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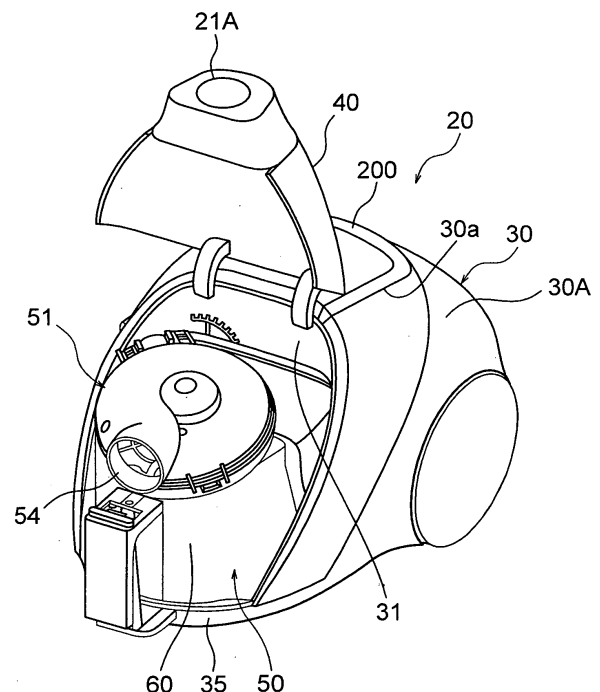
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(54) **Vacuum cleaner**

(57) The vacuum cleaner includes a vacuum cleaner body (20) having a dust collector (60) and an electric blower (33) for producing an intake negative pressure in the dust collector, a filter (100) for separating dust absorbed in the dust collector with air by the negative pressure, and a dust dumping member (304) for dumping the dust attached to the filter by vibrating the filter. Moreover, the vacuum cleaner includes a handle (200) mounted on the vacuum cleaner body for carrying the vacuum cleaner body, the handle being movable in a vertical direction between a storing position and a using position; a storage spring (323) for energizing the handle to the storing position; and a power transmission unit (300A) for driving the dust dumping member by linking with the vertical movement of the handle.

FIG.2



Description

PRIORITY CLAIM

[0001] This application claims priority from Japanese Patent Application No. 2006-99860, filed with the Japanese Patent Office on March 31, 2006, the contents of which are incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a vacuum cleaner having a filter for collecting dust and debris.

Description of the Related Art

[0003] A conventional vacuum cleaner has known. The vacuum cleaner includes a first filter (a first dust and debris separator) for separating dust and debris from the air that is taken in with the air in a dust collecting room, a pleat filter (a second dust and debris separator) for separating from the air the thin dust that passed the first filter, a dust dumping member (a dust removal unit) that can move so as to continuously strike a lot of protrusions of the pleat filter, a cord reel for winding a power cord, and an interlocking unit for transmitting a rotation of the cord reel to the dust dumping member. For example, see Japanese Patent Publication No. 2006-6383.

[0004] The vacuum cleaner dumps the thin dust attached to the upstream surface of the pleat filter as follows. First, when the power cord is wound around the cord reel, the rotation of the cord reel is conveyed to the dust dumping member through the interlocking unit. Then, continuously striking a lot of protrusions of the pleat filter's by the dust dumping member gives vibration or oscillation to the pleat filter. Finally, the thin dust attached to the upstream surface of the pleat filter is dumped through the vibration.

[0005] However, the conventional vacuum cleaner contained one-way clutch in the interlocking unit, so that only the rotation in one direction of the cord reel was transferred to the dust dumping member. Accordingly, the interlocking unit had a complex structure.

[0006] For the foregoing reasons, there is a need for a vacuum cleaner for collecting dust that can drive a dust dumping member with a simple structure.

SUMMARY OF THE INVENTION

[0007] The present invention is directed to a vacuum cleaner for collecting dust that satisfies this need. The vacuum cleaner comprises a vacuum cleaner body including a dust collector and an electric blower for producing an intake negative pressure in the dust collector; a filter for separating dust absorbed in the dust collector with air by the negative pressure; a dust dumping mem-

ber for dumping the dust attached to the filter by vibrating the filter; a handle mounted on the vacuum cleaner body for carrying the vacuum cleaner body, the handle being movable in a vertical direction between a storing position on a surface of the vacuum cleaner body at which the handle is stored and a using position to which the handle is lifted upward; a storage spring for energizing the handle to the storing position; and a power transmission unit for driving the dust dumping member by linking with the vertical motion of the handle.

Advantageously, the dust dumping member reciprocates by linking with the vertical motion of the handle.

Advantageously, the dust dumping member and the filter produce a first load therebetween when the handle is moved upward by a manual operation; the dust dumping member and the filter produce a second load therebetween when the handle is moved down to the storing position by the storage spring; and the second load is determined to be smaller than the first load.

Advantageously, the filter is a pleat filter in which a multiplicity of folds having crests and troughs extending in the vertical direction are arranged in the horizontal direction; and the dust dumping member is provided to be able to reciprocate in the direction in which the folds are arranged, by linking with the vertical motion of the handle; and further comprises a first guide provided in the dust dumping member for going by linking with the motion of the handle when the handle is moved upward by a manual operation and for sequentially striking the folds; and a second guide provided in the dust dumping member for returning by linking with the motion of the handle when the handle is moved downward by the storage spring and for sequentially striking the folds weaker than the first guide.

Advantageously, the filter is a pleat filter in which a multiplicity of folds having crests and troughs extending in the vertical direction are arranged in the horizontal direction; the dust dumping member is provided to be able to reciprocate in the direction in which the folds are arranged, by linking with the vertical motion of the handle; and the dust dumping member is provided to return by linking with the handle when the handle is moved downward by the storage spring, and to be rotatable in the direction opposite to the returning direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings.

Fig. 1 is a perspective view of a vacuum cleaner in accordance with the present invention.

Fig. 2 is an illustrative view of an open body of the vacuum cleaner shown in Fig. 1.

Fig. 3 is a partial sectional view of the vacuum cleaner shown in Fig. 1.

Fig. 4 is a perspective view of a dust collecting container shown in Figs. 1 and 2.

Fig. 5 is a perspective view of the dust collecting container seen from its back upward and obliquely shown in Fig. 4.

Fig. 6 is a sectional view of an upper circular wind pass for the dust collecting container of Fig. 4.

Fig. 7 is a perspective view of an essential portion of a dust removing unit, seen from the dust collecting container, mounted on a front wall of Fig. 2.

Fig. 8 A is a perspective view of an essential portion of a dust removing unit, seen from an electric blower, mounted on a front wall of Fig. 2.

Fig. 8 B is an illustrative view of a link removing unit of Fig. 8 A.

Fig. 9 is an illustrative view of operation of the dust removing unit of Fig. 7.

Fig. 10 is an illustrative view of operation of the dust removing unit of Fig. 8.

Fig. 11 is a perspective view representing a relationship between a handle of Fig. 7 and a cord reel brake unit.

Fig. 12 is a perspective view representing a relationship between a handle of Fig. 11 and a cord reel brake unit.

Fig. 13 is a perspective view of an expanded slider of Fig. 7.

Fig. 14 is an illustrative view representing a relationship between a dust dumping member mounted on a slider of Fig. 13 and a pleat filter.

Fig. 15 is an expanded perspective view of the pleat filter of Figure 14.

Fig. 16 is an illustrative view of operation of the handle of Figs. 7 and 8.

Fig. 17 is an illustrative view representing a relationship between a position of the handle of Fig. 16 and the dust dumping member of Fig. 14.

DETAILED DESCRIPTION OF THE INVENTION

[0009] An embodiment of a vacuum cleaner in accordance with the present invention will be described referring to the drawings.

[0010] Fig. 1 is a perspective view of a vacuum cleaner 10 in accordance with the present invention. The vacuum cleaner 10 includes a body 20. One end of a dust collecting hose 12 is removably connected to a hose connection port 21 provided at the front of the body 20, while the other end is connected to a handle grip 13. An extension duct 14 is removably connected to the handle grip 13, and an intake port member 15 is removably connected to the end of the extension duct 14.

[0011] The intake port member 15 includes an intake room (not shown) having an intake port (not shown) open in its lower surface. The handle grip 13 includes an operation unit 13A, on which a plurality of switches S are provided.

[0012] As shown in Figure 2, the body 20 contains a

housing 30, a dust collecting container 50 that is removably attached to the housing 30, and a lid 40 whose back portion is hinged to the housing 30. The lid 40 can be opened or closed in the vertical direction.

[0013] An handle storage unit 30a is formed on a front surface of the rear portion of the housing 30, and a handle 200 for carrying the body 20 is provided with the handle storage unit 30a. The handle 200, which is shown in Figure 7, contains arms 200a and 200b mounted to rise up forward or lie down backward with respect to the housing 30, and a grip 200c constituting an end opposite to the arms 200a and 200b.

[0014] As shown in Figure 3, an electric blower 33 is built-in in a rear portion 30A of the housing 30. As shown the dotted lines in Figure 3, a cord reel 34 is provided on the side of the electric blower 33. The cord reel 34 is rotatably attached to the housing 30 by a horizontal axis 34a of Figure 11 and is provided to be able to wind a power cord 34b of Figure 11 by a spiral spring (not shown). Since this structure is well known, a detailed explanation thereof will be omitted.

[0015] A plate-like bottom 35 is provided in front of the housing 30 (a left side in Figure 3). The dust collecting container 50 is removably placed on the bottom 35. When the lid 40 is closed, the lid 40 and the bottom 35 sandwich the dust collecting container 50 to fix it.

[0016] As shown in Figure 3, the lid 40 contains a duct 22 whose end is the hose connection port 21. The back end of the duct 22 is a connection port 23.

[0017] As shown in Figure 2, a front wall 31 is placed at a back portion 30A of the housing 30. In the front wall 31, as shown in Figures 7-10, a front aperture 201 is formed. The front aperture 201 communicates with an intake port 33A of the electrical blower 33 through a communication wind passage (not shown). At the front wall 31, as shown in Figure 7, side walls 31a and 31a are formed, and a dust removing unit 300 is provided.

