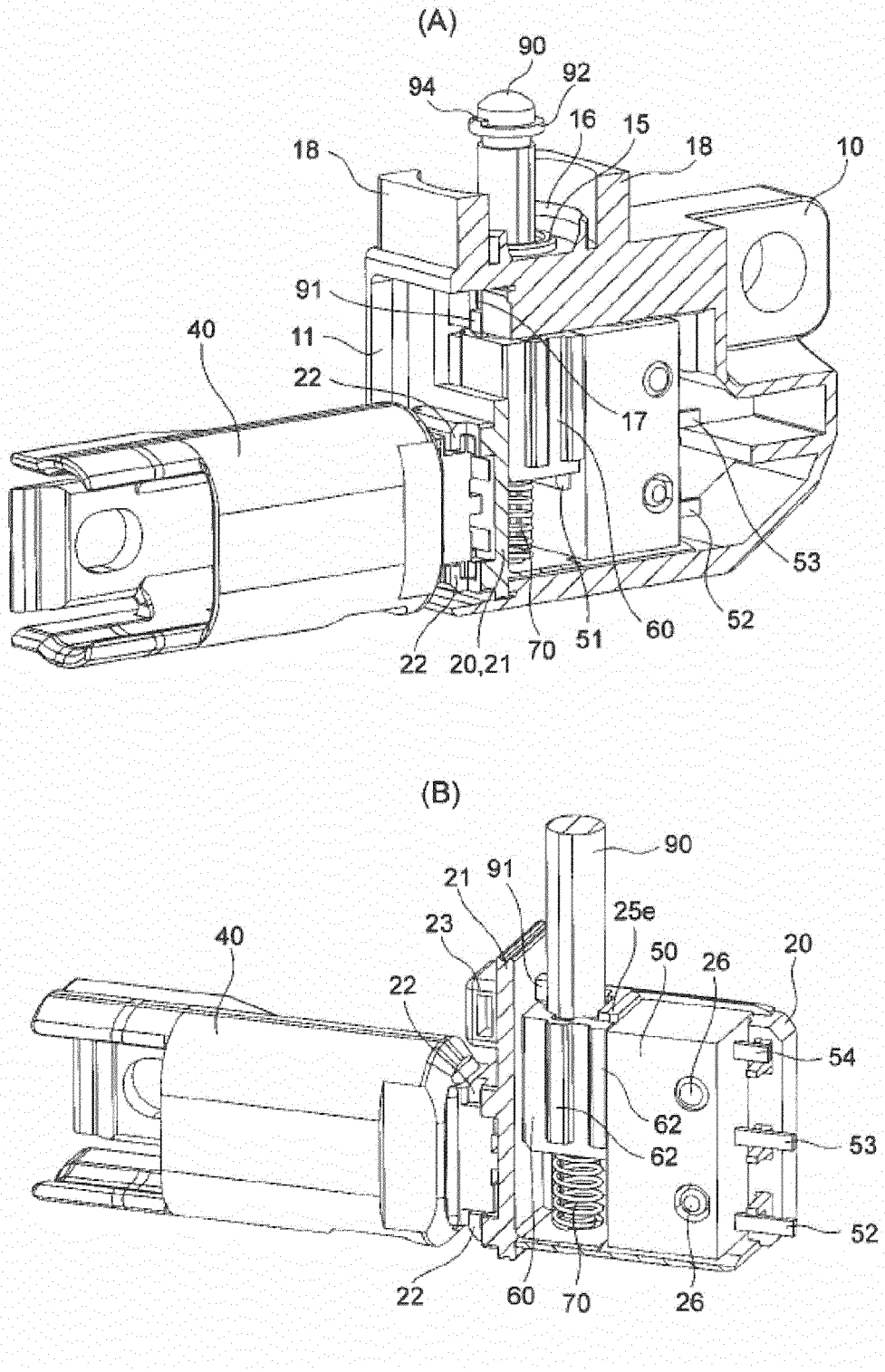
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Fig. 7

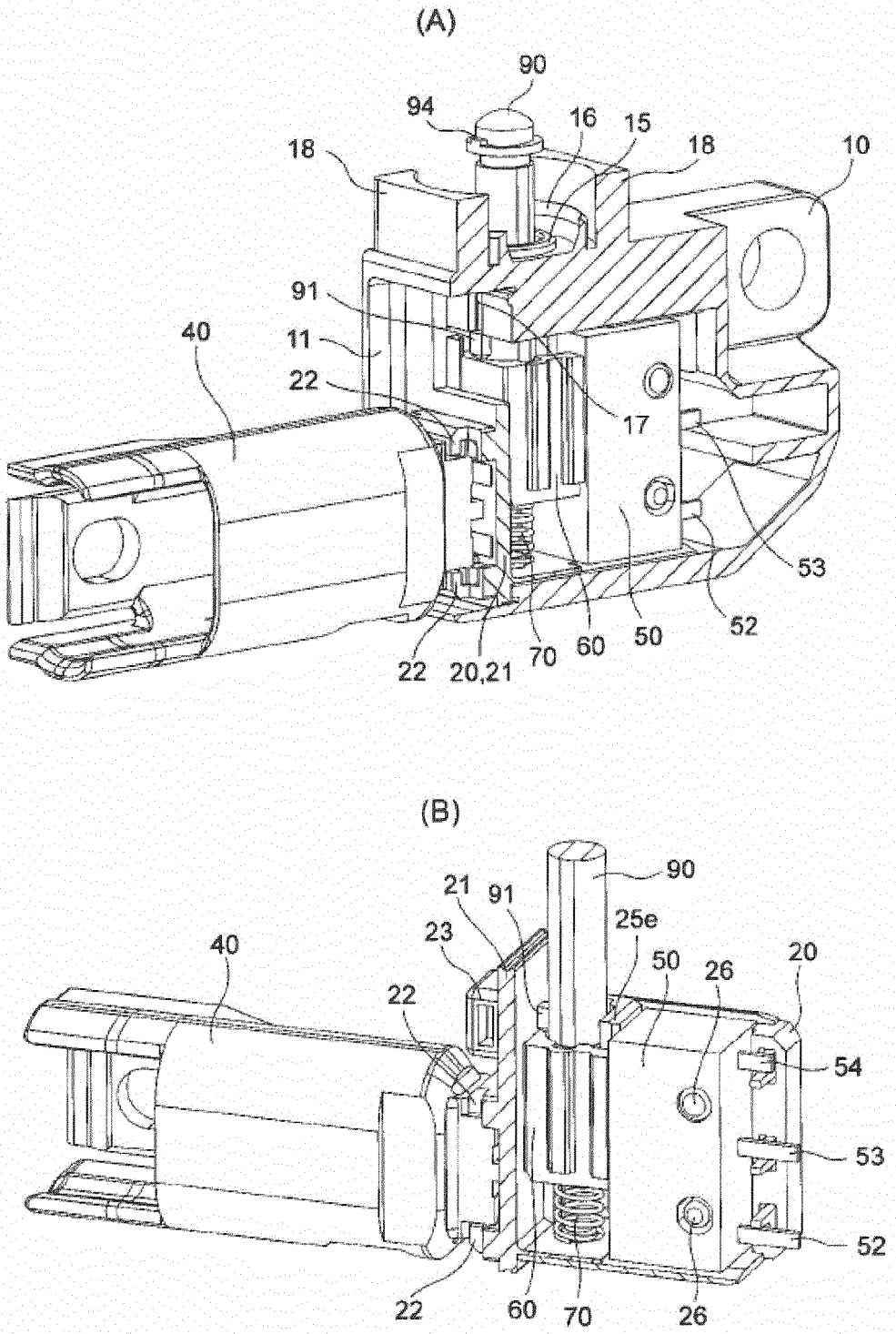
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Fig. 8

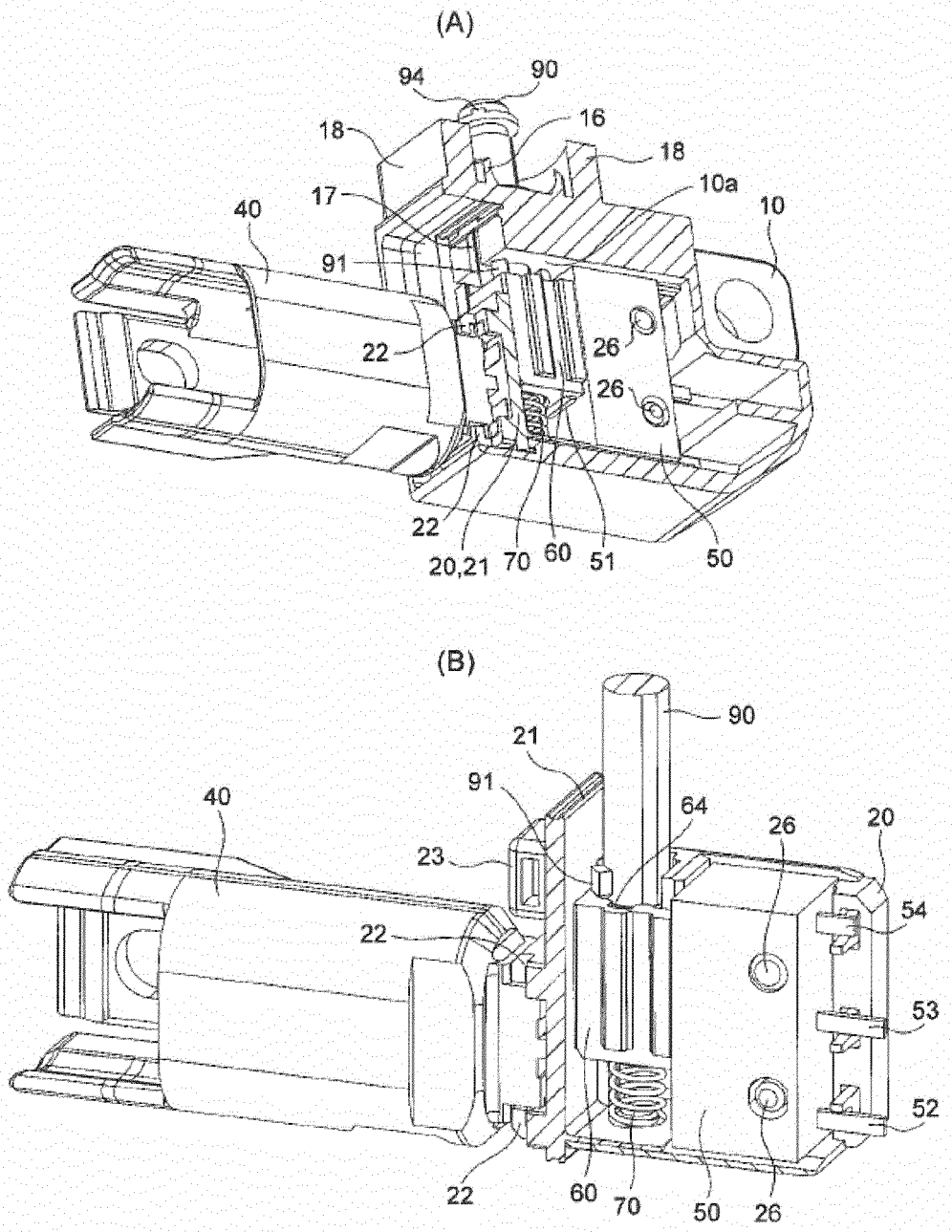
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Fig. 9

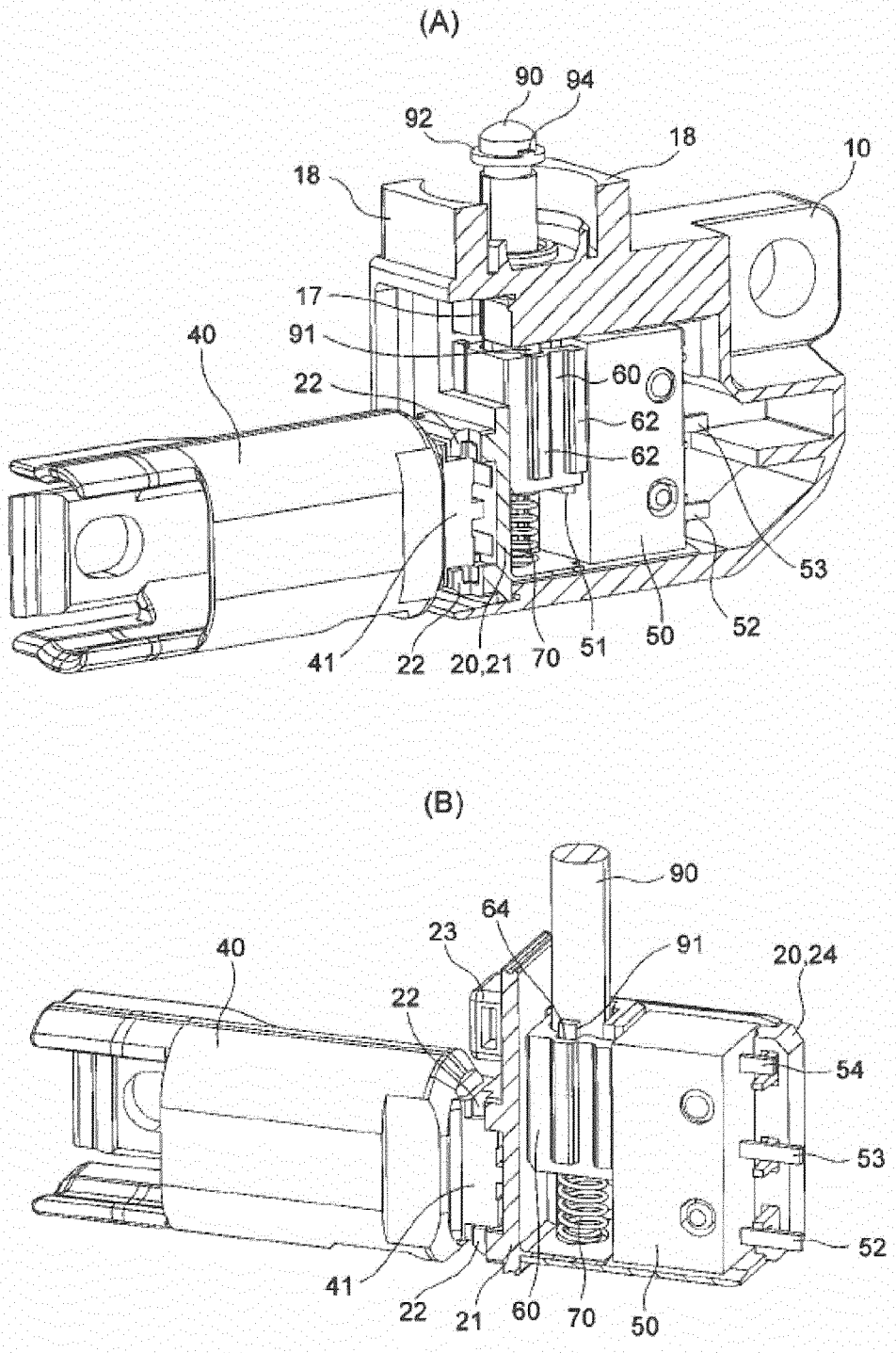
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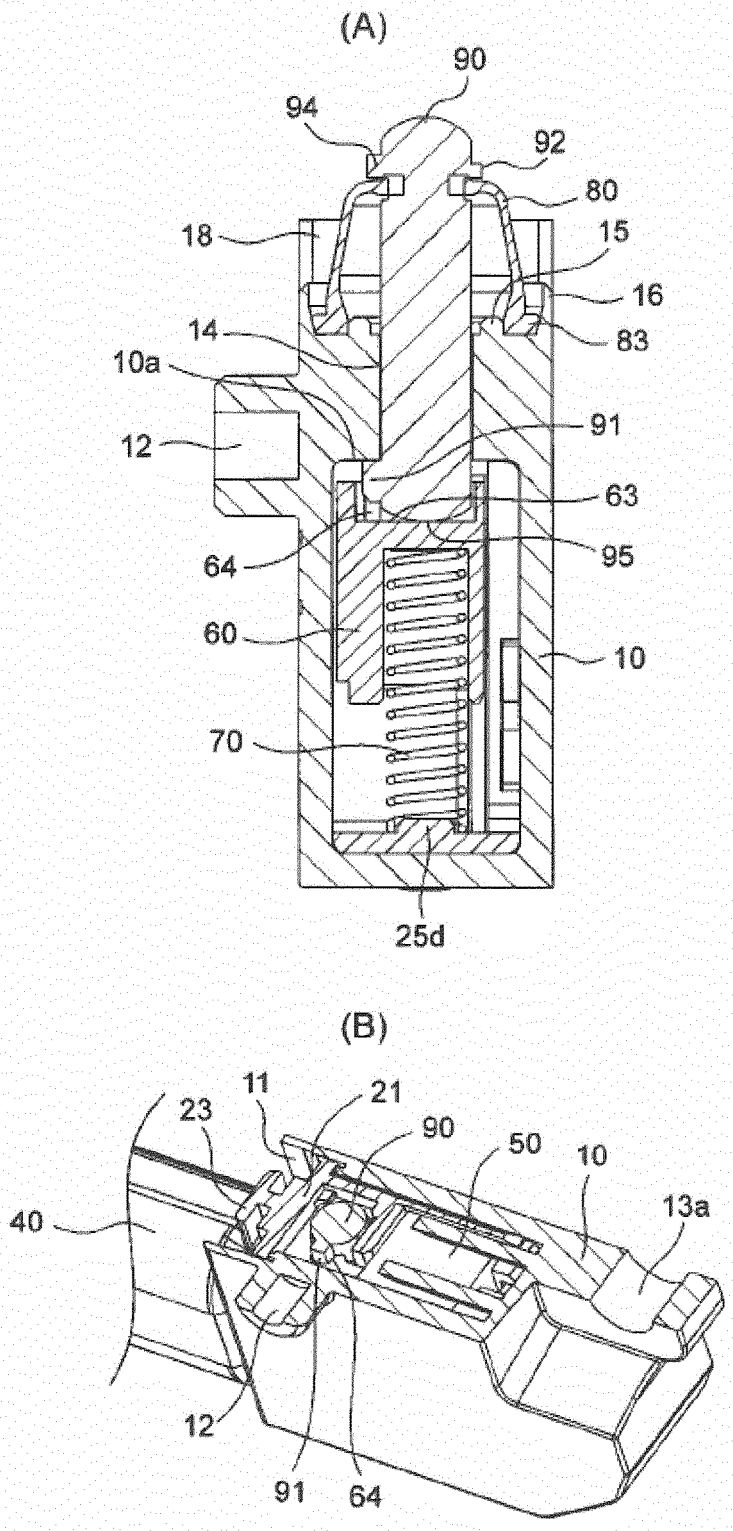
