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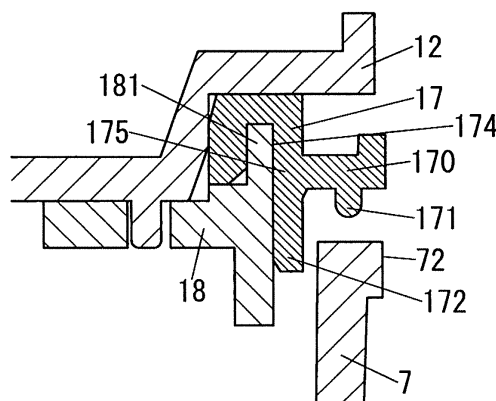
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(54) **SMALL ELECTRICAL APPARATUS CLEANING DEVICE**

(57) It is possible to improve a waterproofing property of a container storing cleaning liquid without requiring strong force for pressing. A cleaning device includes a housing part and a sealing member. The housing part is configured to be mountable with a container for storing cleaning liquid to be supplied to clean a cleaned part of a small electrical appliance. The sealing member is configured to provide waterproofing between the housing

part and an opening part of the container while the container is mounted to the housing part. The sealing member includes a rib that is configured to pivot around a contact point of coming into contact with an end face of the container, as a fulcrum, through a pressure that is applied with the container being housed in the housing part, and then closely come into contact with a lateral face of the container.

**FIG. 1A**



## Description

### TECHNICAL FIELD

**[0001]** The invention relates to a cleaning device for a small electrical appliance which requires periodical cleaning, such as an electric shaver or an epilation device.

### BACKGROUND ART

**[0002]** There has been a cleaning device for a small electrical appliance, which includes a cleaning tray, a container, a cleaning-liquid-supply means, and a discharge path (for example, see JP2010-57833A). The cleaning tray is configured to receive a cleaned part of the small electrical appliance. The container is for storing cleaning liquid to be supplied into the cleaning tray during cleaning of the cleaned part. The cleaning-liquid-supply means is configured to supply, into the cleaning tray, the cleaning liquid stored in the container. Through the discharge path, the cleaning liquid supplied into the cleaning tray is returned to the container.

**[0003]** In such a cleaning device, when the container is housed in a housing part of the cleaning device, an opening edge of the container is sealed by a sealing member, and accordingly, the container storing the cleaning liquid is waterproofed. Here, as shown in Fig. 24, a conventional sealing member 17A is compressed between a member 12A on the side of the housing part and an opening edge of a container 7A, and accordingly, a watertight structure is achieved through this compressing portion.

**[0004]** In this case, a closely contacting direction includes only one direction, as a compressing direction. Therefore, it may be impossible to secure the waterproofing property due to adhesion of dust or the like. Furthermore, strong force for pressing the sealing member may be required, in order to achieve the contacting.

### DISCLOSURE OF THE INVENTION

**[0005]** It is an object of the present invention to provide a cleaning device for a small electrical appliance, which can improve a waterproofing property of a container storing cleaning liquid without requiring strong force for pressing.

**[0006]** A cleaning device for a small electrical appliance, according to the present invention, includes a housing part and a sealing member. The housing part is configured to be mountable with a container. The container is for storing cleaning liquid to be supplied to clean a cleaned part of the small electrical appliance. The sealing member is configured to provide waterproofing between the housing part and an opening part of the container while the container is mounted to the housing part. The sealing member includes a rib that is configured to pivot around a contact point of coming into contact with

an end face of the container, as a fulcrum, through a pressure that is applied with the container being housed in the housing part, and then closely come into contact with a lateral face of the container.

**[0007]** In this cleaning device for the small electrical appliance, preferably, the sealing member further includes a projected part that is provided at the contact point of coming into contact with the end face of the container, and a gap between the rib and the lateral face of the container is set smaller than a height of the projected part.

**[0008]** In this cleaning device for the small electrical appliance, the sealing member may further include plural projected parts that are provided at the contact point of coming into contact with the end face of the container.

**[0009]** In this cleaning device for the small electrical appliance, preferably, the sealing member further includes one or more projections that are provided at portions of the rib facing the lateral face of the container.

**[0010]** In this cleaning device for the small electrical appliance, the container may include a projected part that is provided at the end face of the container, and the projected part may be configured to make the sealing member pivot, through coming into contact with the sealing member.

**[0011]** In this cleaning device for the small electrical appliance, preferably, the rib is formed of an elastic member, and includes a first rib and a second rib. The first rib preferably projects, when the pressure is applied in a first direction, outward along a second direction crossing the first direction at right angles, and the second rib preferably extends along the first direction. The first rib is preferably configured to be bent in a direction opposite to the first direction, around a contact point of the first rib coming into contact with the end face of the container, as a fulcrum. The second rib is preferably configured to be bent outward along the second direction according to bending of the first rib, so that an outer peripheral face of the second rib closely comes into contact with an inner peripheral face of the container.

**[0012]** In this cleaning device for the small electrical appliance, preferably, the sealing member further includes a projected part that is provided at the contact point of the first rib coming into contact with the end face of the container, and a gap between the outer peripheral face of the second rib and the inner peripheral face of the container is set smaller than a height of the projected part.

**[0013]** In this cleaning device for the small electrical appliance, preferably, the sealing member further includes plural projected parts that are provided at the contact point of the first rib coming into contact with the end face of the container.

**[0014]** In this cleaning device for the small electrical appliance, preferably, the sealing member further includes one or more projections that are provided at portions of the outer peripheral face of the second rib facing the inner peripheral face of the container.

**[0015]** In this cleaning device for the small electrical appliance, preferably, the container includes a projected part that is provided at the end face of the container, and the first rib is configured to be bent in a direction opposite to the first direction, around a contact point of the first rib coming into contact with the projected part, as a fulcrum.

**[0016]** According to the present invention, it is possible to make the sealing member closely contact the container even when force for pressing is weak, thereby improving a waterproofing property.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0017]** Preferred embodiments of the present invention will now be described in further details. Other features and advantages of the present invention will become better understood with regard to the following detailed description and accompanying drawings where:

Fig. 1A is a partially cross-section view of a cleaning device for a small electrical appliance according to an embodiment;

Fig. 1B is a partially cross-section view of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 2 is a perspective view of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 3 is a vertical cross-section view of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 4 is a perspective view of the cleaning device for the small electrical appliance according to the embodiment, in a state where the small electrical appliance is removed;

Fig. 5 is an exploded perspective view of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 6 is an exploded perspective view of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 7 is a transverse cross-section view of the cleaning device for the small electrical appliance according to the embodiment, in a state where a lateral cover is removed;

Fig. 8 is a partially enlarged cross-section view of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 9 is a perspective view of the cleaning device for the small electrical appliance according to the embodiment, in a state where a top-face cover, a support block, the lateral cover and a front cover are removed;

Fig. 10 is a plan view of the cleaning device for the small electrical appliance according to the embodiment, in a state where the top-face cover and the support block are removed;

Fig. 11 is a cross-section view taken along line N-N

of Fig. 10;

Fig. 12 is a cross-section view taken along line L-L of Fig. 10;

Fig. 13 is a lateral view of a cleaning tray in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 14 is a plan view of the cleaning tray in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 15 is a perspective view of the cleaning tray in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 16 is an exploded perspective view of a container and a filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 17 is a perspective view of the container and the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 18A is a vertical cross-section view of the container and the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 18B is a transverse cross-section view of the container and the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 19A is a plan view of the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 19B is a back view of the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 19C is a lateral view of the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 19D is a bottom view of the filter frame in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 20 is a cross-section view of a main part, near a sealing member, in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 21 is an explanatory drawing for a dimensional relationship in the cleaning device for the small electrical appliance according to the embodiment;

Fig. 22 is a cross-section view of a sealing member in another example of the cleaning device for the small electrical appliance according to the embodiment;

Fig. 23 is a cross-section view of a sealing member in yet another example of the cleaning device for the small electrical appliance according to the embodiment; and

Fig. 24 is a partially enlarged cross-section view of a conventional cleaning device.

## BEST MODE FOR CARRYING OUT THE INVENTION

**[0018]** Hereinafter, a cleaning device according to the present embodiment will be described in detail with reference to drawings. A cleaning device 1 according to the present embodiment is provided for cleaning a blade head Ea of a small electrical appliance E that is a reciprocating electric shaver. The cleaning device 1 is provided in an upper face thereof with an opening part 20, through which the blade head Ea is inserted while the small electrical appliance E is inverted.

**[0019]** As shown in Figs. 3, 5 and 6, the cleaning device 1 includes inside thereof, a cleaning tray 5, a container 7 for storing cleaning liquid, a pump P for circulating the cleaning liquid between the container 7 and the cleaning tray 5, and a heater unit H and a motor fan F for drying the blade head Ea after cleaning. Further, the cleaning device 1 includes a support part S that is disposed on the upper rear side of the cleaning device 1. The support part S includes a connecting part for electrically connecting the small electrical appliance E and the cleaning device 1.

**[0020]** The pump P starts supplying of the cleaning liquid stored in the container 7 into the cleaning tray 5, when being activated in a state where the container 7 containing the cleaning liquid is set in the cleaning device 1 and the blade head Ea of the small electrical appliance E is disposed in the cleaning tray 5 through the opening part 20 and further the electrically connection between the small electrical appliance E and the cleaning device 1 is completed by the connecting part of the support part S. Here, the cleaning tray 5 includes an overflow weir 54, and accordingly, cleaning liquid, which overflows the overflow weir 54, is returned into the container 7 that is disposed below the cleaning tray 5. During the cleaning, the blade head Ea of the small electrical appliance E can be activated by power supply and transmission of signals through the above-mentioned connecting part. Therefore, it is possible to perform the cleaning of the blade head Ea more quickly and effectively.

**[0021]** Next, each part of the cleaning device 1 will be described in detail with reference to Figs. 5 and 6. The cleaning device 1 further includes: a bottom plate 11; a base 12 that is vertically movable with respect to the bottom plate 11; a support frame 13 that is disposed on the base 12; the cleaning tray 5 of which four side upper edges are supported by an upper edge of the support frame 13; a top-face cover 2 that includes the opening parts 20; a support block 6 to which the connecting part is attached; a lateral cover 15 for covering a lateral face; and a front cover 16 that is disposed on a front face. Here, among those, the bottom plate 11, the base 12, the lateral cover 15 and the front cover 16 (except the support frame 13, the top-face cover 2, the cleaning tray 5 and the support block 6) are equivalent to a housing part of the present embodiment, which is configured to be mountable with the container 7.

**[0022]** As shown in Fig. 5, the bottom plate 11 is pro-

vided with two guide posts 110 and 110 that are respectively erected from both right and left sides of the bottom plate. The base 12 is vertically movable along the guide posts 110. The base 12 is biased upward by a pushing-up rod 111 that is provided with a spring 112 and is disposed in each guide post 110 of the bottom plate 11.

**[0023]** As shown in Fig. 5, on the base 12, a switch plate 31 is disposed slidably in the lateral direction. The switch plate 31 is biased in one direction by a spring 32, and one end of the switch plate 31 is exposed to the outside from the lateral cover 15. The switch plate 31 includes an engagement part for engaging with a hook part 115 that is provided at an upper end of each guide post 110. When the switch plate 31 is pushed against the biasing of the spring 32, the engagement with the hook part 115 is disengaged, and accordingly, the base 12 is moved upward by receiving biasing of the spring 112. When the base 12 is pushed downward, the switch plate 31 engages with the hook part 115 again, and accordingly, the base 12 is kept in a state of being pushed down.

**[0024]** As shown in Fig. 5, the base 12 includes a cylindrical motor cover part 120 that projects downward. The motor cover part 120 houses a motor M through a motor casing 121. Also as shown in Fig. 12, an impeller 123 is attached to a motor output shaft that projects downward from a bottom face of the motor cover part 120 through an M-shaped sealing part 122. Further, a pump cover 124 including a suction port is attached around the impeller 123. The suction port is opened in a central part of the bottom of the pump cover 124. When the impeller 123 is rotated, the cleaning liquid is sucked from the suction port of the pump cover 124, and then supplied to a water supply/discharge port 56 of the cleaning tray 5, described later, through a connecting pipe 126 that is provided integrally with the motor cover part 120.

**[0025]** Further, three water level detecting pins 24, 25 and 26 are disposed on an outer periphery side of the motor cover part 120. The three water level detecting pins 24, 25 and 26 are immersed into the cleaning liquid stored in the container 7, and then a level of a cleaning liquid is measured based on electric resistance values between those pins. That is, because the cleaning liquid has conductivity, the level of the cleaning liquid is measured by utilizing that the electric resistance value becomes larger than a prescribed value, when no cleaning liquid exists between the water level detecting pins 24 and 25, or between the water level detecting pins 24 and 26.

**[0026]** Among lower ends of the water level detecting pins 24, 25 and 26, a lower end of the pin 24 is at the lowest position, and further, lower ends of the pins 25 and 26 are at difference height positions. Accordingly, it is possible to measure the level of the cleaning liquid in two steps, for example: when the residual amount of the cleaning liquid is somewhat small; and when the residual amount thereof is smaller than the amount required for circulating the cleaning liquid to perform the cleaning op-

eration (when it becomes impossible to perform the cleaning). Here, the reason that the lower end of the water level detecting pin 24 is disposed lower than those of the other water level detecting pins 25 and 26 is because of giving a margin to the level measurement even when the cleaning device 1 is located on a slope.