[0018] The dust removing unit 300, as shown in Figure 7, includes a pair of axial guide rails 301 and 301 extending left and right and a slider 302 that is held to be able to voluntarily move left and right on the guide rails. The guide rails 301 and 301, both ends of which are fixed at the side walls 31a and 31a, are arranged vertically to be parallel to each other. At the back of the slider 302 facing the front wall 31, as shown in Figures 7 and 13, a rack 303 is arranged that has a lot of teeth disposed in the horizontal direction.

[0019] The dust removing unit 300, as shown in Figure 13, includes a pair of dust dumping members 304 and 304 as a dust removing unit mounted on the left and right ends of a slider 302. The dust dumping member 304 includes a dust damping unit 305, an installation boss 306 integrally attached to a base of the dust damping unit 305, and legs 307 and 308 extending parallel, branched left and right of the installation boss 306 from the base of the dust damping unit 305.

[0020] The dust dumping member 304 is mounted horizontally rotatably on both ends of the slider 302 through

the installation boss 306. As shown in Figure 14, support walls 309 and 310 are formed on the slider 302 that are located between legs 307 and 308. The dust damping unit 305 protrudes upstream of (in front of) the slider 302.

[0021] A coil spring (an elastic member) 311 is disposed between the leg 308 and the support wall 309. The coil spring 311 is energized so that the leg 307 can contact with an outer surface of the support wall 309. While the leg 307 contacts with the outer surface of the support wall 309, the dust dumping unit 305 is almost vertical with respect to the slider 302.

[0022] As shown in Figure 13, the dust dumping unit 305 is designed to reciprocate as one unit together with the slider 302 in the A1 and A2 directions designated by the arrows. The side of the dust dumping unit 305 in going one way constitutes a first engagement portion 305a that is almost vertical with respect to the slider 302 while the leg 307 touches the outer surface of the support wall 309. In contrast, the side of the dust dumping unit 305 in returning constitutes a second engagement unit 305b that is inclined with respect to the slider 302 while the leg 307 touches the outer surface of the support wall 309.

[0023] The dust removing unit 300 includes a power transmission unit 300A that transforms a vertical motion of the handle 200 to a horizontal motion of the slider 302.

[0024] The power transmission unit 300A, as shown in Figure 7, is rotatably attached to the front wall, and contains a pinion 312 for engaging with the rack 303, a pinion 313 fixed on a rotational axis 312a (see Figure 8A) for the pinion 312, a gear 314 for engaging the pinion 313 and rotatably attached to the back of the front wall 31, and a pinion 315 integrally provided with the gear 314.

[0025] As shown in Figure 8A, the power transmission unit 300A includes a rack 316 for engaging with the pinion 315 and held at the back of the front wall 31 to be vertically movable, a protrusion 317 mounted on the rack 316, and a link 318 placed between a portion close to the base of the leg 200b of the handle 200 and the protrusion 317.

[0026] The lower end (one end) of the link 318 is mounted on the protrusion 317 to be rotatable back and forth, while the upper end (the other end) of the link 318 is mounted on the portion close to the base of the leg 200b of the handle 200 by a link removing unit B 1 to be rotatable back and forth.

[0027] As shown in Figure 8 B, the link removing unit B1 consists of an oval hole 318a and a support axis 318b. The oval hole 318a is formed at the upper end of the link 318. The support axis 318b is inserted into the oval hole 318a and is mounted on the portion close to the base of the leg 200b. Therefore, the upper end of the link 318 is supported by the support axis 318b so that the upper end can be rotated about the leg 200b.

[0028] The rack 316 can move vertically in a predetermined range by the arrangement of a pair of upper and lower guide slits 319 and 319 formed in the guide portion 317a and a pair of protrusions 320 and 320 that are ejected at the back of the front wall 31 and inserted into the guide slits 319 and 319. As shown in Figure 8A, at a

position in which the handle 200 lies down, since the upper end of the guide slits 319 and 319 comes in contact with the protrusions 320 and 320, the rack 316 is prevented from moving downward.

[0029] At the front wall 31, a spring storing space 321 is provided that has a spring receiving wall 321a at the upper end. The spring storing space 321, which is close to the guide portion 317a, extends vertically and are open at the back. In the spring storing space 321, a spring receiving projection 322, which is integrally provided at the lower end of the guide portion 317a, is arranged. The spring storing space 321 includes a coil spring (a handle storage spring) 323 disposed between the spring receiving projection 322 and the spring receiving wall 321a.

[0030] As shown in Figure 11, between the lower portion of the leg 200a of the handle 200 and the brake drum 34a in the side of the cord reel 34, a brake unit 324 is arranged. The brake unit 324 contains a brake release lever 325 rotatably mounted about a support axis 325a in the housing 30, a roll supporting unit 326 having an inverse U shape and disposed together with the brake release lever 325, an oval hole 327 provided on side plates 326a and 326a of the roll supporting unit 326 and extending inclined in the back and forth direction, a rubber roll 328 placed between the side plates 326a and 326a, and an axis portion provided in the rubber roll 328 and inserted into the oval hole 327 to be movable in the back and forth direction.

[0031] Where the axial portion 329 of the rubber roll (brake roll) 328 has moved to the back end of the oval hole 327, a spring force of a spiral spring (not shown), which rotates the cord reel 34 in the direction in which the power cord 34b is wound, prevents the cord reel 34 from rotating, with the rubber roll 328 pressed by the brake drum 34a. When the power cord 34b is pulled out from the cord reel 34, the axial portion 329 of the rubber roll (brake roll) 328 moves to the front of the oval hole 327. Accordingly, since the pressure to the brake drum 34a by the rubber roll 328 is released, the brake is also released.

[0032] Pressing downward the release lever 325 by the brake separates the rubber roll 328 from the brake drum 34a, which releases the brake of the cord reel 34. Because the cord reel 34 is rotated by the spring force of the spiral spring (not shown), the power cord 34b is wound on the cord reel 34. The well-known structure can be employed for the brake unit 324.

[0033] When the handle 200 is stored in the coil spring (the handle storing spring) 323 in the handle storing unit 30b and the upper ends of the guide slits 319 and 319 come in contact with the guide protrusions 320 and 320, the leg 200a of the handle 200 only touches the upper end of the brake release lever 325, and at the same time the supporting axis 318b is located at the upper end of the oval hole 318a, which enables the handle 200 to be further pressed downward. Therefore, even if the handle 200 is further pressed downward from the handle storing position, the brake release lever 325 is pressed down at

the leg 200a of the handle 200, and the brake of the cord reel 34 by the rubber roll 328 is released, the slider 302 and the dust dumping member never move.

As a result of this, it can be prevented beforehand that release of the brake by the handle operation damages the slider 302 and the dust dumping member 304.

[0034] As shown in Figure 3, the dust collecting container 50 includes a circular wind passage unit 51 (see Figures 4 and 5), a dust collector 60 (a first dust collector) as a first dust collecting room formed under the circular wind passage unit 51, a negative pressure room 70 formed at the back of the dust collector 60, and a bottom lid 80.

[0035] The circular wind passage unit 51, as shown in Figure 6, includes a circular wind passage 53 having an arc shape around the circumference of a dust and debris separator (a first dust and debris separator) 52 placed in the center. An end aperture located at the end of the circular wind passage 53, as shown in Figure 3, is connected to the connection aperture 23 of the duct 22 of the lid 40. The circular wind passage 53 communicates with the dust collector 60 through a rear end aperture 55.

[0036] An aperture 57 is formed that communicates with the negative pressure room 70 at the bottom in the circular wind passage 53. The aperture 57 is equipped with a net filter F2. The dust and debris separator 52 is composed of a net filter F1 formed in a shape of a truncated cone and has an aperture 56 at the bottom. The dust and debris separator 52 communicates with the negative pressure room 70 through the aperture 56.

[0037] An aperture 62 for communicating with the negative pressure room 70 is formed at a separation wall 61 at the back of the dust collector 60. A communication hole (communication aperture) 63 is formed at a lower wall 61A of the separation wall 61. That is, the communication hole 63 is made under the aperture 62. The aperture 62 is provided with a net filter F3.

[0038] A frame 71 for removably fitting a pleat filter 100 of Figure 3 is formed at the back (right side in Figure 5) of the negative pressure room 70. A rear end aperture 72 of the frame 71 is connected to a front aperture (not shown) of the housing 30 shown in Figure 3.

[0039] The pleat filter 100, as shown in Figures 14 and 15, consists of crests and troughs extending vertically, and has a lot of folds 100a arranged horizontally. As shown in Figure 14, the end of the dust dumping unit 305 provided at the dust dumping member 304 engages with the back of the pleat filter 100 (downstream of the air flow).

[0040] A lower back wall 73 is formed in the lower portion of the frame 71. A space enclosed by the lower back wall 73 and the lower wall 61A of the separation wall 61 of the dust collector 60 and the bottom lid 80 constitutes a thin dust collector (a second dust) 74. The thin dust collector 74 communicates with the dust collector 60 through the communication hole 63 of the separation wall 61. A lower frame wall 71A of the frame 71 and the lower wall 61A of the separation wall 61 constitutes an intro-

duction aperture 75.

[0041] One end (upper portion in Figure 3) of an open-close plate (an open-close lid) 76 for closing the introduction aperture 75 is axially supported at the lower portion of the separation wall 61 of the dust collector 60. The open-close plate 76 is rotatably around one end. When the electric blower 33 is not driven, the open-close plate 76 closes the communication hole 63 of the separation wall 61 through its weight to open the introduction aperture 75 of the thin dust collector 74. When the electric blower 33 drives the negative pressure room 70 negative, the open-close plate 76 rotates to close the introduction aperture 75 (see Figure 9).

[0042] A bottom lid 80 is supposed to rotate clockwise about an axis 81, as shown in Figure 3. The rotation opens the bottom of the dust collector 60 and the thin dust collector 74 to dump the dust piled up in the dust collector 60 and the thin dust collector 74.

