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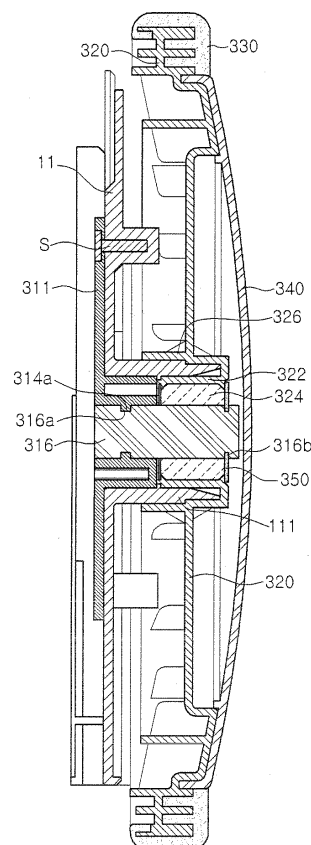
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(54) **VACUUM CLEANER**

(57) The embodiment discloses a vacuum cleaner. The vacuum cleaner includes a cleaner body, and a suction motor assembly provided in the cleaner body to generate a suction force, and a wheel assembly to facilitate a movement of the cleaner body.

Fig. 7



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Description

Field of the Invention

[0001] The present invention relates a vacuum cleaner.

Description of the Related Art

[0002] Typically, a vacuum cleaner is a filtering apparatus in which after inhaling air containing dust and then filtering the dust by a dust separation unit by using a suction force generated by a suction motor included in a main body.

[0003] Such a vacuum cleaner includes a cleaner body provided with a suction motor assembly, a dust separation unit which separates dust contained in an inhaled air, and a dust container accommodating the dust separated by the dust separation unit.

[0004] The cleaner body is provided with wheels to facilitate a movement of the cleaner body. The noise generated by the vacuum cleaner may occur from an operation of the suction motor or a rotation of the wheel. Therefore, the effort of reducing the noise generated by the vacuum cleaner has been required.

SUMMARY

[0005] An object of the present invention is to provide a vacuum cleaner in which noise due to a rotation of a wheel is reduced.

[0006] Another object of the present invention is to provide a vacuum cleaner in which noise due to an operation of a suction motor is reduced.

[0007] A vacuum cleaner according to an aspect of the present invention includes a cleaner body provided with a suction motor assembly for generating a suction force; and a wheel assembly to facilities a movement of the cleaner body, the wheel assembly includes a wheel support having a fixed portion coupled with the inside of the cleaner body and a shaft which is the center axis of rotation; and a wheel body coupled with the shaft in the outside of the cleaner body and the fixed portion and the shaft are integrally formed by an inserting injection mould.

[0008] According to the proposed embodiment of the present invention, the shaft which is the center axis of the wheel body is integrally provided with the fixed portion, such that a friction due to the relative movement of the shaft and the fixed portion during the rotation process of the wheel body is prevented and the noise may be reduced.

[0009] In addition, the wheel body and a bearing are integrally formed, such that a friction due to the relative movement of the bearing and the wheel body is prevented and the noise may be reduced.

[0010] In addition, a first suction member is provided in the lower side of the suction motor and an inner hous-

ing, a second suction member is provided in the inner housing and an outer housing, and a third suction member is provided between the inner housing and an upper side of the suction motor, such that a vibration of the suction motor and the noise due to the vibration may be reduced.

[0011] Further, since the first absorption member is configured to couple an upper member and a lower member each other, a vibration absorbed amount may be increased and a noise due to the vibration may be reduced.

[0012] In addition, noise absorbent absorbing noise is provided between the inner housing and the outer housing, and noise reduction portion moving the noise toward the noise absorbent is provided, such that the noise generated by an operation of the suction motor may be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a perspective view of a vacuum cleaner according to a first embodiment of the present invention.

FIG. 2 is a perspective view showing a condition in which a dust separation unit is separated in the vacuum cleaner according to the first embodiment of the present invention.

FIG. 3 is an exploded perspective view of the vacuum cleaner according to the first embodiment of the present invention.

FIG. 4 is a perspective view of a wheel supporter according to the first embodiment of the present invention.