**[0027]** The cleaning tray 5 is disposed on the base 12 through the support frame 13. The cleaning tray 5 is formed of soft material, such as rubber, and includes a folded-back part 50 that is provided by an upper edge thereof projecting toward an outer periphery side, and an end thereof being folded downward. When the top-face cover 2 is assembled in a state where the upper edge of the support frame 13 is covered with the folded-back part 50, a back cover 23 provided at a lower edge of the top-face cover 2 is fitted into a groove 51 provided in a top-face of an upper edge of the cleaning tray 5, as shown in Fig. 8. The upper edge of the cleaning tray 5 is compressed between the top-face cover 2 and the support frame 13, and accordingly, this portion is waterproofed.

**[0028]** Also as shown in Figs. 13 to 15, the cleaning tray 5 includes, therein, an overflow weir 54. By the overflow weir 54, the cleaning tray 5 is partitioned into a cleaning part 52 on the front part side of the overflow weir 54, and an overflow part 53 on the rear part side of the overflow weir 54. The cleaning part 52 is for housing the blade head Ea of the small electrical appliance E, and determining a position of the blade head Ea in a front-back direction between a rib 55 provided integrally with a wall face on a side of the overflow weir 54, and a supporting part 36 of a head guide 35 disposed on an inner face of the cleaning tray 5. Further, plural projected strips 59 are provided on the bottom of the cleaning tray 5. Due to the projected strips 59, the blade head Ea is supported while slightly floating from the bottom.

**[0029]** The cleaning part 52 of the cleaning tray 5 is provided at the lowest portion thereof with the water supply/discharge port 56. The overflow part 53 is provided with two water discharge ports 57 and 58. The water supply/discharge port 56 is connected to the pump P via the connecting pipe 126 provided at the base 12. The respective water discharge ports 57 and 58 are connected to connecting pipes 127 and 128 provided at the base 12. Those connecting pipes 127 and 128 are located directly above the container 7 storing the cleaning liquid. The cleaning liquid passing through the water discharge ports 57 and 58 is returned to the container 7 via the connecting pipes 127 and 128.

**[0030]** Here, the water discharge port 57 of which an upper face opening is at a low position, of the water discharge ports 57 and 58, is configured to discharge the cleaning liquid for the circulation of the cleaning liquid. On the other hand, an upper face opening of the water discharge port 58 is at a high position and further is at a position farther from the overflow weir 54 than an upper face opening of the water discharge port 57, and accordingly, the water discharge port 58 is provided as a port for emergency when the water discharge port 57 is

clogged with some cause and cannot exert the function. For this reason, a bottom face of the overflow part 53 is provided as a sloping face that slopes downward toward the water discharge port 57 disposed on one side.

**[0031]** The cleaning tray 5 is provided on one side of a front edge thereof with a wall body 500 formed into a bag-shape. A portion that is surrounded by the wall body 500 is provided for installing a selecting button 29 that is for operation instructions. When the selecting button 29 exposed from the top-face cover 2 is operated, a switch that is provided at a switch substrate 27 (see Fig. 5) is driven via a switch rod 290 (see Fig. 6). For this reason, it is possible to direct an operation of the cleaning device 1 with the selecting button 29. At this time, a display lamp for displaying the operation, which is provided at the switch substrate 27, is configured to display a content corresponding to the directed operation, on the top-face cover 2 via a light guide plate 28. Further, a display lamp for displaying the amount of the cleaning liquid in the container 7 may be also provided.

**[0032]** The support block 6, of which the back face side is covered by the back cover 23 of the top-face cover 2, and the back cover 23 constitute the support part S. The support block 6 is provided with a plurality of contact parts 39 that are respectively individually biased forward by a plurality of springs 37 via a plurality of supporting members 38. The plurality of contact parts 39 are exposed through a front face of the support block 6 so as not to project further than the front face of the support block 6.

**[0033]** A magnet 43 and a yoke 44 for attracting the small electrical appliance E are located above the plurality of contact parts 39. When the blade head Ea is fitted into the cleaning tray 5, the small electrical appliance E is magnetically attracted to the support part S by the magnet 43, and then terminal parts Eb of the small electrical appliance E come into contact with the plurality of contact parts 39, and further the terminal parts Eb push the plurality of contact parts 39 against the plurality of springs 37, thereby holding a state of securing contact pressures. By the terminal parts Eb coming into contact with the plurality of contact parts 39, it becomes a state capable of performing power supply to the small electrical appliance E and transmission of signals from the cleaning device 1 to the small electrical appliance E.

**[0034]** A main-body-detecting plate 42 is disposed in the support part S for coming into contact with the plurality of contact parts 39. When the small electrical appliance E is installed to the cleaning device 1 and the plurality of contact parts 39 are retracted, the main-body-detecting plate 42 is separated from the plurality of contact parts 39, and accordingly, installing of the small electrical appliance E to the cleaning device 1 is detected.

**[0035]** The support block 6 is provided in a lower part thereof with a blowing port 66. A motor fan F is installed on the back side of the blowing port 66. A lower edge of the blowing port 66 is placed on a rear upper edge of the cleaning tray 5. The motor fan F is provided for sucking air through a sucking port 150 that is positioned at a back

face of the cleaning device 1, and sending the air to the blade head Ea of the small electrical appliance E through the blowing port 66. Therefore, the blowing port 66 for the motor fan F is directed obliquely downward so as to be capable of drying the blade head Ea by sending the air to the blade head Ea from the upper side. Further, the blowing port 66 is provided with straightening plates 67 for efficiently changing a direction of the sent air.

**[0036]** For heating, a heater unit H is installed on a rear face (lower face) side of the cleaning part 52 of the cleaning tray 5. The heater unit H includes a heater wire, a heater plate, a heater base, a temperature detector for controlling temperature, and a protection component functioning upon abnormal heating (all those are not shown). The heater unit H transmits heat from the heater wire to the blade head Ea through the heater plate, the cleaning tray 5 and the plural projected strips 59 of the cleaning tray 5 to promote the drying of the blade head Ea after the cleaning.

**[0037]** The cleaning tray 5 and the top-face cover 2 are assembled on the base 12 through the support frame 13, and then the lateral cover 15 and the front cover 16 are attached so as to surround outer peripheries of the cleaning tray 5 and the top-face cover 2. Accordingly, when the base 12 is moved vertically with respect to the bottom plate 11, all members other than the bottom plate 11 and the container 7 detachably installed on the bottom plate 11 are vertically moved integrally with the base 12. This vertically movement is performed for attaching or detaching operation of the container 7 disposed on the bottom plate 11.

**[0038]** Next, the container 7 and a filter frame 8, which is detachably disposed in the container 7, will be described with reference to Figs. 16, 17, 18A, 18B, and 19A to 19D. The container 7 is installed on the bottom plate 11, and has an upper face opened, and is formed into a cup-shape in which a lateral width of a rear side thereof is set to be smaller than that of a front side thereof. Further, a line 70 for water supply is marked on an inner wall of the container 7. Further, the container 7 is provided on a lower face thereof with a plurality of convex raised parts 76. Accordingly, it is possible to secure stability in a case where the container 7 is located outside the cleaning device 1, and further even when water droplets are adhered on the lower face of the container 7 due to washing with water or the like, it is possible to prevent the water droplets from accidentally moving to a place where the container 7 is located.

**[0039]** The filter frame 8 includes a bottom plate part 80 that almost covers the bottom face of the container 7, and a partition wall 81 that extends upward from a rear part of the bottom plate part 80. Both side edges of the partition wall 81 contact an inner wall face of the container 7. The filter frame 8 is positioned by a projected part 74 for positioning, which is provided at the inner wall of the container 7. By this filter frame 8, the inside of the container 7 is divided into three spaces: two spaces 7a and 7b that are partitioned by the partition wall 81; and a space

7c that is between the bottom face of the container 7 and the bottom plate part 80, which is in a state of slightly floating from the bottom face of the container 7. The bottom plate part 80 is provided on a lower face side thereof with a grid-like rib 85. Further, the bottom plate part 80 is provided with a recess 88. The recess 88 is disposed in a part that is at a rear part of an upper face of the bottom plate part 80, and faces the space 7b. When the filter frame 8 is located in the container 7, it becomes a state where a gap is formed between a front edge of a periphery of the filter frame 8 and the inner wall face of the container 7.

**[0040]** Further, a flow dividing part 82 is provided at an upper part of the partition wall 81. The flow dividing part 82 includes: a permeation port 84 that is provided in an inclined face 83 formed at the upper part of the partition wall 81; and a slope 86 that is provided directly below the permeation port 84, and slopes in a reverse direction to the inclined face 83. Further, a filter 89 is configured as a mesh sheet that has holes finer than sizes of body hairs and the like, and disposed on the inclined face 83 of the flow dividing part 82.

**[0041]** Cleaning liquid, which does not flow through the filter 89 and the permeation port 84, flows to the space 7b on the upper face side of the bottom plate part 80, via: the space 7a that is between the partition wall 81 and the inner wall of the container 7; the space 7c that is between the bottom plate part 80 and the bottom face of the container 7; and the gap that is between the front edge of the bottom plate part 80 and the inner wall face of the container 7. On the other hand, cleaning liquid, which does flow through the filter 89 and the permeation port 84, flows into the space 7c along the slope 86. An opening area of the permeation port 84 is set so that the amount of the cleaning liquid, which does flow through the filter 89 and the permeation port 84, is larger than the amount of the cleaning liquid, which flows into the space 7c via the space 7a without flowing through the filter 89 and the permeation port 84.

**[0042]** When cleaning the blade head Ea of the small electrical appliance E, a user first floats the whole from the bottom plate 11 by operating the switch plate 31, and then puts cleaning liquid into the container 7 that houses the filter frame 8, and then installs the container 7 on the bottom plate 11. At this time, the container 7 is guided by guide plates 117 that are provided on the bottom plate 11, and further positioned by positioning projections 116. The positioning projections 116 are fitted into engagement recesses 77 that are provided in an outer wall face of the container 7 (see Figs. 18A and 18B), and accordingly, it is possible to prevent the container 7 from floating.

**[0043]** Then, when the user pushes the whole of the cleaning device 1 downward, a lower part of the pump P provided at the base 12 is immersed in the cleaning liquid stored in the container 7. At this time, as shown in Figs. 1A, 1B, 3, 7, 9, 11 and 12, the cleaning device 1 of the present embodiment further includes a sealing member 17 that is mounted to a mounting frame 18. This sealing

member 17 is held between a lower face of a peripheral edge of the base 12 and a flange part 72 that is provided at an upper edge of the container 7 so as to project toward the outer periphery side, and accordingly, this portion is waterproofed. The sealing member 17 will be described in detail later.

**[0044]** With respect to the cleaning device 1 to which the container 7 storing the cleaning liquid has been set as described above, the user puts the blade head Ea of the small electrical appliance E into the cleaning tray 5 through the opening part 20 of the upper face, and makes the terminal parts Eb of the small electrical appliance E come into contact with the contact parts 39 of the support part S.

**[0045]** In this state, when the user starts the cleaning by operating the selecting button 29 of the cleaning device 1 connected to an external power supply, the pump P is activated and sends the cleaning liquid stored in the container 7 into the cleaning part 52 of the cleaning tray 5 via the connecting pipe 126 and the water supply/discharge port 56. Here, cleaning liquid overflowing the overflow weir 54 of the cleaning tray 5 is returned into the container 7 via the water discharge port 57 and the connecting pipe 127. Therefore, the cleaning liquid is circulated between the container 7 and the cleaning tray 5.

**[0046]** During the cleaning, it is preferred that a blade in the blade head Ea of the small electrical appliance E is activated through the support part S. It is possible to perform the cleaning of the blade head Ea more quickly and effectively.

**[0047]** Here, the cleaning liquid in the cleaning tray 5 overflows the overflow weir 54, and flows into the overflow part 53, and is returned into the container 7 via the water discharge port 57 and the connecting pipe 127 as described above. This connecting pipe 127 is located directly above the filter 89 that is in the space 7a of the container 7. Therefore, body hairs and the like included in the cleaning liquid flow down through the space 7a together with the cleaning liquid without passing through the filter 89, and then flow into the space 7c that is at the bottom of the container 7. The cleaning liquid without the body hairs and the like passes through the filter 89 and the permeation port 84, and then flows to, via the slope 86, the side of the recess 88 that is located in the space 7b. Because a sucking port of the pump P is located on this recess 88, the cleaning liquid is sent to the cleaning tray 5 by the pump P again.

**[0048]** On the other hand, the cleaning liquid with the body hairs and the like flows into the space 7c located between the lower face of the filter frame 8 and the bottom face of the container 7 from the space 7a located on one side of a rear part of the container 7, and then spreads along the bottom face of the container 7, and then flows into the space 7b from the gap that is between the front edge of the bottom plate part 80 of the filter frame 8 and the front inner wall of the container 7. At this time, the cleaning liquid, which flowed into the space 7c, spreads on the bottom face as described above, and further, the

cleaning liquid sent to the cleaning tray 5 by the pump P mainly includes the cleaning liquid without body hairs and the like, which passed through the filter 89 and the permeation port 84. Therefore, the amount of the cleaning liquid passing through the space 7c is small, and the flowing speed thereof is considerably low. Furthermore, staying of the cleaning liquid occurs at a plural portions due to the grid-like rib 85 provided on the lower face of the bottom plate part 80 of the filter frame 8. Therefore, the body hairs and the like included in the cleaning liquid are settled and deposited in the space 7c.