Next, the operation of the vacuum cleaner having the above structure will be described.

[0043] As shown in Figure 2, the dust collecting container 50 is placed on the bottom 35 of the housing 30 and the lid 40 is closed. Then, as shown in Figure 1, one end of the dust collecting hose 21 is connected to the hose connecting port 21 of the lid 40.

[0044] As shown in Figure 3, an end aperture 54 of the dust collecting container 50 is connected to the duct 22 of the connection aperture, so that the dust collecting hose 12 is connected to the circular wind passage unit 51 of the dust collecting container 50.

[0045] Operating the switch S of the handle grip 13A drives the electric blower 33. Driving the electric blower 33 makes the pressure of the negative room 70 of the dust collecting container 50 and the dust collector 60 negative. The negative pressure affects an intake room (not shown) of the intake port member through the circular wind passage 53, the dust collecting hose 12, the handle grip 13, and the extension duct (extension pipe) 14.

[0046] By means of the negative pressure, dust and debris on a cleaning surface (not shown) are taken in together with the air to the intake room (not shown) of the intake port member 15. The dust and debris taken in to the intake room (not shown) of the intake port member 15 are taken in with the air to the extension duct (extension pipe) 14, the handle grip 13, and the dust collecting hose 12, and the circular wind passage 53 of the dust collecting container 50.

[0047] Part of both the air and the thin dust absorbed into the circular wind passage 53 flows in the negative pressure room 70 through the net filter F1 and the net filter F2. On the other hand, the larger and heavier of the dust and debris and part of the thin dust taken in together with the air in the circular wind passage 53 flows along the circular wind passage 53 by inertial force to enter the dust collector 60 through the rear end aperture 55 of the circular wind passage 53. Part of the dust and debris flown in the dust collector 60 enters the negative pressure room 70 via the net filter F3. On this occasion, the larger

and heavier of the dust and debris is captured in the dust collector 60.

[0048] The air that has flown in the negative pressure room 70 passes through a pleat filter 100 to be absorbed in the electric blower 33. After the air cools the electric blower 33, it is discharged out of an exit (not shown) of the housing 30 to the outside. On this occasion, the thin dust flown in the negative pressure room 70 is captured by the pleat filter 100.

First, the operation when the handle 100 is stood up is explained below.

With respect to the vacuum cleaner, when an operator holds the handle 200 and lift the body 20, the handle 100 stands up from a storing position (position P of Figure 16) of Figures 7 and 8 to a using position (position Q of Figure 16) of Figures 9 and 10. According to this, the rack 316 that interlinks with the handle 200 is pulled upward as shown in Figure 10 through the link 318.

[0049] In accordance with this, the pinion 315 can be rotated, whose rotation is transmitted to the rack 303 through the gear 314, the pinion 313, and the pinion 313. The slider 302 having the rack 303 is moved (gone one way) in the direction of an arrow A1 from a left position (position P of Figure 17) of Figure 7 to a right position (position Q of Figure 17) of Figure 9.

[0050] Under the situation, the dust dumping member 304 of the slider 302 of Figures 13 and 14 is moved (gone one way) in the direction of an arrow A1 together with the slider 302. The first engagement portion 305a provided on the dust dumping unit 305 of the dust dumping member 304 engages with, and climbs over, the fold 100a of the pleat filter, as shown in Figure 14. The fold 100a is repelled strongly by the first engagement unit 305a to vibrate the pleat filter 100. This movement is performed sequentially with respect to a lot of folds 100a, by which the thin dust attached to the upstream surface of the pleat filter 100 is dropped to be captured in the thin dust collector 74.

Next, the operation when the handle 100 is laid down is discussed hereinbelow.

When the body 20 is moved to a cleaning surface and the handle is released, the handle 200 is lowered from a using position (position Q of Figure 16) of Figures 9 and 10 to a storing position (position P of Figure 16) of Figures 7, 8A and 8B by a force of the coil spring 323.

[0051] According to this, the pinion 315 is rotated, whose rotation is transferred to the rack 303 through the gear 314, the pinion 313, and the pinion 312. The slider 302 having the rack 303 is moved (returned) in the direction of the arrow A2 from a right position (position Q of Figure 17) of Figure 9 to a left position (position P of Figure 17) of Figure 7.

[0052] On this occasion, the dust dumping member 304 of the slider 302 in Figures 13 and 14 is moved (returned) together with the slider 302 in the direction of the arrow A2. When the second engagement portion 305b located on the dust dumping portion 305 of the dust dumping member 304 engages sequentially with, and

climbs over, the fold 100a of the pleat filter 100, the dust dumping member 304 rotates in the direction of the arrow A3 around the installation boss 306 until the leg 308 hits the supporting wall 310. This allows the second engagement portion 305b to repel weakly than the first engagement portion 305a to vibrate the pleat filter 100. This movement is performed sequentially with respect to a lot of folds 100a, so that the thin dust attached to the upstream surface of the pleat filter 100 is dumped to be collected in the thin dust collector 74.

Winding operation of the power cord 34b is explained hereinafter.

Based on this operation, because a lot of folds 100a of the pleat filter 100 is always repelled by at least one of the two dust dumping members 304 and 304, the dust and debris attached to the pleat filter 100 is dumped. When the handle 200 is lowered to the storing position (position P of Figure 16) of Figures 7 and 8 by a force of the coil spring 323 and is stored in the handle storing unit 30a by the coil spring (handle storing spring) 323, the upper ends of the guide slits 319 and 319 come into contact with the guide protrusions 320 and 320.

[0053] Under the situation, the leg 200a of the handle 200 contacts with the upper end of the brake release lever 325 (position P of Figure 16), as shown in Figures 11 and 12, by the weight of the handle 200 itself. At the same time, because the supporting axis 318b of the link 318 is located in the upper end in the vertical direction of the oval hole 318a, the handle can be lowered further.

[0054] However, in this state, since the upper ends of the guide slits 319 and 319 are in contact with the guide protrusions 320 and 320, the rack 316 cannot be lowered even if the handle 200 is further pressed down. Therefore, the slider 302 does not move in the direction of the arrow A2 from the position Q of Figure 17 to hit the filter frame 100b of the pleat filter 100.

[0055] The handle 200 is further pressed down to lower the brake release lever 325 by the leg 200a of the handle 200. When the rubber roll 328 is lifted upward away from the brake drum 34a, the brake of the cord reel 34 is released by the rubber roll 328. As a result, the power cord 34b is wound around the cord reel 34 by a force of a spiral spring (not shown).

[0056] Accordingly, even if the handle 200 is further pressed down from the handle storing position, the brake release lever 325 by the leg 200a of the handle 200 is lowered, and the brake of the cord reel 34 is released by the rubber roll 328, the slider 302 and the dust dumping member 304 are not moved. Consequently, it can be avoided beforehand that the slider 302 and the dust dumping member 304 are damaged by releasing the brake through a handle operation.

[0057] According to the embodiment, the dust dumping member can be driven with a simple structure.

In the embodiment, the dust of the pleat filter 100 is removed. However, a paper pack filter can be employed instead. The dust of the paper pack filter can be removed by vibrating the paper pack filter, using a member that

moves linking with the vertical motion of the handle.

The handle is provided to be isolated, so that the grip is designed to move vertically. However, the handle may be attached to the vacuum cleaner body so that it moves simply vertically.

[0058] Reciprocation motion by the dust dumping member enables the dust of the filter to be dumped effectively.

[0059] Since the dust dumping member can go one way making use of a repelling force of gravity of the vacuum cleaner body when the handle is lifted, the first load produced between the dust dumping member and the filter can be made larger when the handle is lifted upward by a manual operation. Consequently, a larger vibrating force can be applied to the filter (100) from the dust dumping member (304).

When the handle is returned to the storage position by means of a spring force of the storage spring (coil spring 323), the second load produced between the dust dumping member and the filter is made smaller than the first load when the handle is moved downward to the storage position by the storage spring. Because only the spring force of the storage spring (coil spring 323) can return the dust dumping member, a vibration can be applied to the filter from the dust dumping member to remove the dust even if the storage spring (coil spring 323) has a weak spring force.

[0060] The C surface or R surface other than the inclined surface can be used as the second guide (second engagement portion 305b). On this occasion, when the dust dumping member returns owing to a spring force of the storage spring (coil spring 323), it may rotate in the direction opposite to the movement direction (returning direction) or do not have to rotate.

[0061] While preferred embodiments of the invention have been described and illustrated above, it should be understood that these are exemplary of the invention and are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made without departing from the spirit or scope of the present invention. Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

It is explicitly stated that all features disclosed in the description and/or the claims are intended to be disclosed separately and independently from each other for the purpose of original disclosure as well as for the purpose of restricting the claimed invention independent of the composition of the features in the embodiments and/or the claims. It is explicitly stated that all value ranges or indications of groups of entities disclose every possible intermediate value or intermediate entity for the purpose of original disclosure as well as for the purpose of restricting the claimed invention, in particular as limits of value ranges.

Claims

1. A vacuum cleaner for collecting dust, comprising:

- 5 a vacuum cleaner body (20) including a dust collector (60) and an electric blower (33) for producing an intake negative pressure in the dust collector;
- 10 a filter (100) for separating dust absorbed in the dust collector with air by the negative pressure;
- 15 a dust dumping member (304) for dumping the dust attached to the filter by vibrating the filter;
- 20 a handle (200) mounted on the vacuum cleaner body for carrying the vacuum cleaner body, the handle being movable in a vertical direction between a storing position on a surface of the vacuum cleaner body at which the handle is stored and a using position to which the handle is lifted upward;
- 25 a storage spring (323) for energizing the handle to the storing position; and
- a power transmission unit (300A) for driving the dust dumping member by linking with the vertical motion of the handle.

2. A vacuum cleaner as recited in claim 1, wherein the dust dumping member reciprocates by linking with the vertical motion of the handle.