FIG. 5 is a front view of the wheel supporter.

FIG. 6 is a perspective view showing a condition in which the wheel supporter is coupled with a lower body according to the first embodiment of the present invention.

FIG. 7 is a partial cross-sectional view showing a condition in which the wheel assembly is coupled with the lower body according to the first embodiment of the present invention.

FIG. 8 is a vertical cross-sectional view showing a suction motor assembly according to the first embodiment of the present invention.

FIG. 9 is a perspective view of an upper member which constructs a first suction member according to the first embodiment of the present invention.

FIG. 10 is a perspective view of a lower member which constructs the first suction member.

FIG. 11 is a perspective view of a second suction member according to the first embodiment of the present invention.

FIG. 12 is a vertical cross-sectional view showing a suction motor assembly according to a second embodiment of the present invention.

FIG. 13 is a perspective view of an upper outer hous-

ing according to the second embodiment of the present invention.

FIG. 14 is a vertical cross-sectional view showing a suction motor assembly according to a third embodiment of the present invention.

FIG. 15 is a perspective view of an upper outer housing according to the third embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0014] Hereinafter, the embodiments of the present invention will be concretely described with reference to drawings.

[0015] FIG. 1 is a perspective view showing a vacuum cleaner according to a first embodiment of the present invention, and FIG. 2 is a perspective view showing a condition in which a dust separation unit is separated in the vacuum cleaner according to the first embodiment of the present invention.

[0016] Referring to FIGS. 1 and 2, according to the first embodiment of the present invention, the vacuum cleaner 1 includes a cleaner body 10 of constructing the appearance, a dust separation unit 21 separately mounted on the cleaner body 10 and, a dust container 20 separately mounted on the cleaner body 10.

[0017] Although not shown in the cleaner body 10, the cleaner body 10 includes a suction nozzle for inhaling the dust from a bottom surface, and a coupling device coupling the suction nozzle with the cleaner body. In the embodiment of the present invention, the detailed explanation about the suction nozzle and the coupling device are omitted.

[0018] The cleaner body 10 is provided with a lower body 11, and an upper body 12 coupled with an upper side of the lower body 11. The dust separation unit 21 and the dust container 20 are separately mounted on the upper body 12.

[0019] The upper body 12 is provided with a fixing plate 13 in which the upper side of the dust container 20 is fixed. In addition, the upper portion of the upper body 12 is provided with an accommodation portion 16 which accommodates the dust separation unit 21. Further, the cleaner body 10 includes a cover member 17, which covers the dust separation unit 21, in a condition in which the dust separation unit 21 is accommodated in the accommodation portion 16. One end of the cover member 17 is separately coupled with the upper body 12, and other end of the cover member 17 is separately coupled the fixing plate 13.

[0020] A part of the dust separation unit 21 is duly mounted in the fixing plate 13 in a condition in which the dust separation unit 21 is accommodated in the accommodation portion 16. In addition, the fixing plate 13 is provided with opening 15 in which the dust separated from the dust separation unit 21 is moved into the dust container 20. The opening 15 is communicated with a dust discharge portion of the dust separation unit 21 de-

scribed later.

[0021] The dust separation unit 21 includes a cyclone unit 210 generating a cyclonic flow, and a filter unit 220 filtering the air discharged from the cyclone unit 210. The cyclone unit 210 includes a plurality of air suction portions 211 and at least one of the dust discharge portion 213. In addition, the fixing plate 13 is provided with a plurality of suction holes 14 through which the dust containing air is introduced into the dust separation unit 21.

[0022] FIG. 3 is showing a explored perspective view of the vacuum cleaner according to the first embodiment of the present invention.

[0023] Referring to FIG. 3, the cleaner body 10 includes the lower body 11 and the upper body 12, a pair of wheel assemblies 30 coupled with both sides of the lower body 11, a suction motor assembly 40 mounted on the upper side of the lower body 11, and a code reel 50 around which a power cord for supplying power to the cleaner body 10 is wound.

[0024] The upper body 12 covers the suction motor assembly 40 in a condition in which the suction motor assembly 40 is duly mounted on the upper side of the lower body 11.