**[0049]** After passing through the space 7c, the cleaning liquid passes on the bottom plate part 80 of the filter frame 8 via the front part side of the container 7, and then flows to the recess 88 below which the sucking port of the pump P is opened near the rear part of the container 7. In addition to such a long path, the bottom plate part 80 is disposed between the sucking port, and the body hairs and the like settled and deposited. Therefore, it is unlikely that the pump P sucks the body hairs and the like and returns those into the cleaning tray 5 again.

**[0050]** The size of the space 7c is normally set so as to be capable of securing the amount of the body hairs deposited by the cleaning operations that are performed several tens times. The user can wash away the deposited body hairs by taking the container 7 out from the cleaning device 1 and removing the filter frame 8. After that, when the user puts new cleaning liquid into the container 7, the cleaning device 1 can obtain initial cleaning capability again. The above-mentioned flange part 72 provided at the upper edge of the container 7 is formed so as to extend toward the outer periphery side. Therefore, when the user allows the opening of the container 7 to turn downward in order to discard old cleaning liquid in the container 7, it is possible to discharge the old cleaning liquid (and body hairs and the like) smoothly. The flange part 72 is provided for securing the rigidity for water stop. However, if it is possible to secure the rigidity by increasing a thickness of a lateral wall of the container 7, the flange part 72 is not required.

**[0051]** When the cleaning is completed and the pump P is stopped, the cleaning liquid remaining in the cleaning part 52 of the cleaning tray 5 is returned into the container 7 by natural falling via the water supply/discharge port 56, the connecting pipe 126 and the pump P (a space between the impeller 123 and the pump cover 124 of the pump P). The impeller 123 is in a state of being immersed in the cleaning liquid stored in the container 7, and further, the cleaning liquid remaining in the cleaning part 52 hardly includes body hairs and the like upon completion of the cleaning. Therefore, although the cleaning liquid passes through the pump P, clogging hardly occurs. In addition, even when the water discharge port 57 of the overflow part 53 is clogged during the cleaning operation, because the water discharge port 58 is additionally provided, it is possible to prevent the cleaning liquid from overflowing the cleaning tray 5.

**[0052]** When the cleaning is completed and the clean-

ing liquid is recovered into the container 7, current is applied to the motor fan F and the heater unit H and the drying of the blade head Ea is promoted.

**[0053]** Here, as described above, the cleaning device 1 of the present embodiment includes the sealing member 17. While the container 7 is set to the cleaning device 1, an opening edge of the container 7 is waterproofed by the sealing member 17. Hereinafter, this sealing member 17 will be specifically described.

**[0054]** The sealing member 17 of the present embodiment is formed of an elastic member for example into, as the whole, a frame shape that is the approximately same shape as an outer peripheral part of the mounting frame 18, as shown in Fig. 5. The mounting frame 18 is provided at the outer peripheral part thereof with a fitting piece 181 that projects upward. The fitting piece 181 is formed over the entire periphery of the outer peripheral part. As shown in Fig. 1A, the sealing member 17 is provided with a recess 174 into which the fitting piece 181 of the mounting frame 18 is fitted. The recess 174 is formed over the entire periphery of the sealing member 17. That is, the sealing member 17 is mounted to the mounting frame 18 by fitting the fitting piece 181 into the recess 174. In this state, the mounting frame 18 is fixed on the lower face side of the base 12.

**[0055]** Further, as shown in Fig. 1A, the sealing member 17 of the present embodiment includes a rib. In the following explanation, a direction, in which a pressure is applied to the base 12 by the container 7 being housed, is defined as a first direction (downward in Fig. 1A), and a direction crossing the first direction at right angles is defined as a second direction. In this case, the rib integrally includes: a first rib 170 that projects outward along the second direction from an outer peripheral part 175 of the sealing member 17 (a portion of projecting outward in a state where the mounting frame 18 is fixed on the lower face side of the base 12); and a second rib 172 that extends along the first direction (downward) from the outer peripheral part 175. Further, the sealing member 17 of the present embodiment includes a projected part 171 that is provided at a contact point on a lower face of the first rib 170, of coming into contact with an end face of the container 7 (an upper face of the flange part 72). The first and second ribs 170 and 172 are formed over the entire periphery of the sealing member 17. On the other hand, the projected part 171 may be formed over the entire periphery or formed partially.

**[0056]** Then, as shown in Fig. 1B, when the container 7 is set and the pressure is applied to the base 12 in the first direction (when the base 12 is pushed downward in Fig. 1B), the end face of the container 7 (the upper face of the flange part 72) pushes up the projected part 171, and accordingly, the first and second ribs 170 and 172 integrally pivot around the contact point of the projected part 171 coming into contact with the end face of the container 7, as a fulcrum. That is, the first rib 170 is bent in a direction (upward) opposite to the first direction, around the above-mentioned contact point, as the ful-

crum. The outer peripheral part 175 and the second rib 172 are bent outward along the second direction according to bending of the first rib 170. An outside face (outer peripheral face) of the second rib 172 entering the inside of the container 7 closely comes into contact with an inner wall (inner peripheral face) of the container 7 through this pivot, and therefore, the opening part of the container 7 is waterproofed. Because the second rib 172 closely comes into contact with the container 7 by the first and second ribs 170 and 172 being bent, strong contact force can be provided, even if the force for pressing in the first direction (downward), which is applied to the sealing member 17, is weak. For this reason, high waterproofing property can be provided. Therefore, even if the cleaning device 1 is inclined, the cleaning liquid is prevented from being leaked out from the container 7.

**[0057]** Instead of the projected part 171 provided at the sealing member 17, a projected part 720 may be provided at the end face of the container 7, as shown in Fig. 20. The first and second ribs 170 and 172 may be configured to pivot around this projected part 720.

**[0058]** An height L1 of the projected part 171 (or the projected part 720) is set smaller than a margin L2 (see Fig. 21) for bending of the first rib 170 between an upper face of the first rib 170 and a lower face of the base 12, and further larger than a gap L3 between the outside face (outer peripheral face) of the second rib 172 and the inner face (inner peripheral face) of the container 7 ( $L2 > L1 > L3$ ). Through the setting, it is possible to securely provide the state where the second rib 172 closely comes into contact with the inner face of the container 7. Note that, Fig. 21 is an expedient drawing for describing the above-mentioned sizes, and it does not mean that a recess 710, into which the projected part 171 is fitted, is actually provided in the container 7.

**[0059]** As shown in Fig. 22, plural projected parts 171 may be provided at a lower face of the first rib 170. As shown in Fig. 23, one or more projections 173 may be provided at portions of the outer peripheral face of the second rib 172 facing the inner wall (inner peripheral face) of the container 7. In any cases, it is possible to enhance the contact property for the waterproofing. Note that, the projections 173 are formed over the entire periphery of the sealing member 17.

**[0060]** The small electrical appliance E cleaned by the above cleaning device 1 is a reciprocating electric shaver. However, the small electrical appliance E is not limited in particular, as long as it requires periodical cleaning. The sealing member 17 of the present embodiment may be applied to even a cleaning device that is configured to clean an epilation device for epilating the user's arms or legs for example.

**[0061]** Although the present invention has been described with reference to certain preferred embodiments, numerous modifications and variations can be made by those skilled in the art without departing from the true spirit and scope of this invention, namely claims.

## Claims

1. A cleaning device for a small electrical appliance, comprising:

a housing part configured to be mountable with a container, the container being for storing cleaning liquid to be supplied to clean a cleaned part of the small electrical appliance; and a sealing member configured to provide water-proofing between the housing part and an opening part of the container while the container is mounted to the housing part, wherein the sealing member comprises a rib that is configured to pivot around a contact point of coming into contact with an end face of the container, as a fulcrum, through a pressure that is applied with the container being housed in the housing part, and then closely come into contact with a lateral face of the container.

2. The cleaning device for the small electrical appliance, according to claim 1, wherein the sealing member further comprises a projected part that is provided at the contact point of coming into contact with the end face of the container, and

wherein a gap between the rib and the lateral face of the container is set smaller than a height of the projected part.

3. The cleaning device for the small electrical appliance, according to claim 1 or 2, wherein the sealing member further comprises plural projected parts that are provided at the contact point of coming into contact with the end face of the container.

4. The cleaning device for the small electrical appliance, according to any one of claims 1 to 3, wherein the sealing member further comprises one or more projections that are provided at portions of the rib facing the lateral face of the container.

5. The cleaning device for the small electrical appliance, according to claim 1, wherein the container comprises a projected part that is provided at the end face of the container, and wherein the projected part is configured to make the sealing member pivot, through coming into contact with the sealing member.

6. The cleaning device for the small electrical appliance, according to claim 1, wherein the rib is formed of an elastic member, and comprises:

a first rib that projects, when the pressure is ap-

plied in a first direction, outward along a second direction crossing the first direction at right angles; and

a second rib that extends along the first direction, and

wherein the first rib is configured to be bent in a direction opposite to the first direction, around a contact point of the first rib coming into contact with the end face of the container, as a fulcrum, the second rib being configured to be bent outward along the second direction according to bending of the first rib, so that an outer peripheral face of the second rib closely comes into contact with an inner peripheral face of the container.

7. The cleaning device for the small electrical appliance, according to claim 6, wherein the sealing member further comprises a projected part that is provided at the contact point of the first rib coming into contact with the end face of the container, and

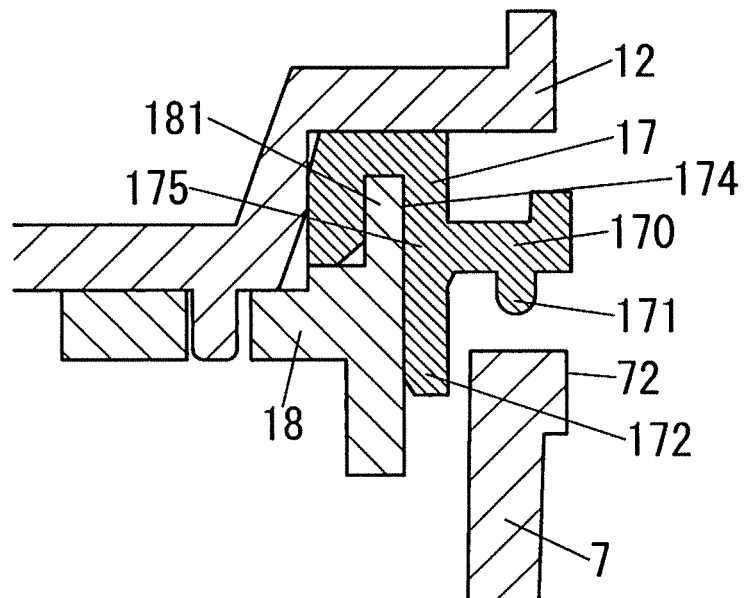
wherein a gap between the outer peripheral face of the second rib and the inner peripheral face of the container is set smaller than a height of the projected part.

8. The cleaning device for the small electrical appliance, according to claim 6 or 7, wherein the sealing member further comprises plural projected parts that are provided at the contact point of the first rib coming into contact with the end face of the container.

9. The cleaning device for the small electrical appliance, according to any one of claims 6 to 8, wherein the sealing member further comprises one or more projections that are provided at portions of the outer peripheral face of the second rib facing the inner peripheral face of the container.

10. The cleaning device for the small electrical appliance, according to claim 6, wherein the container comprises a projected part that is provided at the end face of the container, and wherein the first rib is configured to be bent in a direction opposite to the first direction, around a contact point of the first rib coming into contact with the projected part, as a fulcrum.