3. A vacuum cleaner as recited in claim 2, wherein:

- 30 the dust dumping member and the filter produce a first load therebetween when the handle is moved upward by a manual operation;
- 35 the dust dumping member and the filter produce a second load therebetween when the handle is moved down to the storing position by the storage spring; and
- 40 the second load is determined to be smaller than the first load.

4. A vacuum cleaner as recited in claim 3, wherein:

- 45 the filter is a pleat filter in which a multiplicity of folds having crests and troughs extending in the vertical direction are arranged in the horizontal direction; and
- 50 the dust dumping member is provided to be able to reciprocate in the direction in which the folds are arranged, by linking with the vertical motion of the handle; and
- 55 further comprising:
 - a first guide (305a) provided in the dust dumping member for going one way by linking with the motion of the handle when the handle is moved upward by a manual operation and for sequentially striking the folds;

and
a second guide (305b) provided in the dust
dumping member for returning by linking
with the motion of the handle when the han- 5
dle is moved downward by the storage
spring and for sequentially striking the folds
weaker than the first guide.

5. A vacuum cleaner as recited in claim 3, wherein:

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the filter is a pleat filter in which a multiplicity of
folds having crests and troughs extending in the
vertical direction are arranged in the horizontal
direction;
the dust dumping member is provided to be able 15
to reciprocate in the direction in which the folds
are arranged, by linking with the vertical motion
of the handle; and
the dust dumping member is provided to return
by linking with the handle when the handle is 20
moved downward by the storage spring, and to
be rotatable in the direction opposite to the re-
turning direction.

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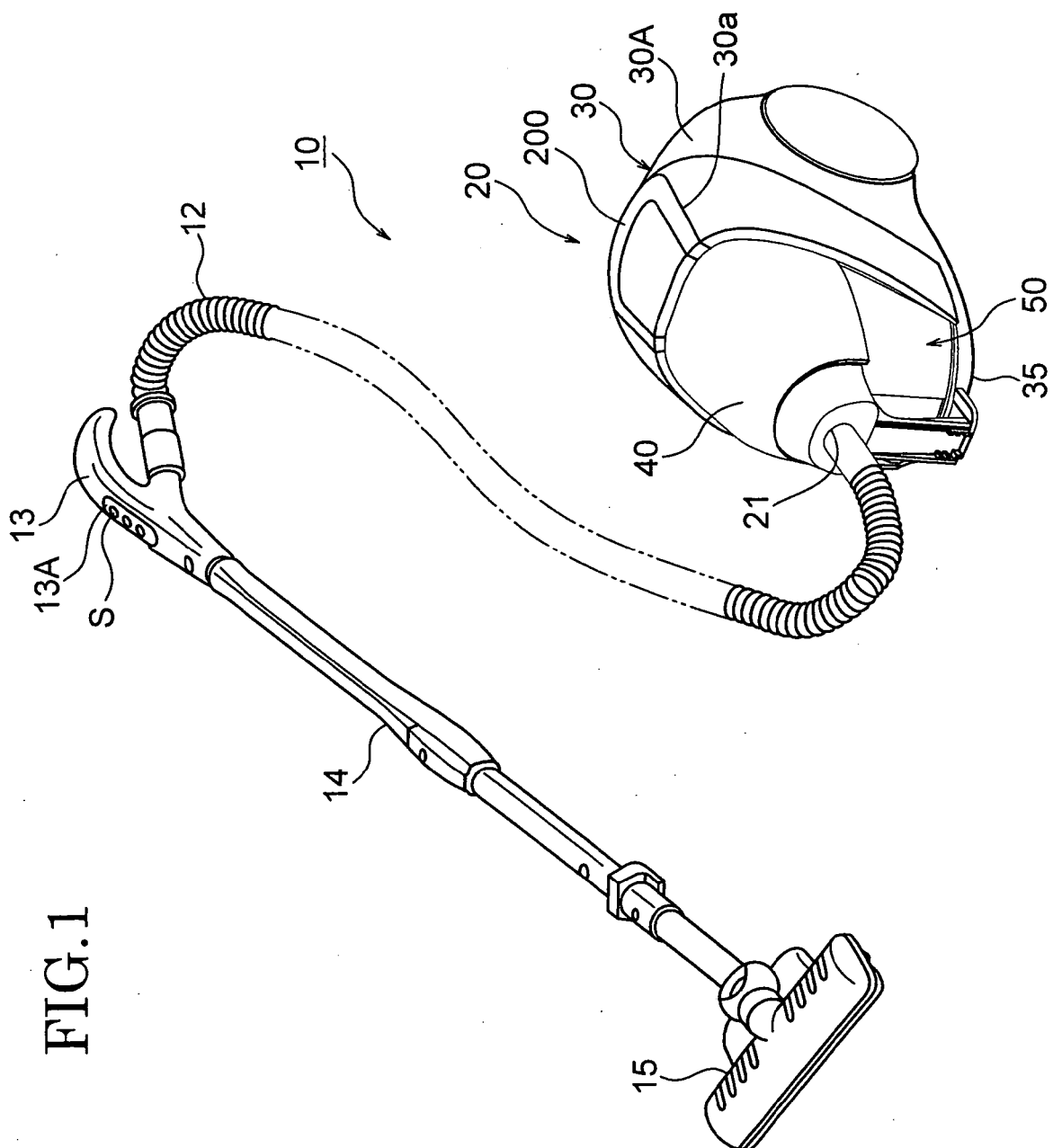