[0025] The wheel assembly 30 includes a wheel supporter 310 provided with a shaft (refer to 316 in FIG. 4), a wheel body 320 which is rotated based on the shaft (refer to 316 in FIG. 4) as a rotation center, a buffer member 330 coupled with the perimeter of the wheel body 320 and buffering an impact, a wheel cover 340 coupled with the outside of the wheel body 320, and a coupling member 350 coupled with the shaft (refer to 316 in FIG. 4) in a condition in which the shaft (refer to 316 in FIG. 4) and the wheel body 320 are coupled with each other.

[0026] Meanwhile the suction motor assembly 40 includes outer housings 410 and 420, inner housings 430 and 440 accommodated in the outer housings 410 and 420, a suction motor 450 which is accommodated in the inner housings 430 and 440 and generates a suction force, a first absorption member 460 provided into the lower side of the suction motor 450 and which absorbs a vibration of the suction motor 450, a plurality of second absorption member 470 provided between the inner housings 430 and 440 and the outer housings 410 and 420 and which absorbs a vibration, a third absorption member 480 provided on the upper side of the suction motor 450 and which absorbs a vibration of the suction motor 450, and a sealer 490 provided between the inner housings 430 and 440 and the outer housings 410 and 420.

[0027] Hereinafter, the detailed explanation about of the wheel assembly 30 will be described.

[0028] FIG.4 is a perspective view of a wheel supporter according to the first embodiment of the present invention, FIG. 5 is a front view of the wheel supporter, and FIG. 6 is a perspective view showing a condition in which the wheel supporter is coupled with a lower body.

[0029] Referring to FIGS. 3 to 6, the wheel supporter 310 includes a fixing portion 311 coupled with the inside

of the lower body 11, and a shaft 316 integrally formed by the fixing portion 311 and the inserting. That is, the shaft 316 is first formed, and the fixing portion 311 is integrally provided with the shaft 316 by injecting melted synthetic resins inside a mold in a condition in which the mold corresponding to the fixing portion 311 is formed.

[0030] Since the shaft 316 is integrally provided with the fixing portion 311, a friction of the relative movement of the shaft 316 and the fixing portion 311 may be prevented during the rotation of the wheel body 320, and noise may be reduced.

[0031] The completed fixing portion 311 is provided with support portion 314 which wraps around the perimeter of the shaft 316. The support portion 314 protrudes from the fixing portion 311 to a predetermined length to maintain a stably coupled state with the shaft 316.

[0032] The fixing portion 311 is provided with a plurality of hooks 312 so as to be coupled with the lower body 11, and the lower body 11 is provided with a plurality of hooks coupling portion 113 so as to be coupled with the plurality of hooks 312. In addition, the lower body 11 and the fixing portion 311 are provided with a plurality of fixation members 115 and 313 for fixation of the fixation members, respectively. The support portion 314 is provided with a plurality of storage portions 315 for storing a lubricant. The plurality of storage portions 315 is formed in a position adjacent to the shaft 316.

[0033] FIG. 7 is showing a partial cross-sectional view showing a condition in which the wheel assembly is coupled with the lower body according to the first embodiment of the present invention.

[0034] Referring to FIGS. 3 to 7, the perimeter of the shaft 316 is provided with a coupling groove 316a. The coupling groove 316a may be generally formed along the perimeter of the shaft 316. In contrast, the plurality of coupling groove 316a having a predetermined size may be formed at the perimeter of the shaft 316.

[0035] In addition, if the fixing portion 311 is formed by an injection molding, the fixing portion 311 is provided with a protruded portion 314a inserted into the coupling groove 316a. That is, the protruded portion 314a is formed at inner peripheral surface of the support portion 314.

[0036] The protruded portion 314a is formed in the same number and the same shape as those of the coupling groove 316a. The protruded portion 314a is inserted into the coupling groove 316a, which may prevent the shaft 316 from separating from the fixing portion 311.

[0037] In addition, the end of the shaft 316 is provided with a fixation portion 316b so as to fix the coupling portion 350. The fixation portion 316 may be a groove so to be inserted the part of the coupling member 350.