*FIG. 1 A*



*FIG. 1 B*

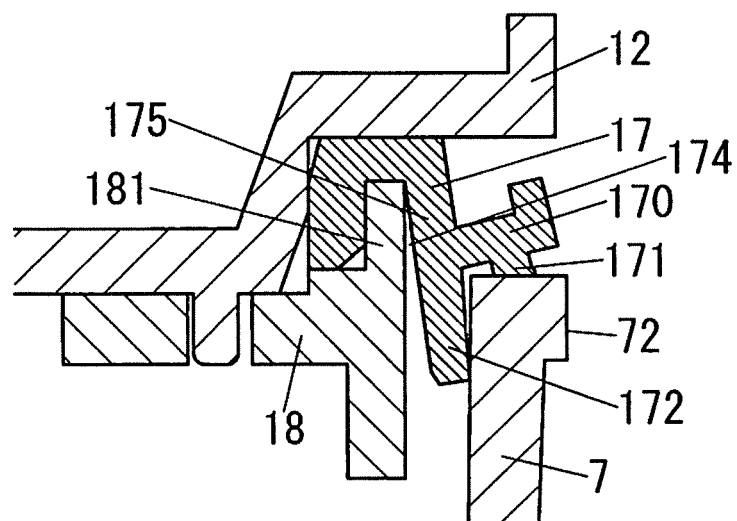


FIG. 2

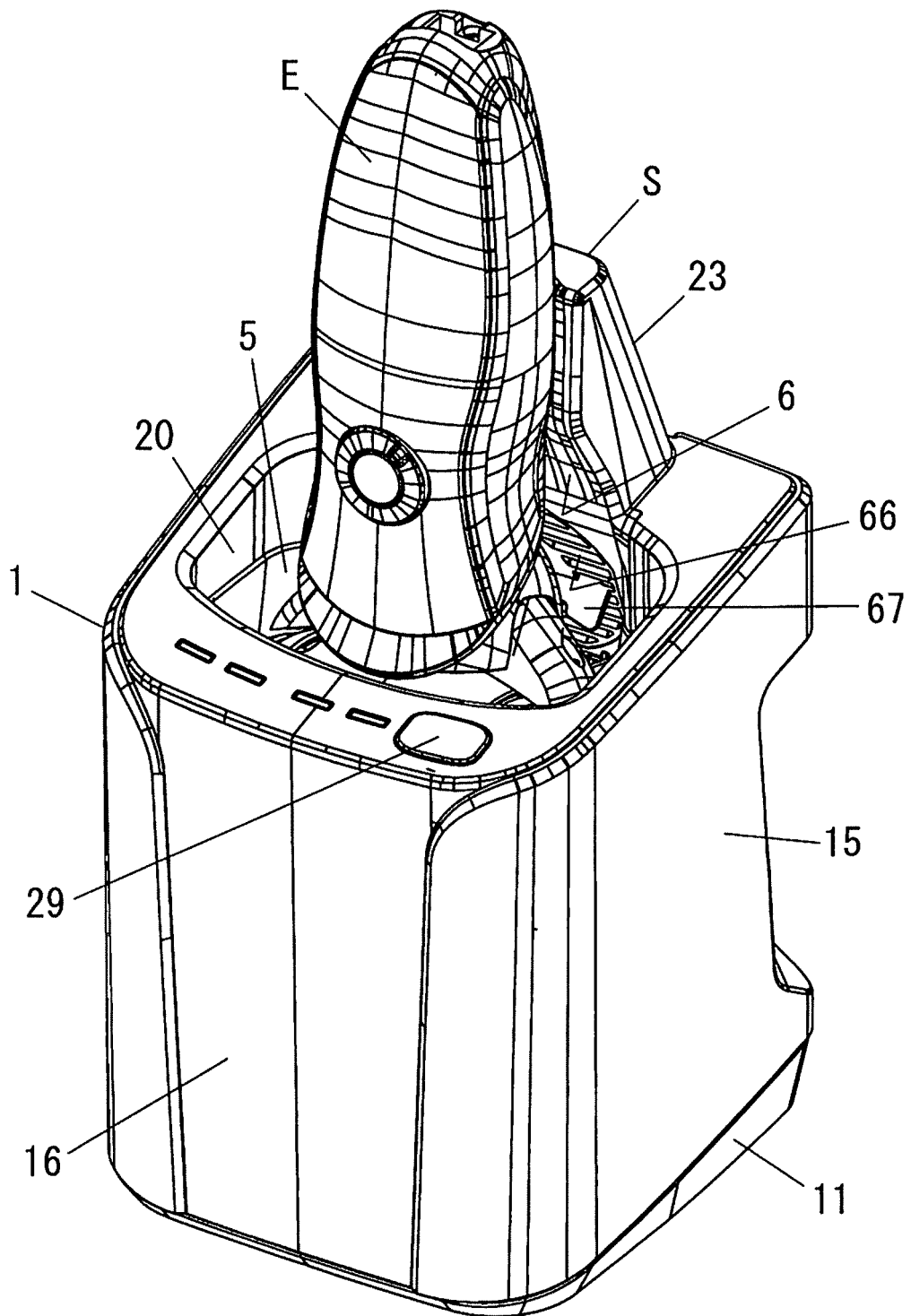


FIG. 3

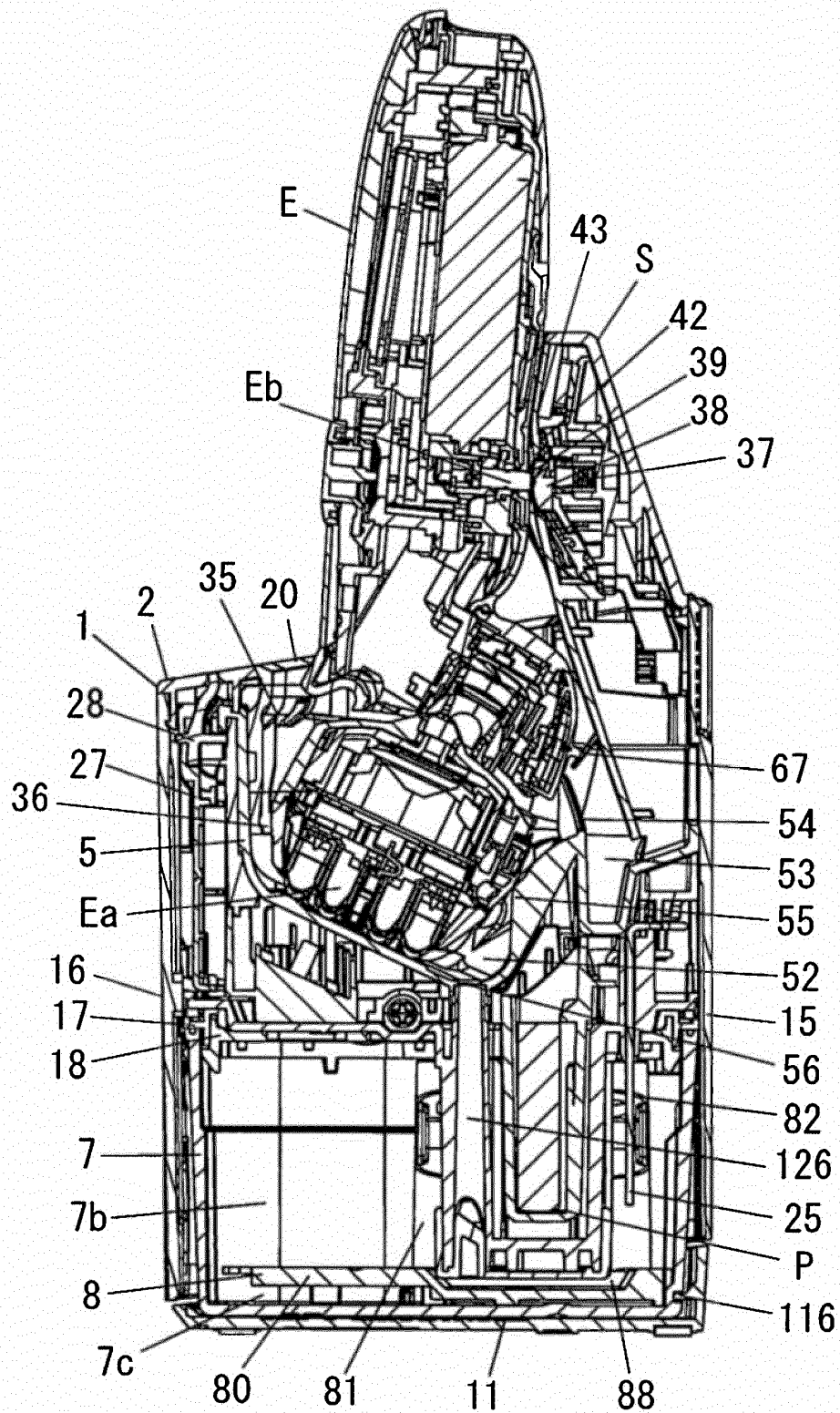


FIG. 4