FIG. 1

FIG.2

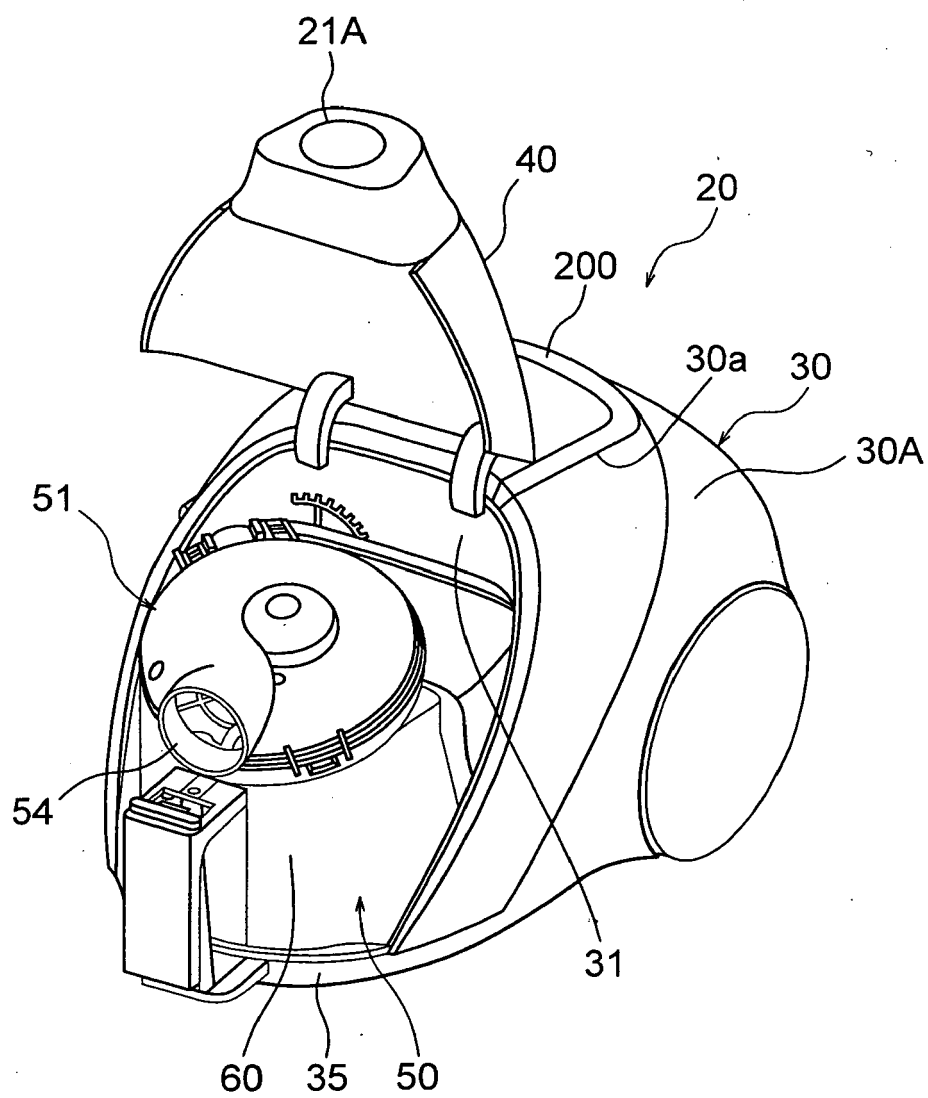


FIG.3

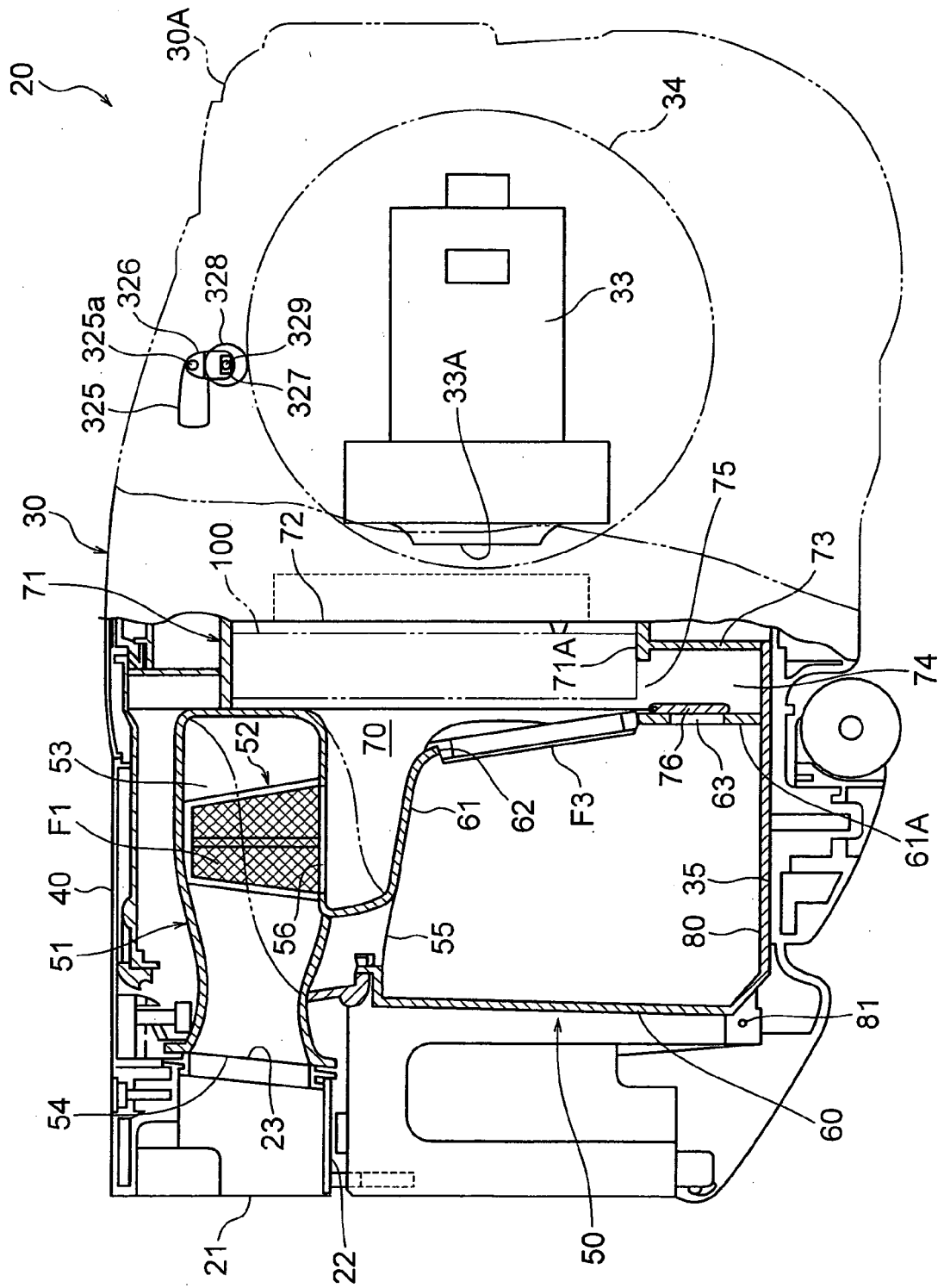


FIG.4

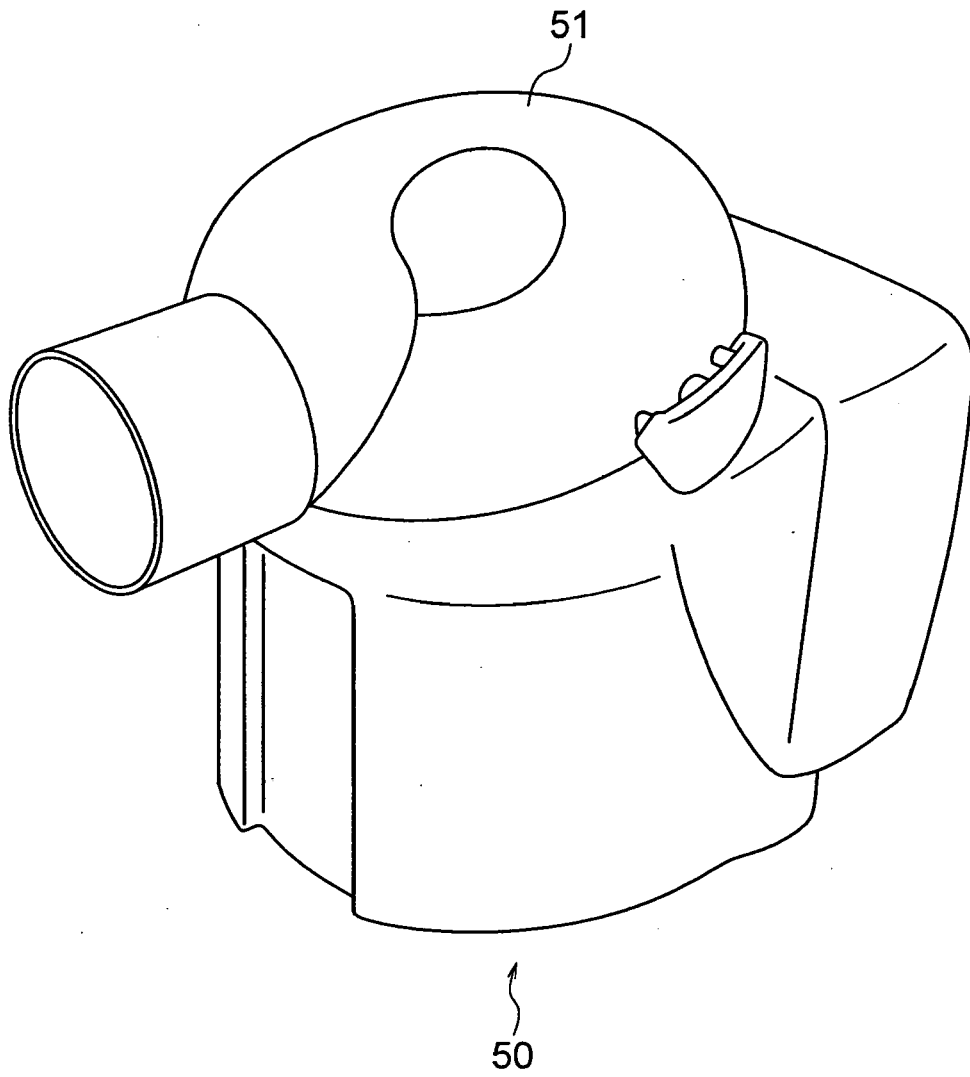


FIG.5

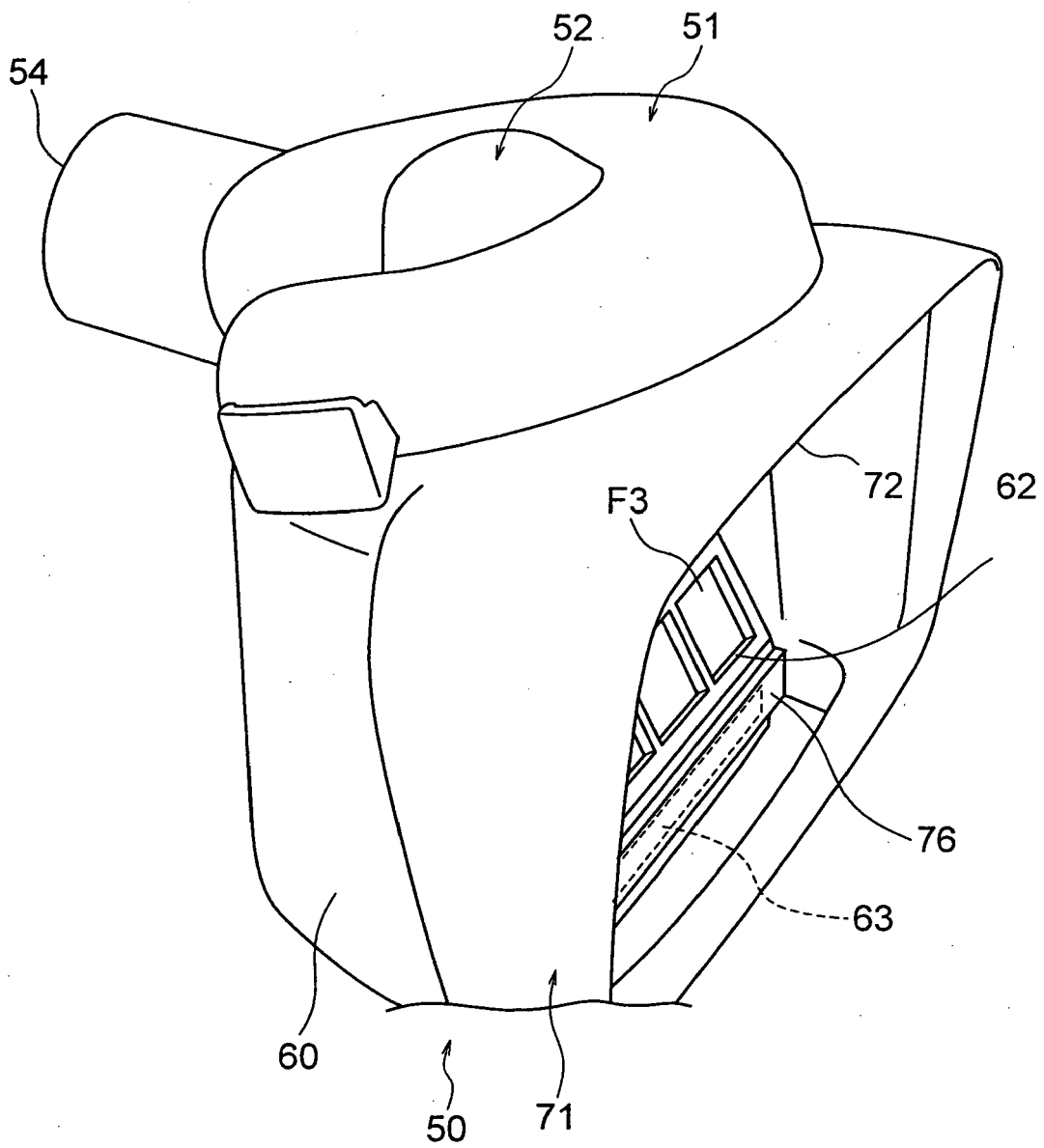


FIG.6

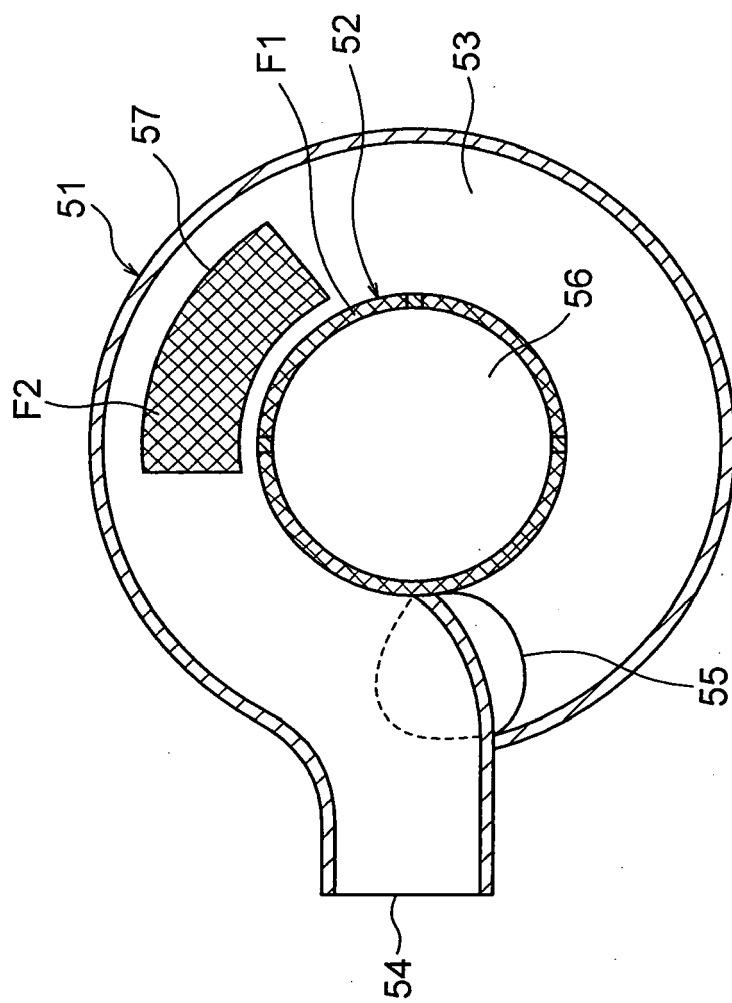