[0038] The wheel body 320 is coupled with the shaft 316 at the outer of the lower body 11. The wheel body 320 includes a bearing 324 so as to facilitate the rotation of the wheel body 320. The bearing 324 is integrally provided with wheel body 320 by a inserting mold. That is, the bearing 324 is first formed, and the wheel body 320

is integrally provided with the bearing 324 by injecting melted synthetic resins inside a mold in a condition in which the mold corresponding to the wheel body 320 is formed.

[0039] The completed wheel body 320 is provided with support portion 322 which wraps around the perimeter of the bearing 324. In addition, the shaft 316 is inserted into the bearing 324. The bearing 324 and the wheel body 320 are rotated about the shaft 316 in a condition in which the shaft 316 is inserted into the bearing 324. In this case, the bearing 324 is integrally provided with the wheel body 320, such that a friction of the relative movement of the bearing 324 and the wheel body 320 may be prevented, thereby reducing the noise.

[0040] Further, in order to reduce the friction of the bearing 324 and the shaft 316 and to facilitate the rotation of the bearing 324, the bearing 324 and the shaft 316 may be provided with the same materials. In this case, the lubricant stored in storage portion 315 of the supporter 310 is applied to a contacted area of the shaft 316 with the bearing 324, such that the bearing 324 may be more smoothly rotated.

[0041] Herein, the lower body 11 is provided with a guide portion 111 to guide the rotation of the wheel body 320, and the shaft 316 and the bearing 324 are inserted into the guide portion 111. The guide portion 111 is protruded from the lower body 11 outside, and is substantially formed in the size corresponding to the support portion 322.

[0042] In addition, the wheel body 320 is provided with a cover portion 326 covering the perimeter of the guide portion 111 in a condition in which the support portion 322 is inserted into the guide portion 111.

[0043] The buffering member 330 is coupled with the circumference of the wheel body 320. That is, the buffering member 330 is formed in a ring shape. The buffering member 330 may be formed in rubber materials, for example, to buffer an impact. However, it is revealed that the materials of the buffering member 330 are not limited.

[0044] The wheel cover 340 is coupled with the wheel body 320 from the outside of the wheel body 320. The wheel cover 340 may be, for example, hook coupled with the wheel body 320. If the wheel cover 340 is coupled with the wheel body 320, the wheel cover 340 covers the shaft 316 and the bearing 324.

[0045] Hereinafter, the assembly process for the wheel assembly 30 will be described.

[0046] First, in the inside of the lower body 11, the fixing portion 311 is coupled with the lower body 11 by the plurality of hooks 312. If the fixing portion 311 is coupled with the lower body 11, the shaft 316 is passed through the guide portion 111.

[0047] Next, in a condition where the fixing portion 311 is coupled the lower body 11, the fixation member S is fixed on the fixing portion 311 and the lower body 11. In addition, in the outside of the lower body 11, the wheel body 320 integrally provided with the bearing 324 is coupled with the shaft 316. That is, the bearing 324 may be

inserted into the guide portion 11. Then, the shaft 316 is inserted into the bearing 324. In addition, in a condition where the shaft 316 is inserted into the bearing 324, the end of the shaft 316 is protruded outside the bearing 324. Further, the protruded end of the bearing 324 is fixed with the coupling member 350. The coupling member 350 may be, for example, an e-ring or c-ring. In addition, the coupling member 350 is inserted into the fixation portion 316b of the shaft 316.

[0048] The coupling member 350 may prevent the bearing 324 from separating from the guide portion 11 during the rotation of the wheel body 320. Next, if the wheel cover 340 is finally coupled to the wheel body 320, the assembly of the wheel assembly 30 is completed. Herein, the coupling of the buffering member and the wheel body may be achieved in any process.

[0049] Hereinafter, the detailed explanation about of a suction motor assembly will be described.

[0050] FIG. 8 is showing a vertical cross-sectional view showing a suction motor assembly according to the first embodiment of the present invention.

[0051] Referring to FIGS 3 and 8, the outer housings 410 and 420 include a lower outer housing 410 coupled with the lower body 11, and an upper outer housing 420 coupled with the upper side of the lower outer housing 410.