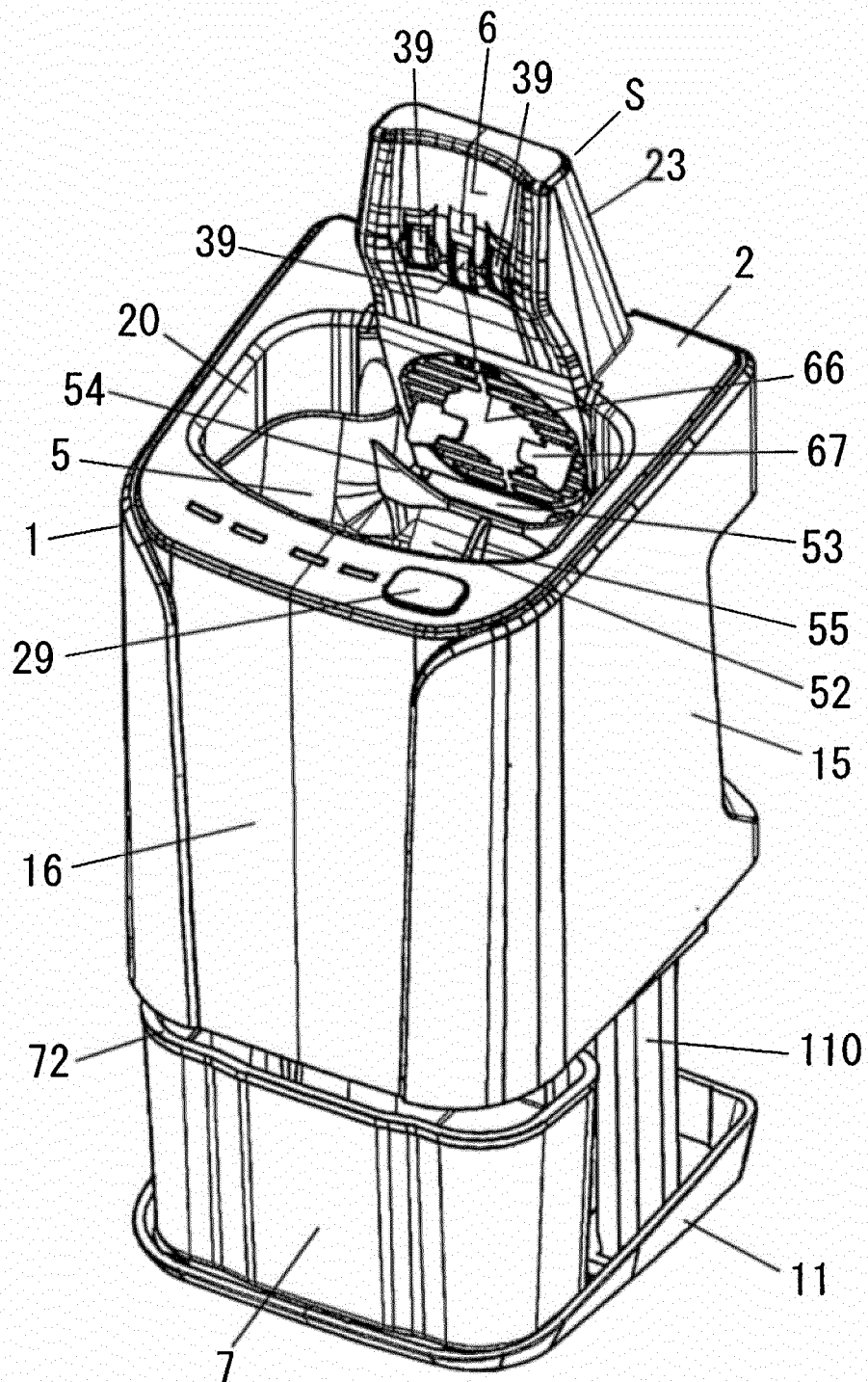


FIG. 5

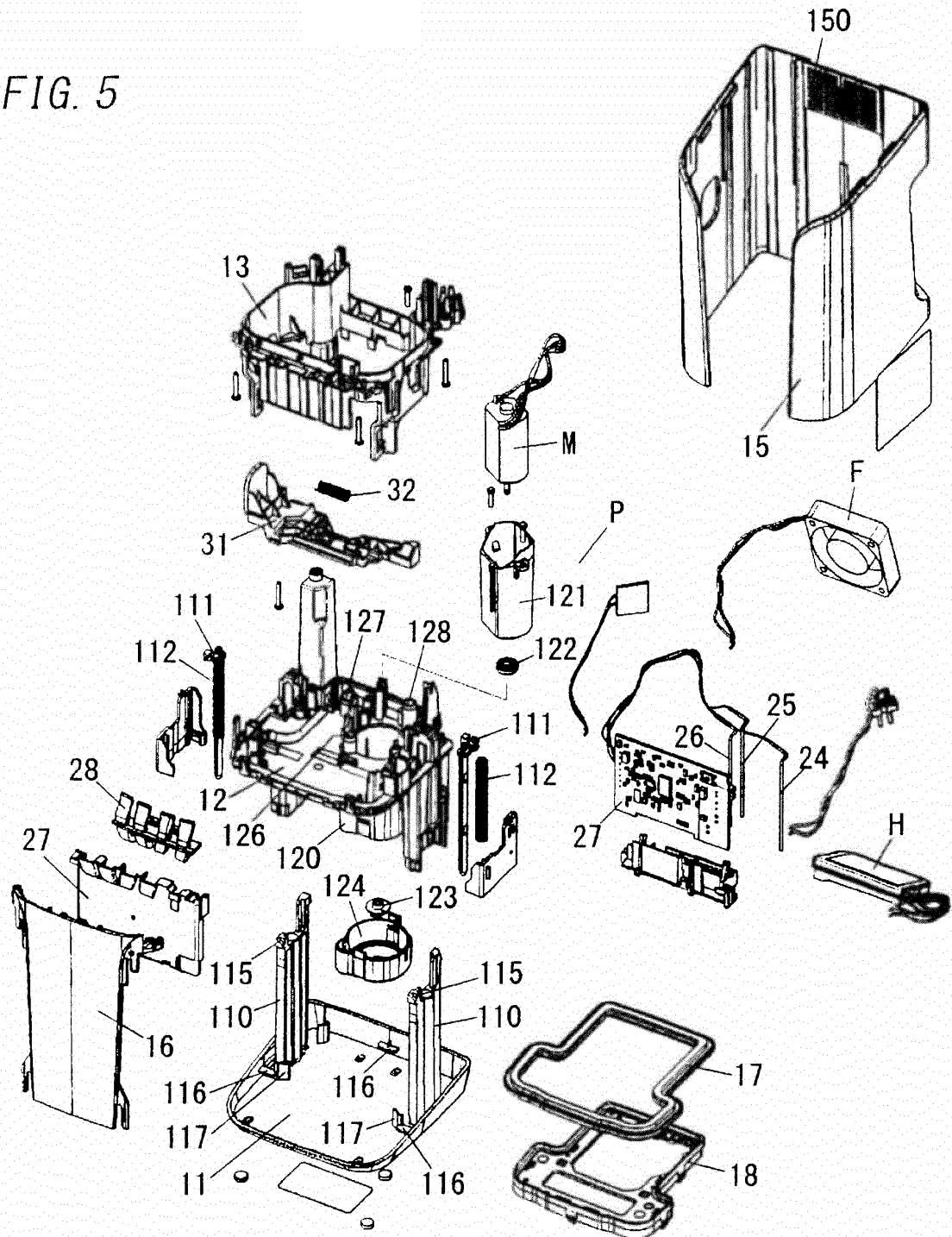


FIG. 6

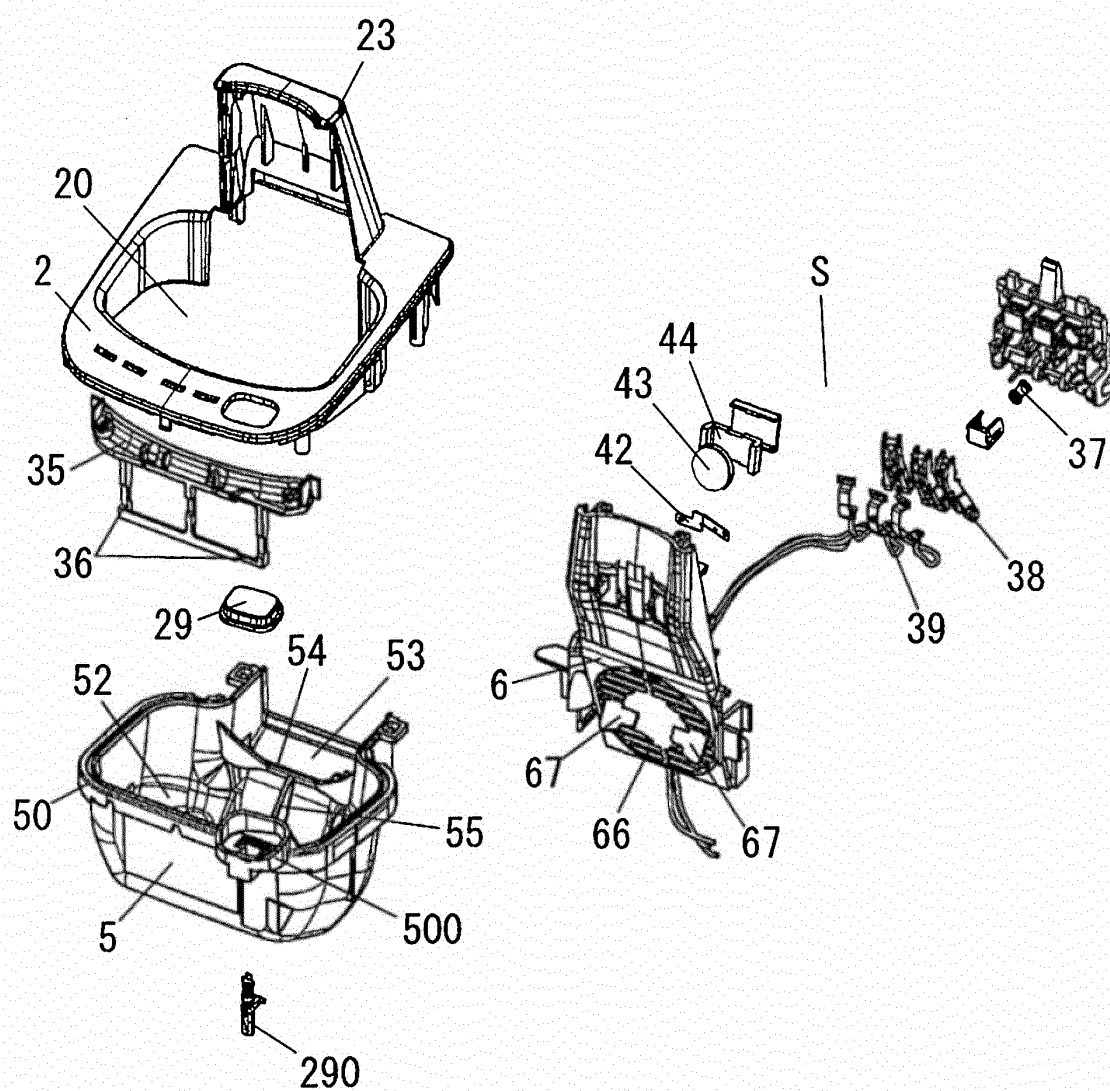
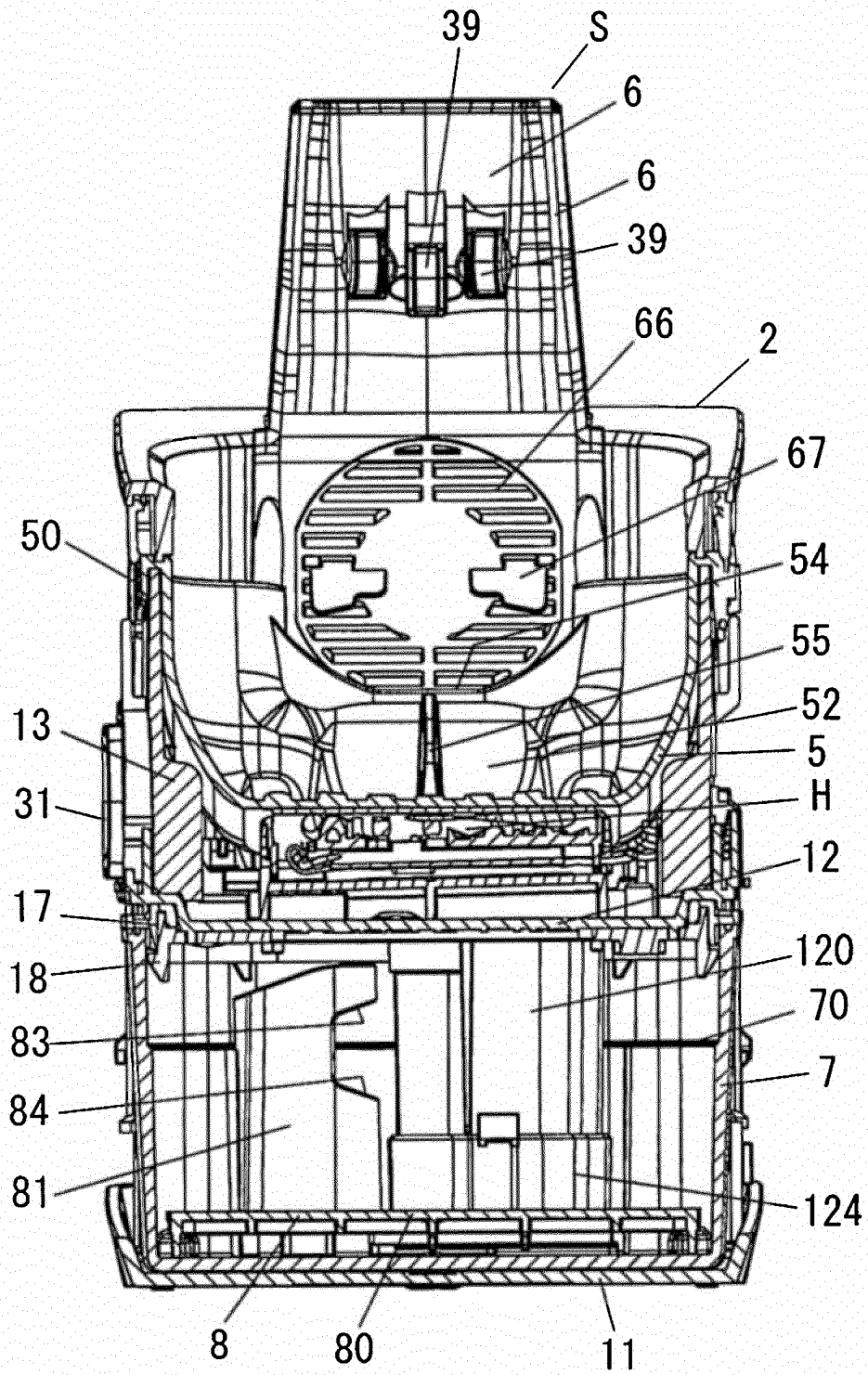