FIG.7

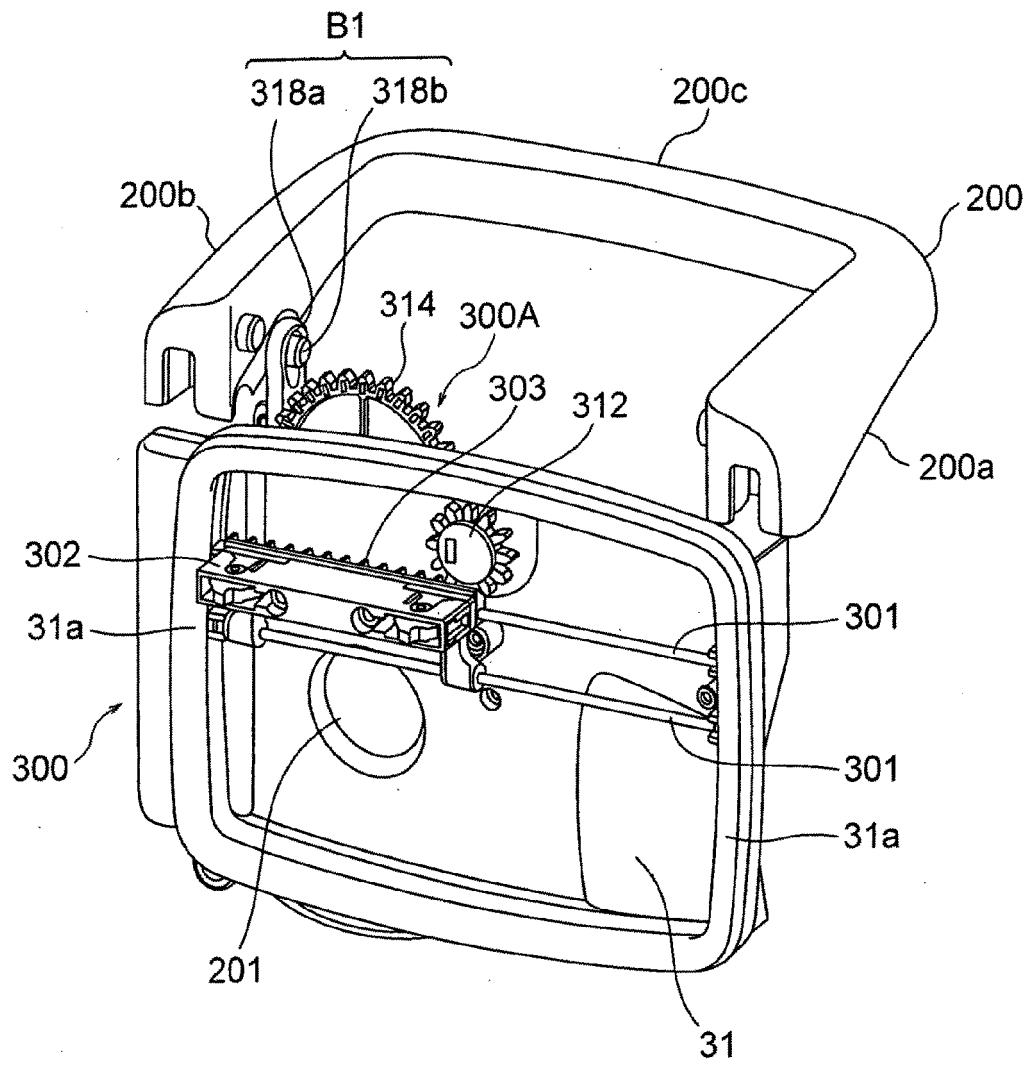


FIG.8A

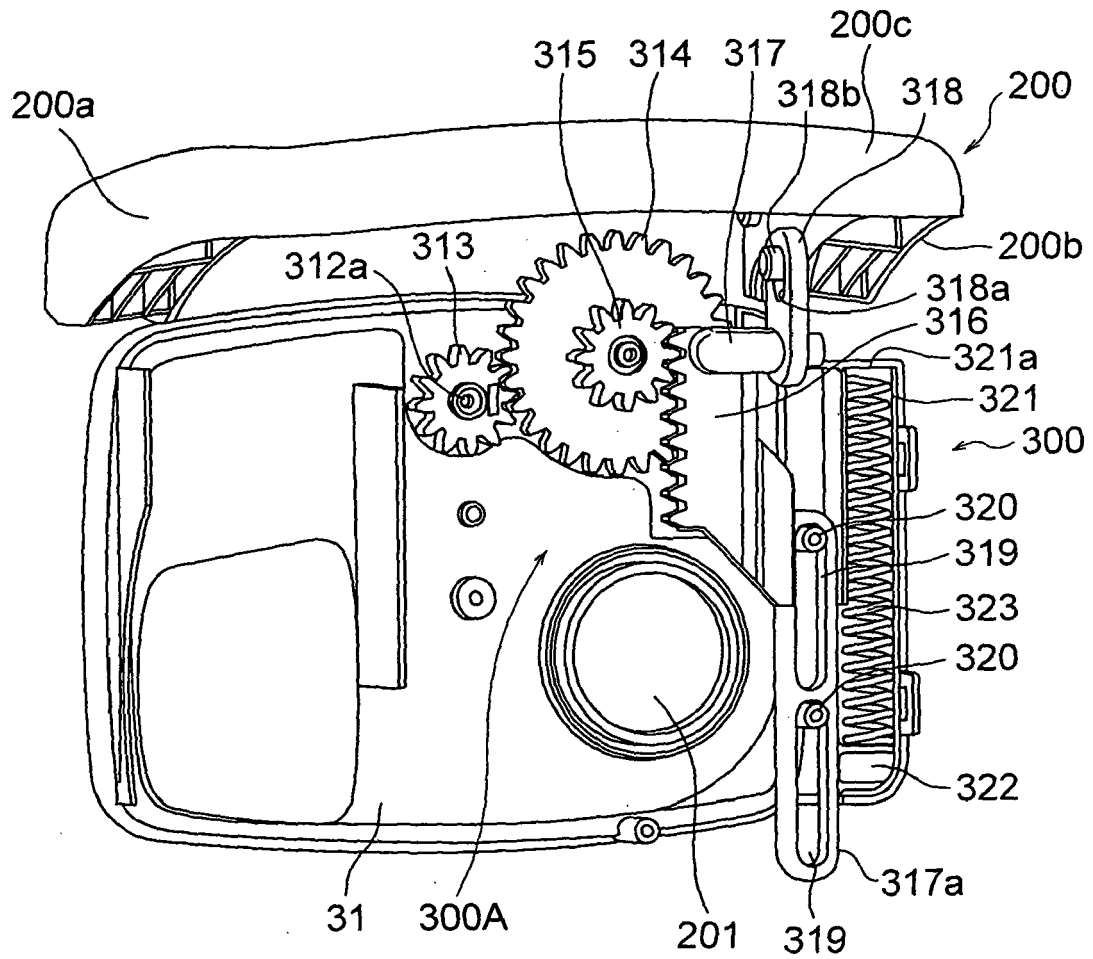


FIG.8B

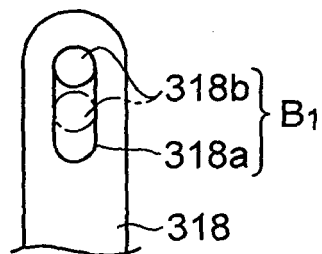


FIG.9

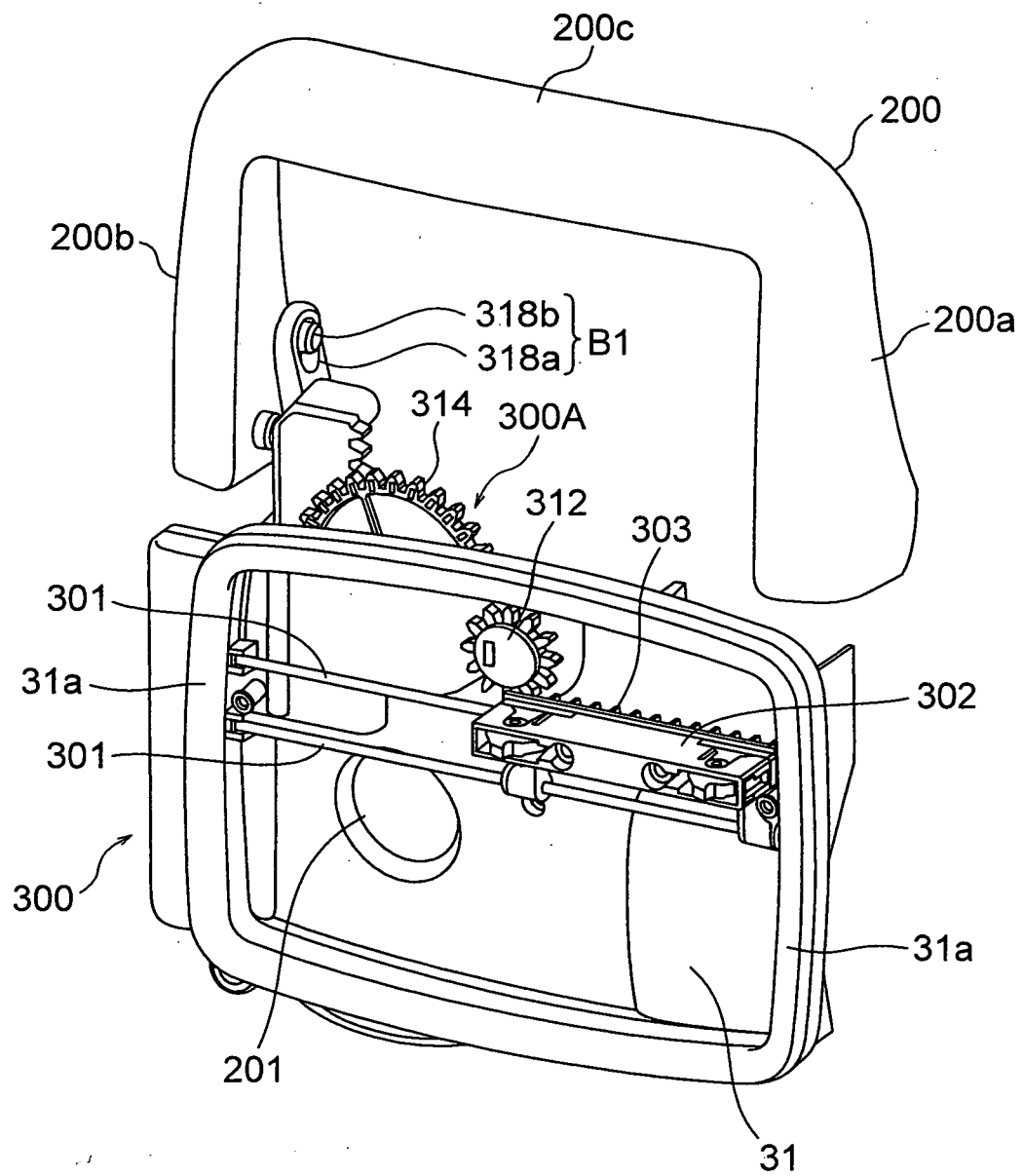


FIG.10