[0052] The upper outer housing 420 is provided with an air inlet 421 in which air discharged from the filter unit 220 is introduced. The air inlet 421 is protruded from the upper outer housing 420 upwards. The air inlet 421 includes an inlet grill 422, and the inlet grill 422 is provided with a plurality of holes 423 through which the air is passed. In addition, the air inlet portion 421 may be provided with a filter in the upstream or downstream of the air inlet portion 421 (not shown).

[0053] The inner housings 430 and 440 are accommodated in the inside of the outer housings 410 and 420. In addition, the suction motor 450 is accommodated in the inside of the inner housings 430 and 440. The inner housings 430 and 440 includes the lower inner housing 430, and the upper inner housing 440 coupled with the upper side of the lower inner housing 430. The upper inner housing 440 is provided with the inlet hole 441 in which the air passed through the air inlet portion 421 is introduced. The inlet hole 441 is located at the bottom of the air inlet portion 421.

[0054] The sealer 490 is provided between the upper outer housing 420 and the upper inner housing 440, which may prevent a leakage of air passed through the air inlet portion 421. That is, the sealer 490 prevents the air passed through the air inlet portion 421 from introducing into a space between the upper outer housing 420 and the upper inner housing 440 and guides so as to pass the inlet hole 441.

[0055] The lower inner housing 430 is provided with a plurality of holes 431 through which the air passed through the suction motor 450 is discharged. In addition, the lower outer housing 410 is formed a discharge unit

416 in which the air passed through the hole 431 is discharged (refer to FIG. 3). Although not shown in drawings, the discharge unit 416 (refer to FIG. 3) may be provided with a filter.

[0056] The first absorption member 460 includes an upper member 461 attached to the lower side of the suction motor 450, and a lower member 466 provided in the lower side of the upper member 461. The first absorption member 460 absorbs the lower vibration of the suction motor 450 and minimizes the vibration of the suction motor 450 transferred to the lower inner housing 430.

[0057] The second absorption member 470, which is coupled with the outer side of the lower inner housing 430, absorbs the lower vibration of the lower inner housing 430 and minimizes the vibration of the lower inner housing 430 transferred to the lower outer housing 410. The plurality of second absorption members 470 is coupled with the lower inner housing 430 at the location spaced to each other.

[0058] The third absorption member 480 is duly mounted in the upper side of the suction motor 450 and the part of the third absorption member 480 is inserted into the inlet hole 441 of the upper inner housing 440. The third absorption member 480 absorbs the upper vibration of the suction motor 450 and minimizes the upper vibration of the suction motor 450 transferred to the upper inner housing 440.

[0059] Herein, the sealer 490 absorbs the vibration of the upper inner housing 440 while preventing the leakage of air, and minimizes the upper vibration of the upper inner housing 440 transferred to the upper outer housing 420.

[0060] Although each absorption member and the sealer may be formed, for example, the robber materials, if those have a vibration absorbing function, the materials are not limited.

[0061] FIG. 9 is a perspective view of an upper member which constructs a first absorption member according to the first embodiment of the present invention, and FIG. 10 is a perspective view of a lower member which constructs the first absorption member.

[0062] Referring to FIGS 8 to 10, the upper member 461 is formed in a ring shape. A center part of the upper member 461 is provided with an opening 462 through which a lower part of the suction motor 450 is passed. In addition, the upper member 461 is provided with at least of one coupling holes 463 so as to couple the lower member 466. FIG.9 illustrates that the upper member 461 is provided with two coupling holes 463.

[0063] In addition, the upper and lower sides of the upper member 461 are provided with a plurality of protruded portion 464 in the circumferential direction of the upper member 461. Further, the plurality of protruded portion 464 is substantially connected to the lower side of the suction motor 450 and the upper side of the lower member 466.

[0064] Like the preceding, the plurality of protruded portions 464 is connected to the lower side of the suction

motor 450, such that the contact area of the suction motor 450 and the upper member 461 is reduced, the transmission of vibration may be reduced. In addition, during the vibration of the suction motor 450, since the protruded portion 464 primarily absorbs the vibration, the vibration absorbing amount of the upper member 461 may be increased.

[0065] A center part of the lower member 466 is provided with the accommodation portion 467 in which the lower part of the suction motor 450 penetrating the upper member 461 is accommodated. In addition, the inner peripheral surface of the accommodation portion 467 is provided with a plurality of contact portion 467a to which the lower part of the accommodated suction motor 450 is connected. The plurality of contact portions 467a is formed separately from each other and is extended in both directions up and down.