FIG. 7



*FIG. 8*

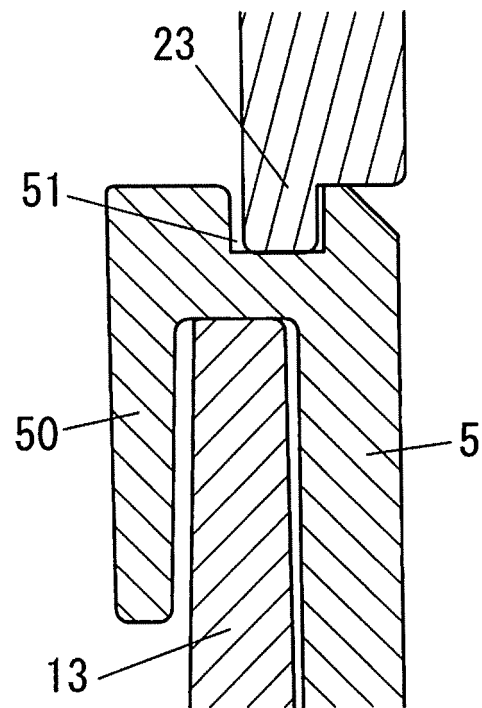


FIG. 9

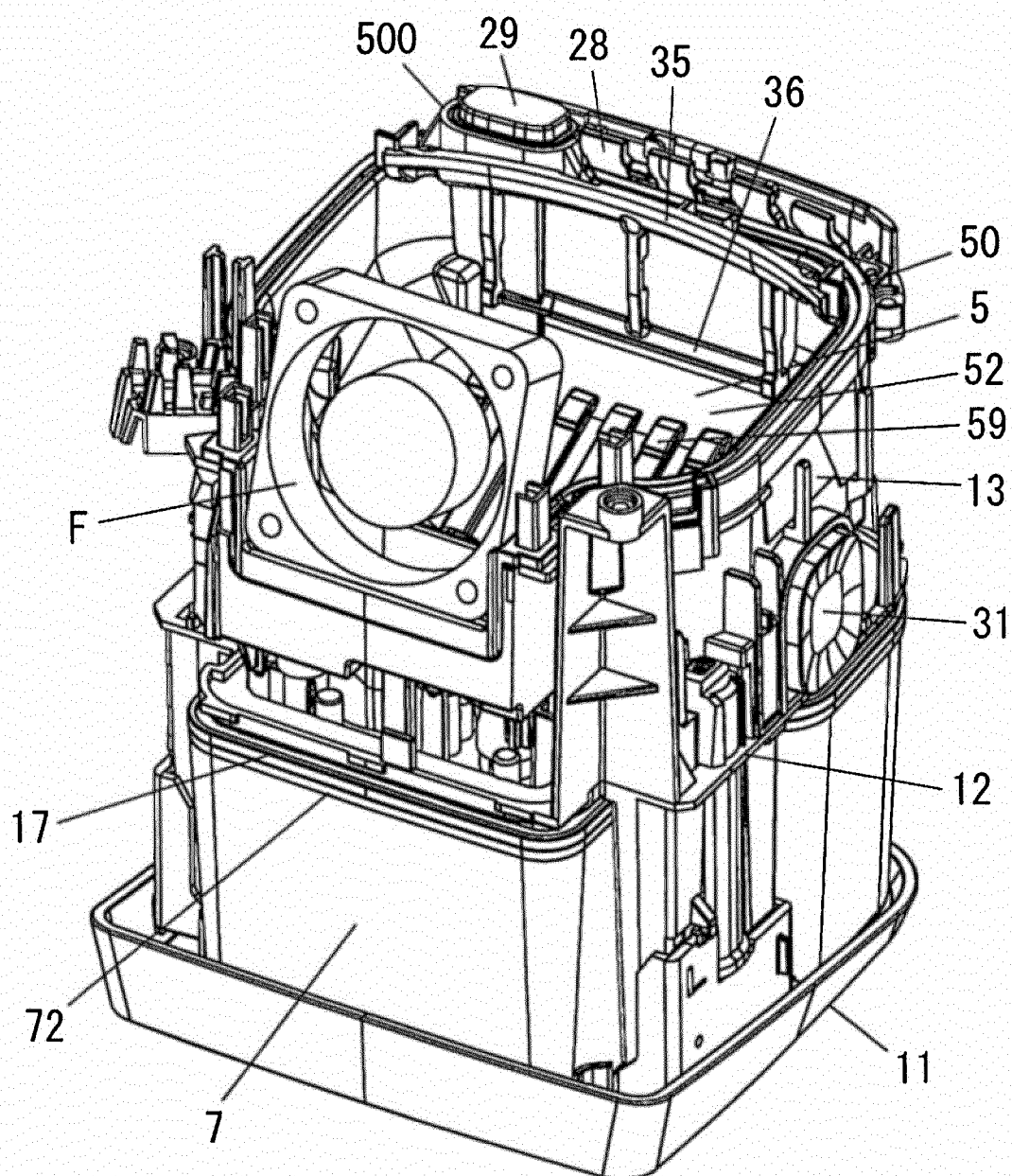


FIG. 10

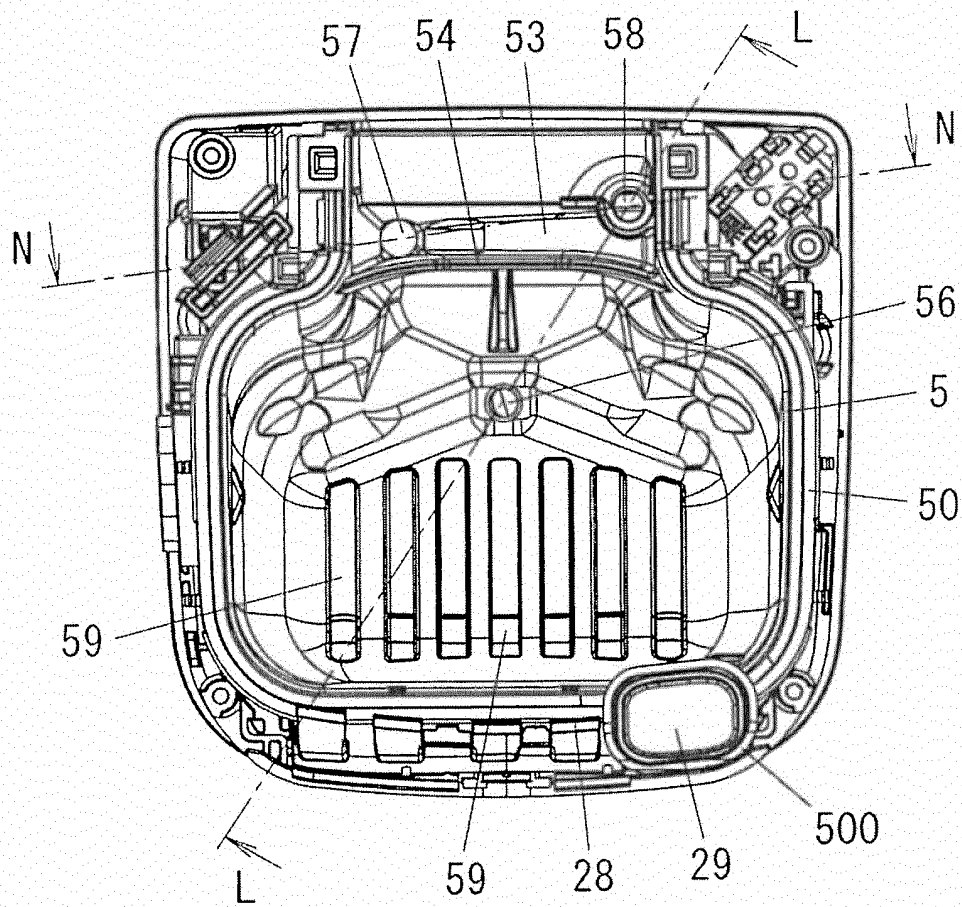


FIG. 11

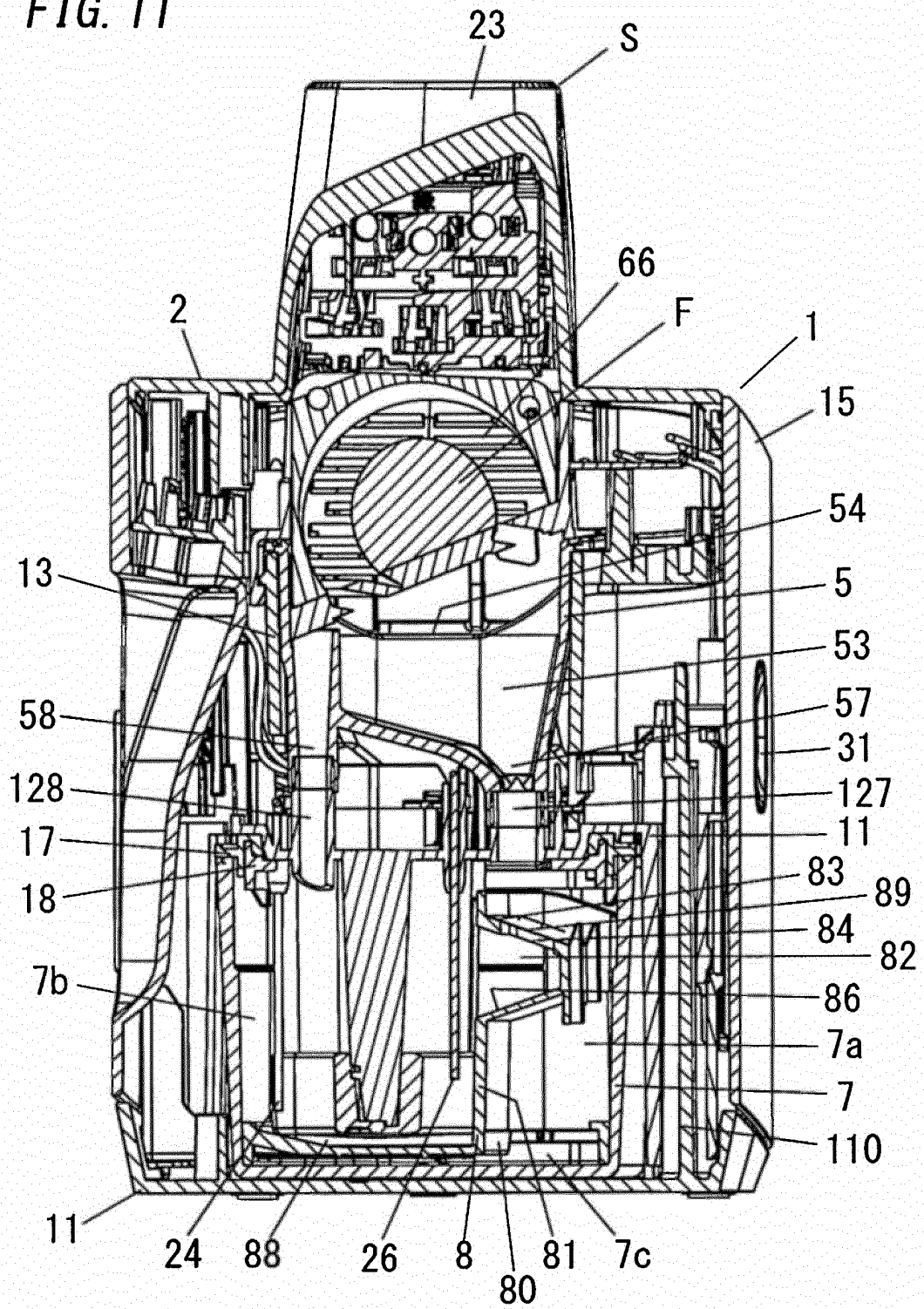


FIG. 12

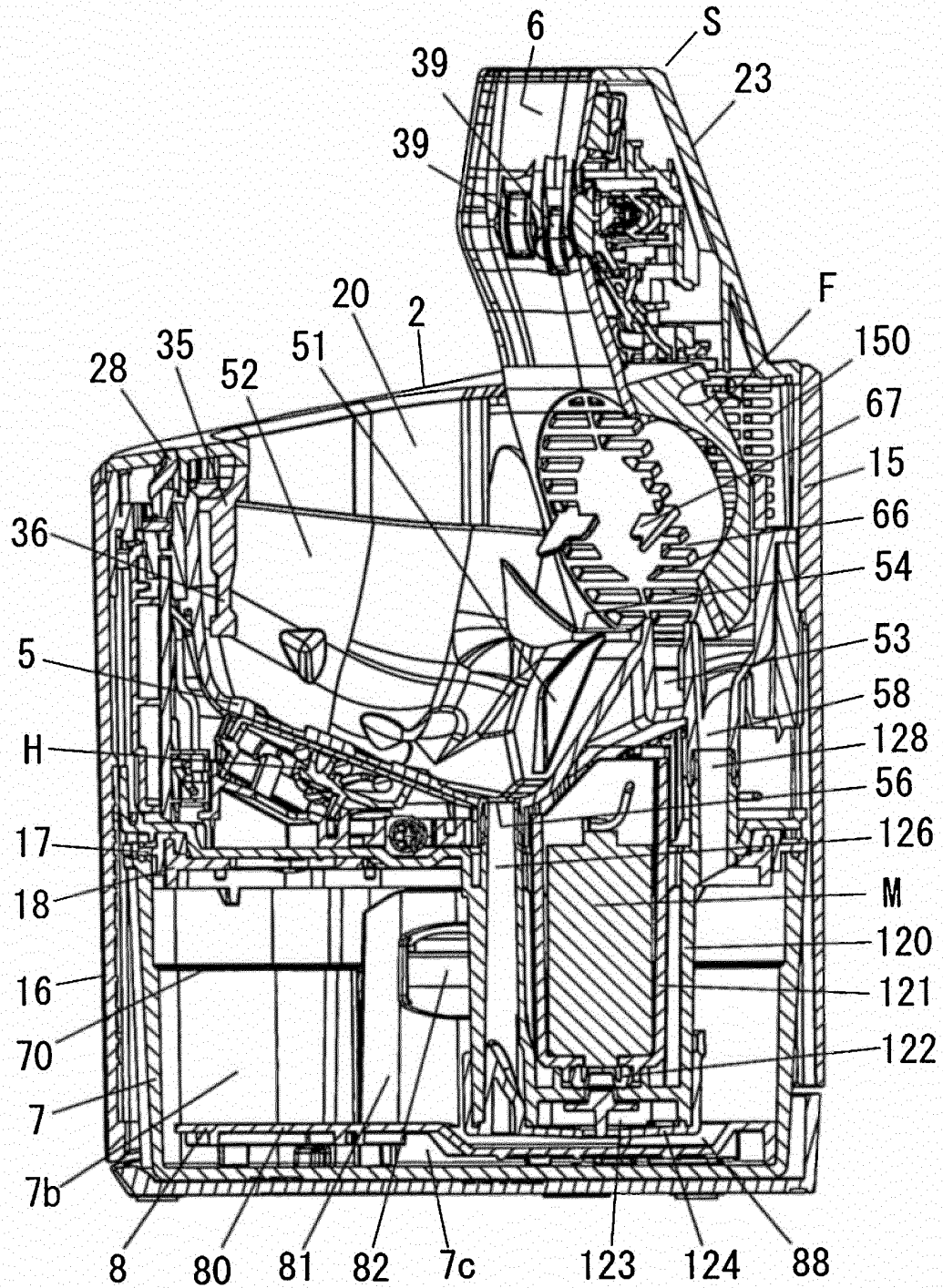


FIG. 13

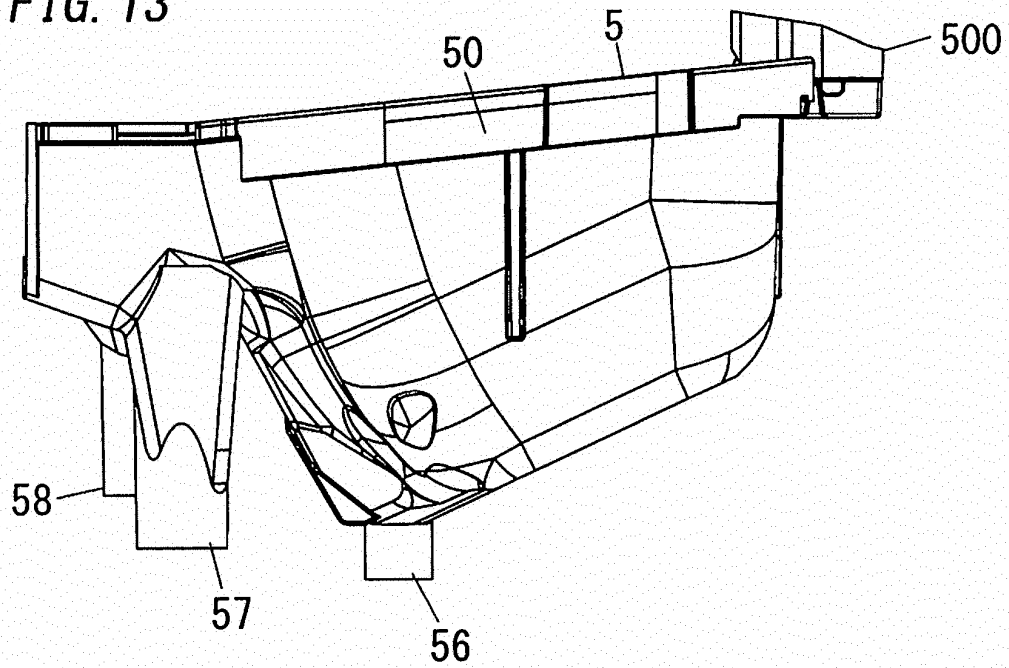


FIG. 14

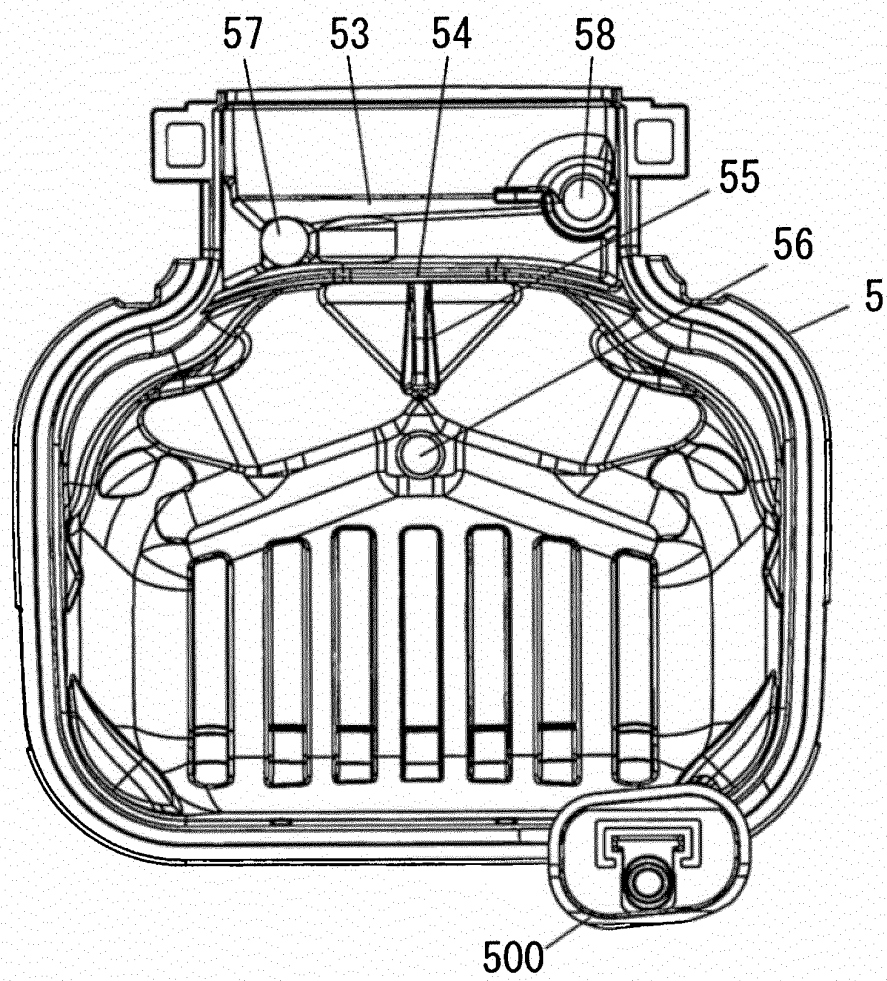


FIG. 15

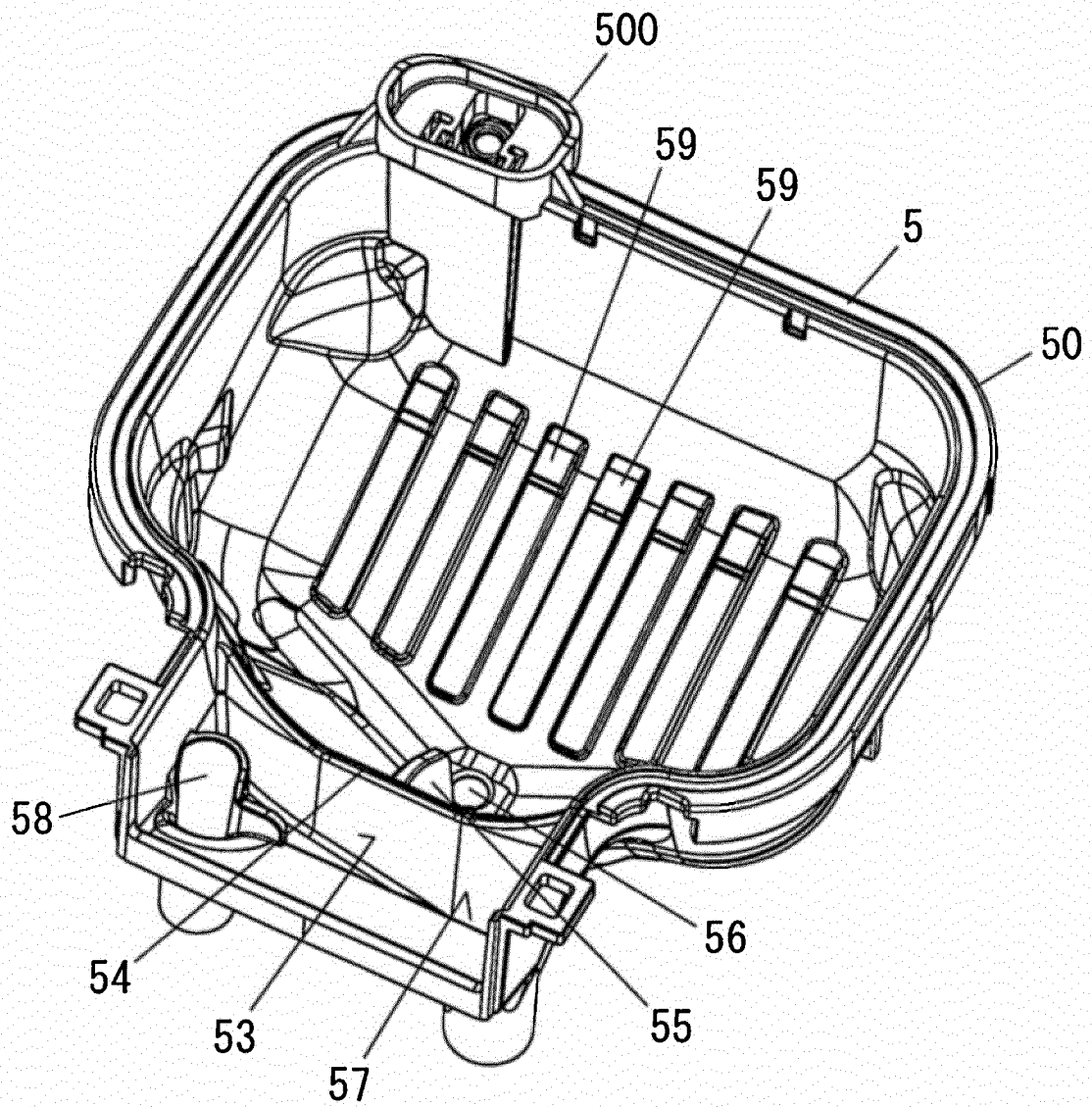


FIG. 16

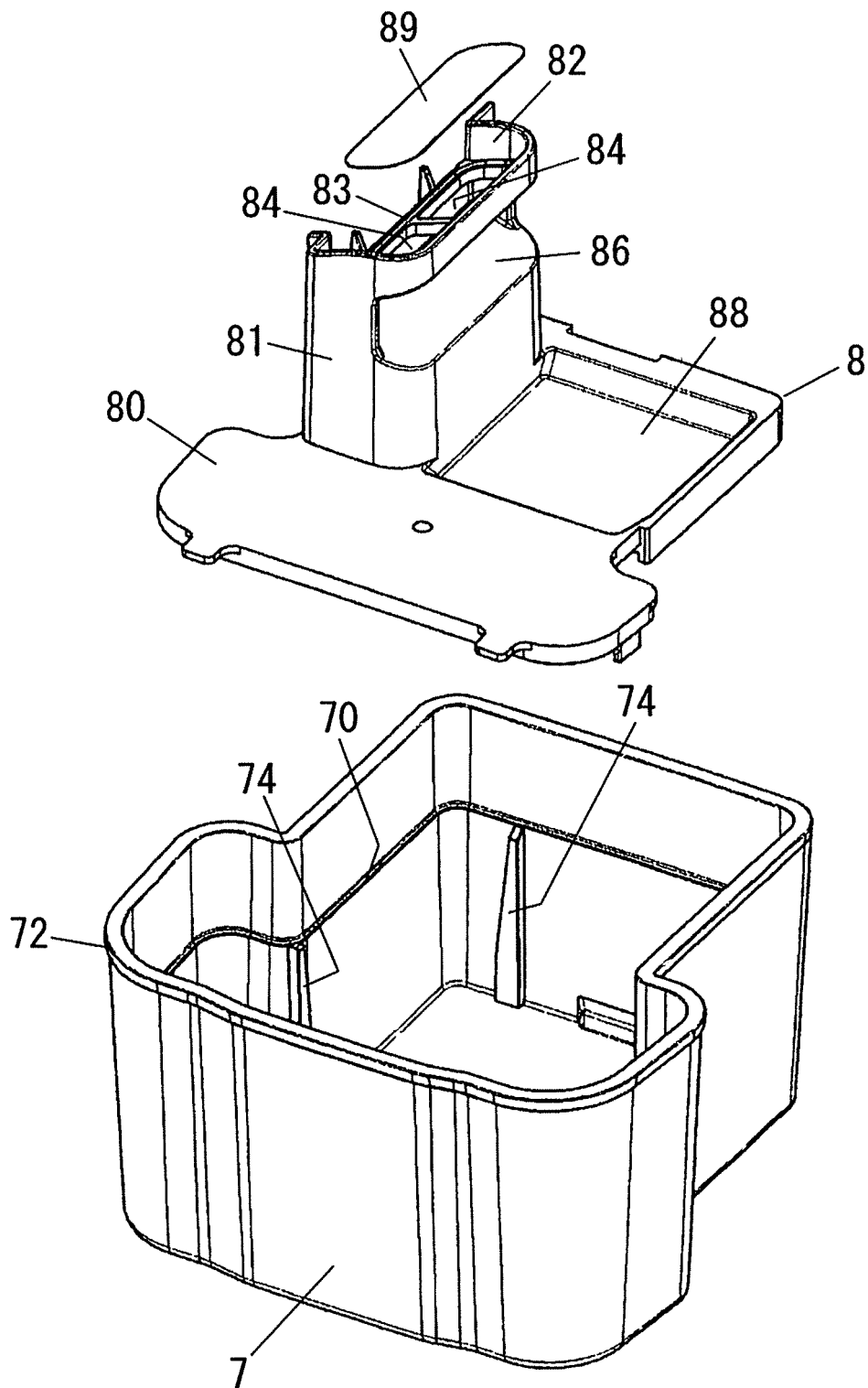


FIG. 17

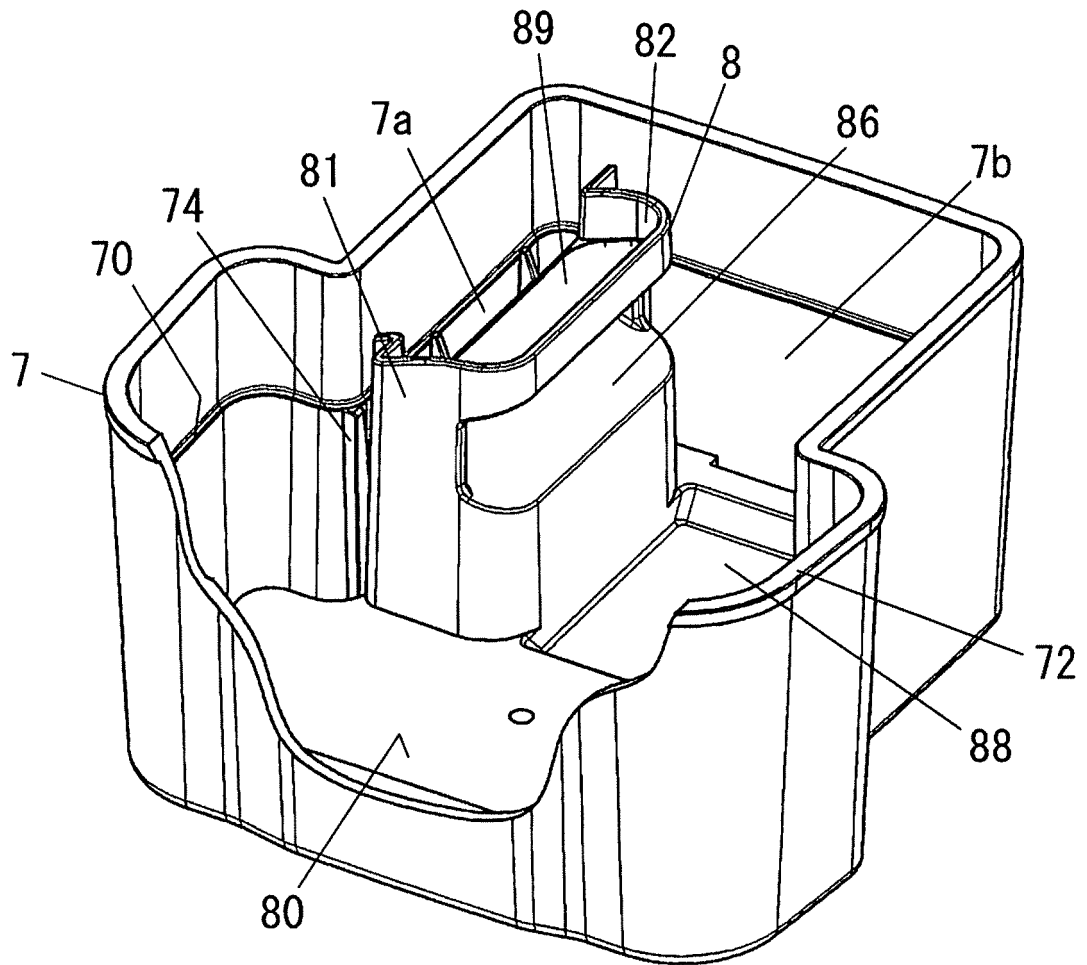


FIG. 18A

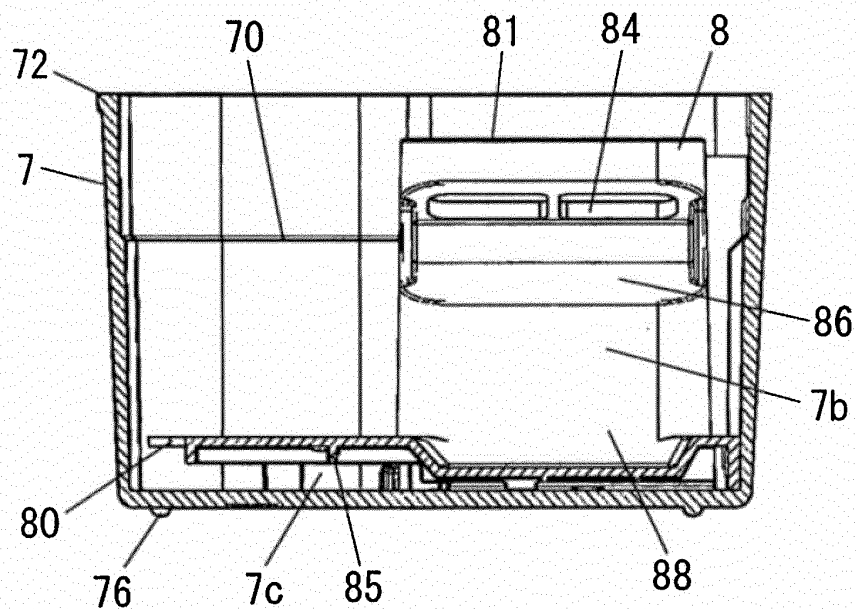


FIG. 18B

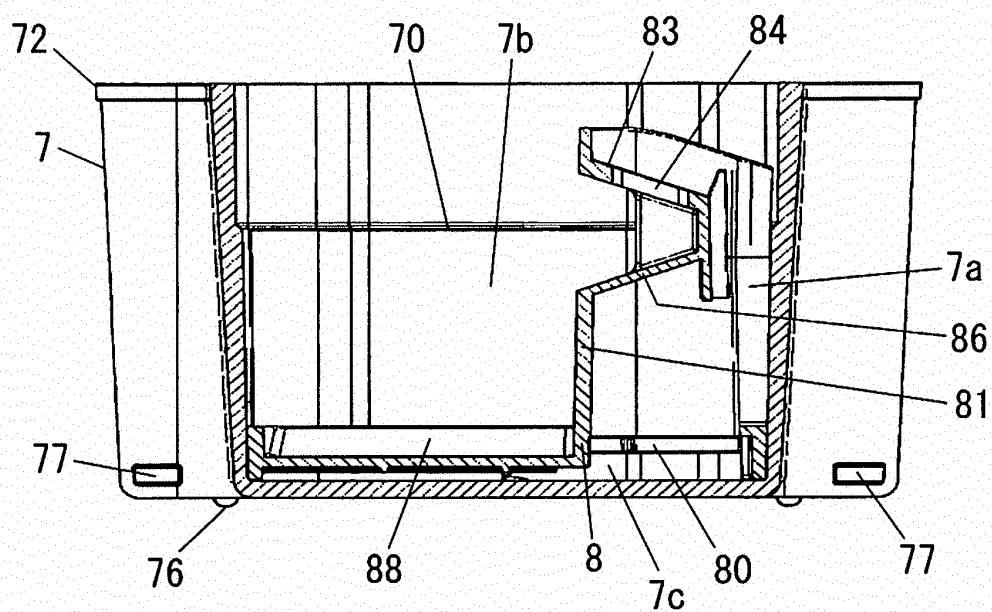


FIG. 19A

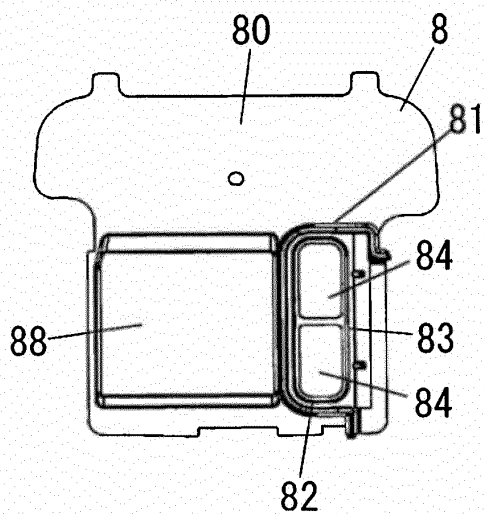


FIG. 19D