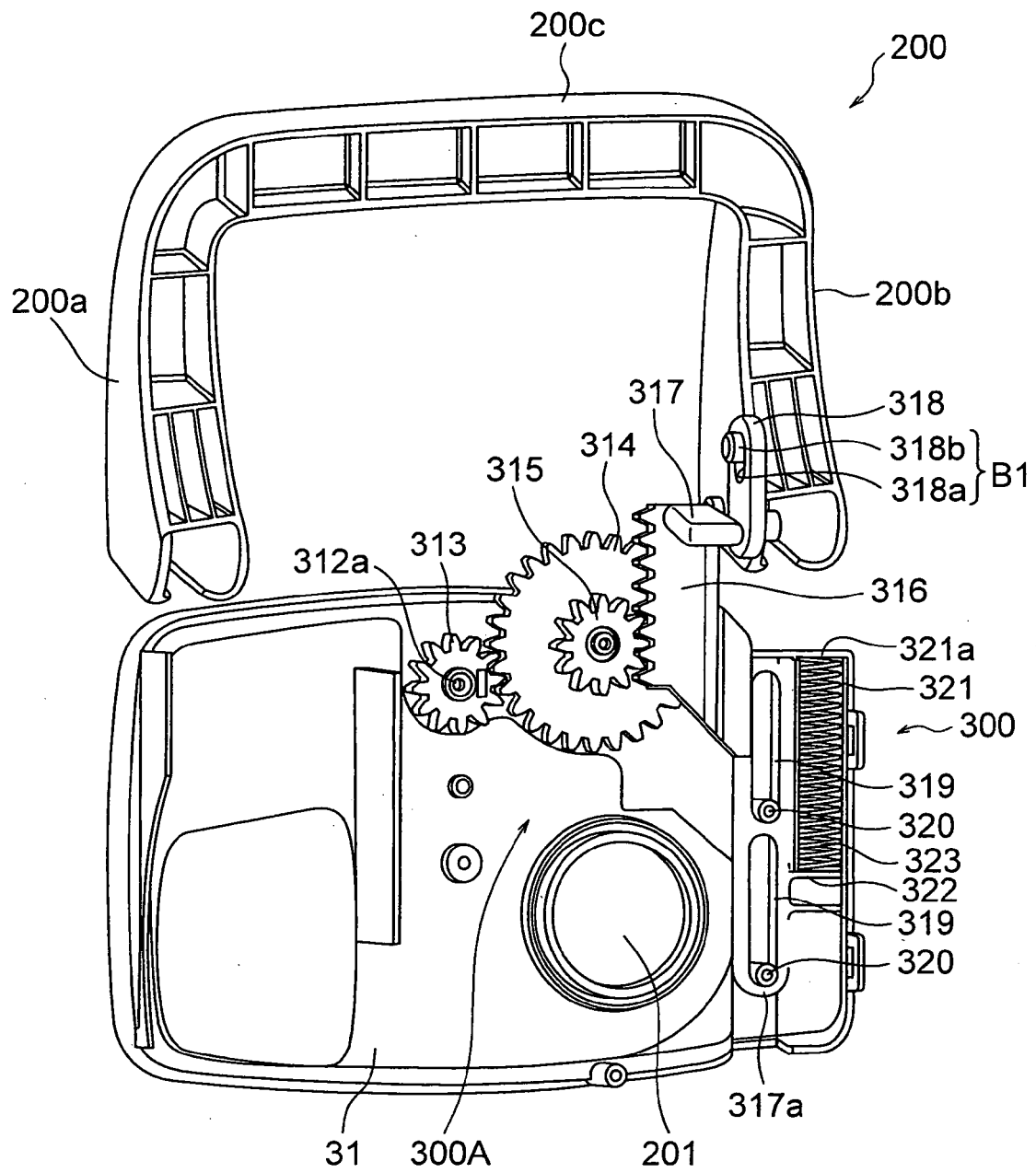


FIG.11

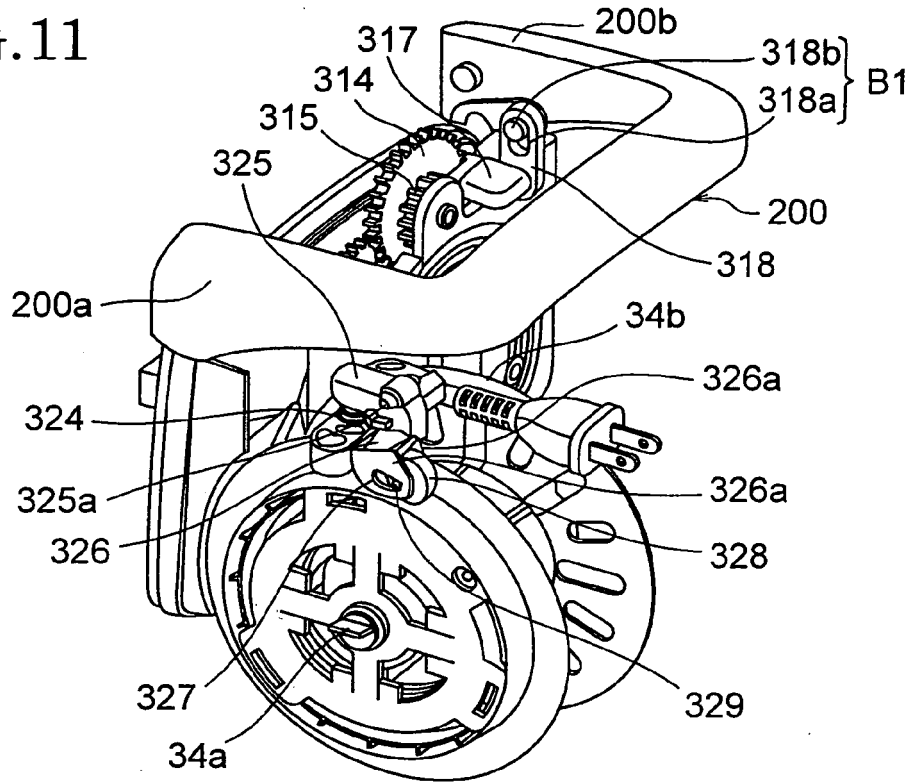


FIG.12

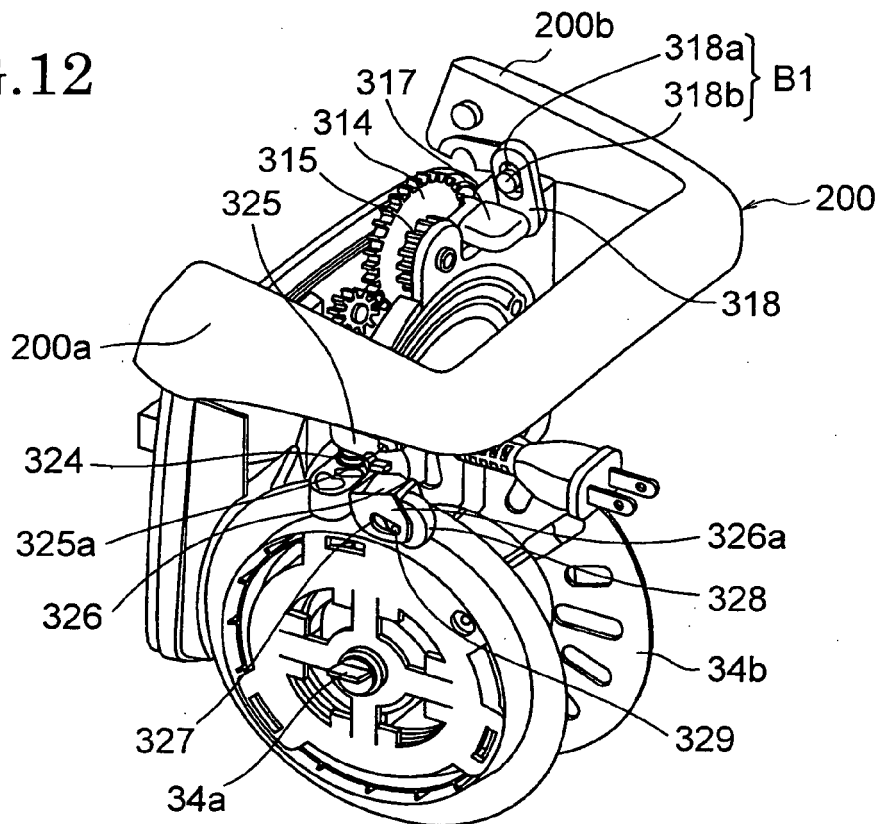


FIG.13

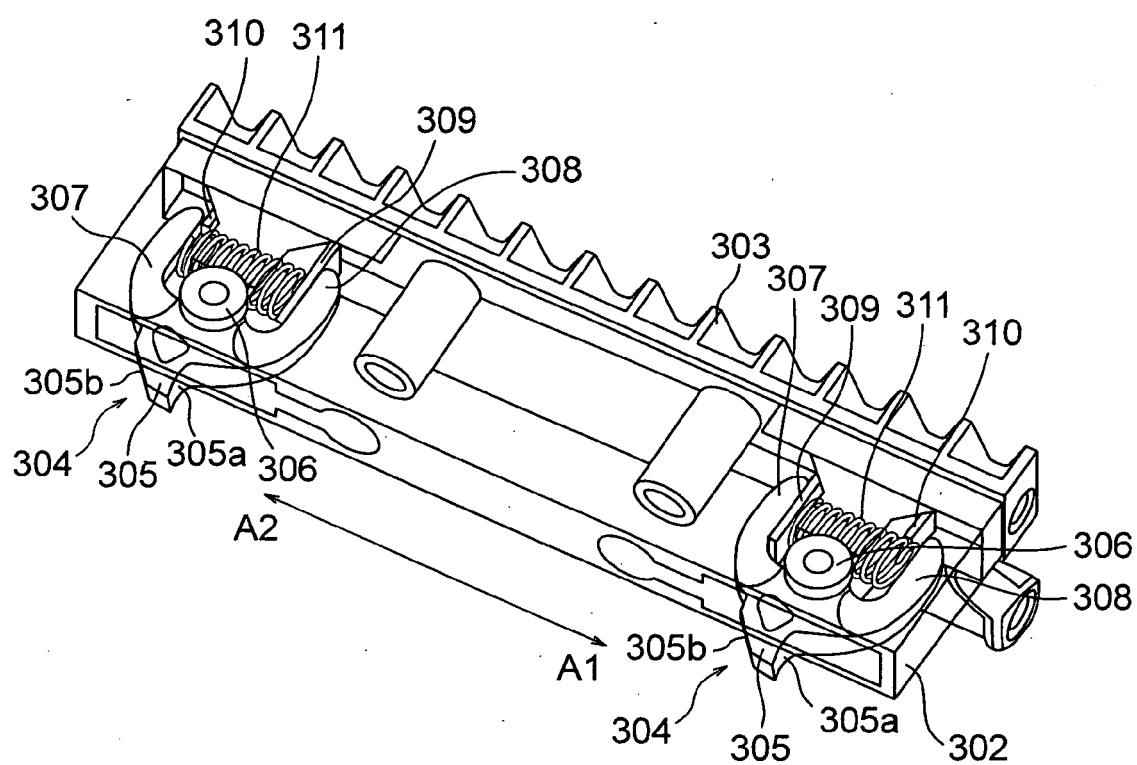


FIG.14

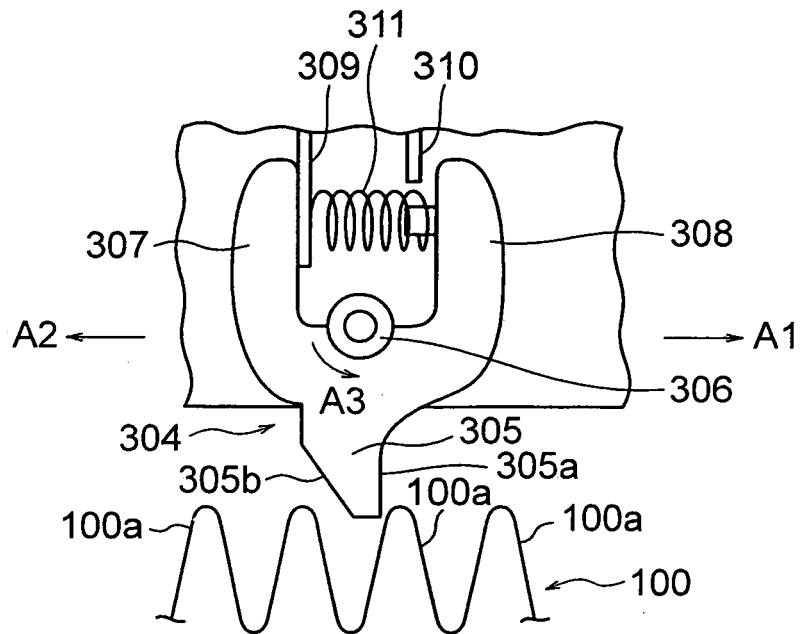


FIG.15