[0066] Like the preceding, the plurality of contact portions 467a is connected to the suction motor 450, such that the lower member 466 may directly absorb a downward vibration of the suction motor 450. In addition, the plurality of contact portions 467a is connected to the suction motor 450, such that the contact area of the suction motor 450 and the lower member 466 is reduced, the transmission of vibration may be reduced. In addition, during the vibration of the suction motor 450, since the contact portion 467a primarily absorbs the vibration, the vibration absorbing amount of the lower member 466 may be increased.

[0067] The upper side of the lower member 466 is provided with at least one of coupling protruded portion 468 to which the coupling hole 463 of the upper member 461 is connected. The coupling protruded portion 468 is inserted into the suction motor 450 in a condition the coupling hole 463 is penetrated. Therefore, the vibration of the suction motor 450 may be absorbed by the coupling protruded portion 468. In this case, since the coupling protruded portion 468 is inserted into the suction motor 450 through the upper member 461 in a condition where the lower member 466 is located at the lower side of the upper member 461, a vibration transmitted to the coupling protruded portion 468 is primarily absorbed by the coupling protruded portion 468. Then, the vibration may be secondary absorbed by the upper member 461. Therefore, the vibration absorbing amount may be increased.

[0068] In addition, since a vibration directly transmitted to the upper member 461 is primarily absorbed, and is secondary absorbed by the lower member 466, the vibration absorbing amount may be increased.

[0069] As a result, the first absorption member 460 is configured by an upper member 461 and a lower member 466 connected to each other, such that a vibration absorbing amount may be increased and noise due to the vibration may be reduced.

[0070] The lower member 466 is coupled with hole 432 formed on the bottom of the lower inner housing 430. Therefore, one part of the lower member 466 is duly

mounted into the upper side of the bottom of the lower inner housing 430, and other part of the lower member 466 penetrates the hole 432.

[0071] Herein, the lower outer housing 410 is provided with the accommodation portion 411 accommodating the bottom part of the lower member 466. In addition, the lower member 466 is separated from the accommodation portion 411 in a condition where the bottom part of the lower member 466 is accommodated in the accommodation portion 411. That is, a gap of constant interval is formed between the accommodation portion 411 and the lower member 466. Therefore, a vibration of the lower member 466 may be prevented to be directly transmitted to the lower outer housing 410.

[0072] FIG. 11 is showing a perspective view of a second suction member according to the first embodiment of the present invention.

[0073] Referring to FIGS. 8 to 11, the second suction member 470 is coupled with coupling portion 434 protruded from the lower inner housing 430. In addition, the lower outer housing 412 is provided with a insertion groove 412 inserting the second suction member 470. The second suction member 470 includes a body 471 in which a groove 472 accommodating the coupling portion 434 is formed. The groove 472 is recessed downward from the upper surface the body 471 and then is formed.

[0074] The outer peripheral surface of the body 471 is provided with the plurality of protruded portions 473. The plurality of protruded portions 473 is formed separately from each other and is extended in both directions up and down. In addition, a plurality of holes 474 is penetrated into the body 471. The holes 474 are extended in both directions up and down. In addition, a plurality of contact portion 475 contacting the insertion groove 412 is formed on a bottom surface of the body 471. Therefore, when the second absorption member 470 is inserted into the insertion groove 412, the plurality of protruded portions 473 and a plurality of contact portions 475 are contacted with the lower outer housing 410.

[0075] The plurality of protruded portions 473 and a plurality of contact portions 475 is contacted with the lower outer housing 410, such that the contact area of the lower outer housing 410 and the second suction member 470 is reduced, thereby reducing the vibration transmission. In addition, during the vibration of the suction motor 450, since the contact portion 475 and the protruded portion 473 primarily absorbs the vibration, the vibration absorbing amount of the second suction member 470 may be increased. In addition, during the vibration of the suction motor 450, since a deformation of the second suction member 470 is increased by the plurality of grooves 474, the vibration absorbing amount may be more increased.