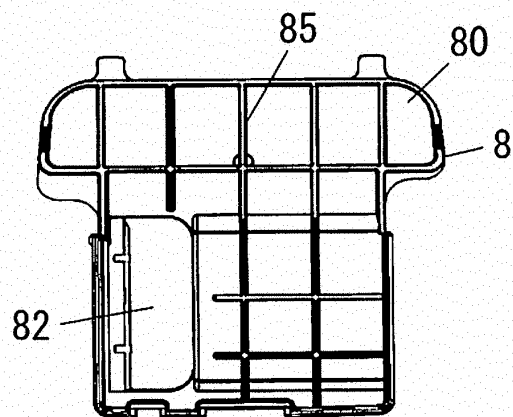


FIG. 19B

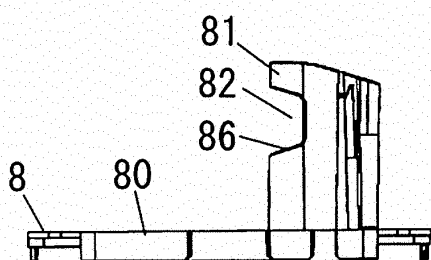


FIG. 19C

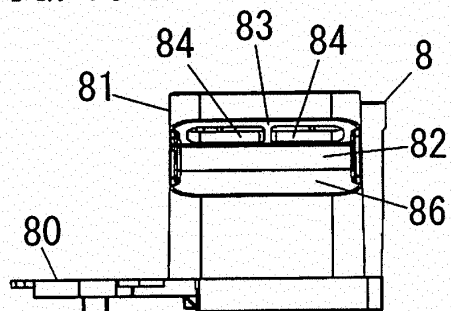


FIG. 20

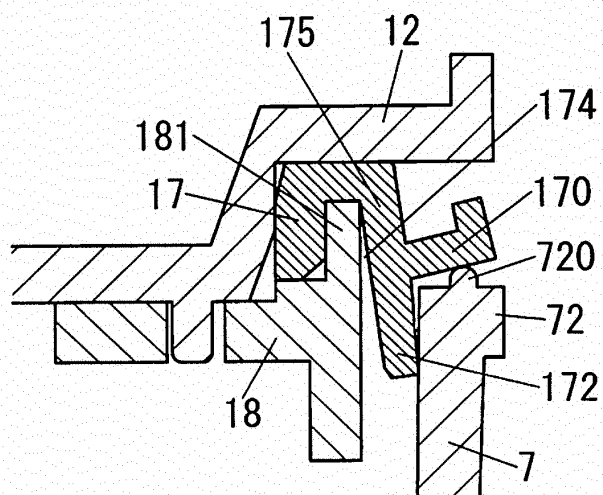


FIG. 21

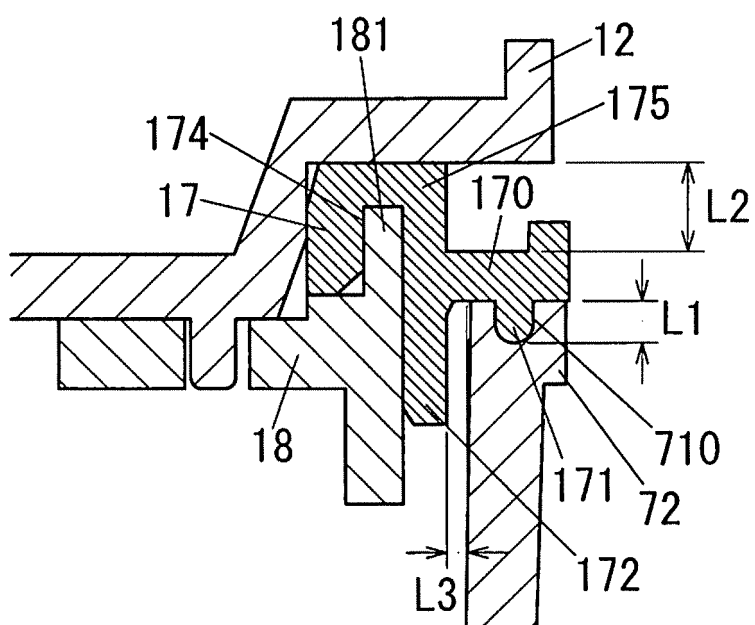
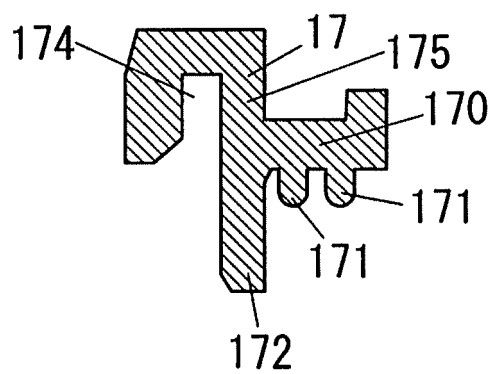
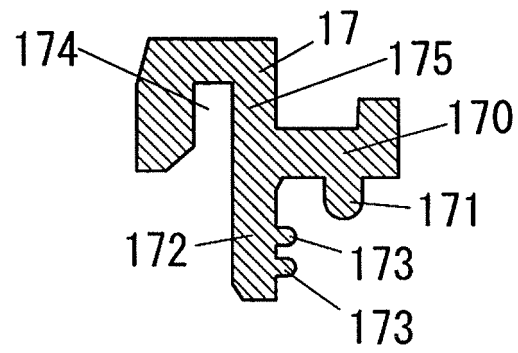


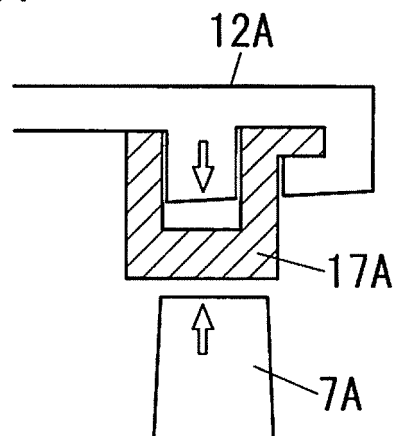
FIG. 22



*FIG. 23*



*FIG. 24*



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/000764

## A. CLASSIFICATION OF SUBJECT MATTER

A45D27/46 (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)

A45D27/46

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. |
|-----------|-------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | JP 2010-57833 A (Sanyo Electric Co., Ltd.),<br>18 March 2010 (18.03.2010),<br>(Family: none)                | 1-10                  |
| A         | JP 2007-167449 A (Matsushita Electric Works,<br>Ltd.),<br>05 July 2007 (05.07.2007),<br>& WO 2007/072783 A1 | 1-10                  |

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

## \* Special categories of cited documents:

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

01 May, 2013 (01.05.13)

Date of mailing of the international search report

14 May, 2013 (14.05.13)

Name and mailing address of the ISA/  
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**Patent documents cited in the description**

- JP 2010057833 A [0002]