Fig. 10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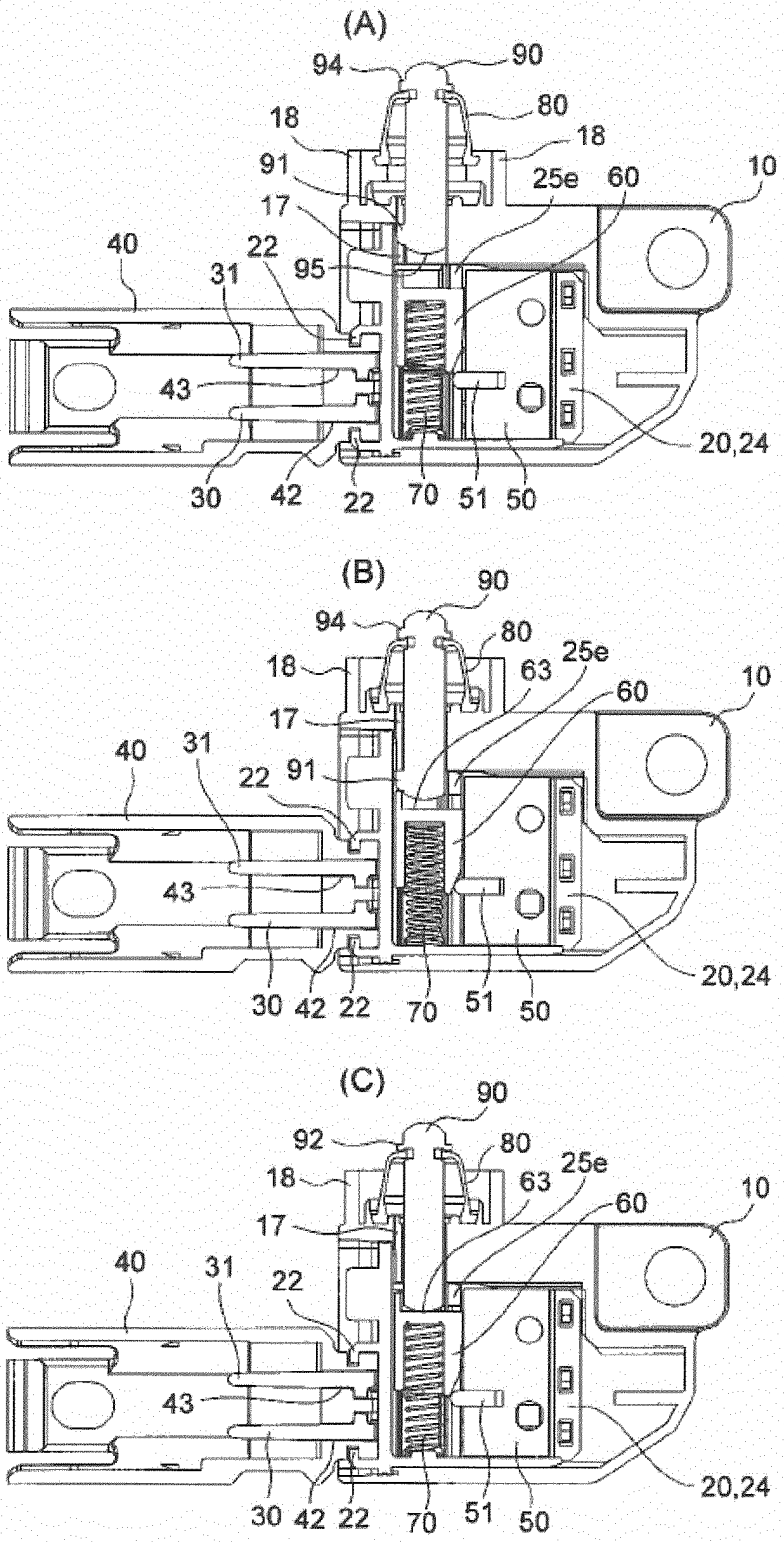
(B)
11
21
23
90
50
10
13a
40
12
91
64

Fig. 11


(A)
94
90
80
18
18
91
25e
60
10
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22
31
95
43
20,24
30
42
22
70
51
50
(B)
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94
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63
25e
60
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20,24