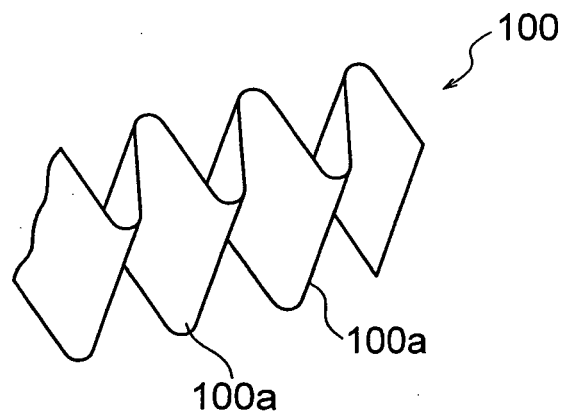


FIG.16

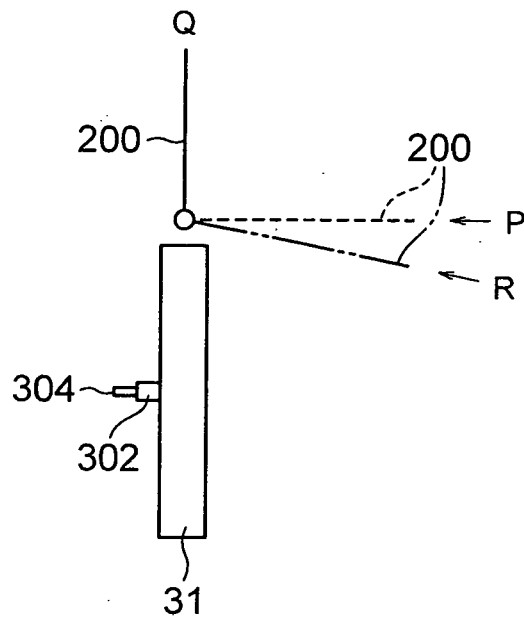
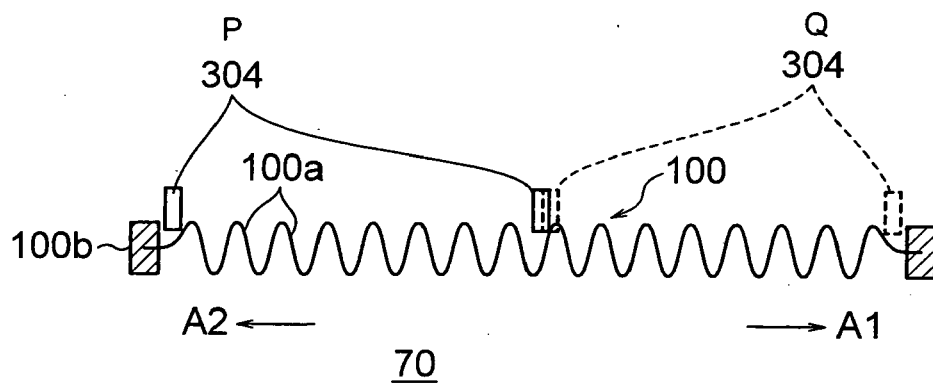


FIG.17



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006099860 A [0001]
- JP 2006006383 A [0003]