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(C)
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25e
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51
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/057003

A. CLASSIFICATION OF SUBJECT MATTER
H01H13/14(2006.01)i, *H01H3/12*(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)
H01H13/00-13/88, H01H3/12

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	1996-2011
Kokai Jitsuyo Shinan Koho	1971-2011	Toroku Jitsuyo Shinan Koho	1994-2011

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.
A	JP 2004-30935 A (Omron Corp.), 29 January 2004 (29.01.2004), entire text; all drawings (Family: none)	1-5
A	JP 8-53030 A (Koito Manufacturing Co., Ltd.), 27 February 1996 (27.02.1996), entire text; all drawings (Family: none)	1-5

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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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
07 June, 2011 (07.06.11)	21 June, 2011 (21.06.11)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/057003

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 107717/1990(Laid-open No. 66020/1992) (Niles Parts Co., Ltd.), 10 June 1992 (10.06.1992), entire text; all drawings (Family: none)	1-5
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 37427/1982(Laid-open No. 139620/1983) (Rhythm Watch Co., Ltd.), 20 September 1983 (20.09.1983), entire text; all drawings (Family: none)	1-5
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 21754/1978(Laid-open No. 124982/1979) (Matsushita Electric Industrial Co., Ltd.), 31 August 1979 (31.08.1979), entire text; all drawings (Family: none)	1-5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2010073662 A **[0003]**