[0076] FIG. 12 is showing a vertical cross-sectional view showing a suction motor assembly according to a second embodiment of the present invention, and FIG. 13 is showing a perspective view of an upper outer housing according to the second embodiment of the present invention.

[0077] The second embodiment is the same as the first embodiment, but it is characterized that a configuration to reduce noise is added. Therefore, a characterized part of the second embodiment will be only described hereinafter.

[0078] Referring to FIGS. 12 and 13, according to the second embodiment, an absorbent 630 absorbing noise generated during the operation of the suction motor is provided between the upper outer housing 620 and the upper inner housing 434.

[0079] An air inlet 622 in which air discharged from the filter unit of the first embodiment is introduced is provided in the upper outer housing 620. The air inlet 622 is protruded from the upper outer housing 620 upwards. The air inlet 622 includes a suction grill 624, and a plurality of holes 625 through which the air is passed is provided in the suction grill 624. In addition, noise reduction portion 626, which reduces the noise during the operation of the suction motor, is provided in the suction grill 624.

[0080] The noise reduction portion 626 changes noise path to move the noise toward the absorbent 630. That is, the noise reduction portion 626 acts as a wall to reflect the noise, and is located on the noise path.

[0081] At least part of the noise reduction portion 626 may be disposed vertically upward of the inlet hole 441 provided at the lower inner housing 440. In addition, the absorbent 630 is provided around the inlet hole 441. Therefore, after the generated noise from the operation of the suction motor 450 is passed through the inlet hole 411, the noise is impacted against the noise reduction portion 626, the movement direction of the noise is changed, and the noise proceed to the absorbent 630. Therefore, according to the embodiment, the generated noise from the operation of the suction motor may be reduced.

[0082] In FIG. 12, the arrow shows the outline of the motion path of the noise.

[0083] FIG. 14 illustrates a vertical cross-sectional view showing a suction motor assembly according to a third embodiment of the present invention, and FIG. 15 illustrates a perspective view of an upper outer housing according to the third embodiment of the present invention.

[0084] The third embodiment is the same as the second embodiment, but a configuration of reducing noise is different. Therefore, a characterized part of the embodiment will be only described hereinafter.

[0085] Referring to FIGS. 14 and 15, according to the embodiment, an air inlet 722 in which air discharged from the filter unit of the first embodiment is introduced provided in the upper outer housing 720. The air inlet 722 is protruded vertically above from the upper outer housing 720. The air inlet 722 includes a suction grill 724, and a plurality of holes 724 through which the air is passed is provided in the suction grill 724. In addition, the noise reduction portion 726, which reduces the noise from the operation of the suction motor, is provided in the suction grill 724.

[0086] In detail, the noise reduction portion 726 is extended from the suction grill 724 to the suction motor 450. In addition, the bottom part of the noise reduction portion 726 is rounded. The plurality of noise reducing holes 727 is disposed in the noise reduction portion 726. The plurality of noise reducing holes 727 is disposed to allow passage of air, to change the path of the noise, and to offset the noise.

[0087] In addition, a part in which the noise reducing hole 727 is not formed in the noise reduction portion 726 is disposed to be moved toward the absorbent 630 by changing the direction of the noise.

[0088] In FIG. 13, the arrow schematically shows the outline of the motion path of the noise.

[0089] According to the embodiment described above, there is an advantage that the generated noise from the operation of the suction motor may be reduced by the noise reduction portion 726 itself and the absorbents 630 when operating of the suction motor.

[0090] In the embodiments described above, although a vacuum cleaner of such type as a canister vacuum cleaner is described, the present invention may be applied to a vacuum cleaner or a robot vacuum cleaner such type as an upright.

[0091] As described above, the exemplary embodiments have been described and illustrated in the drawings and the description. Herein, specific terms have been used, but are just used for the purpose of describing the present invention and are not used for qualifying the meaning or limiting the scope of the present invention, which is disclosed in the appended claims. Therefore, it will be appreciated to those skilled in the art that various modifications are made and other equivalent embodiments are available. Accordingly, the actual technical protection scope of the present invention must be determined by the spirit of the appended claims.

Claims

1. A vacuum cleaner comprising:

a cleaner body including a suction motor assembly to generate a suction force; and
a wheel assembly to facilitate a movement of the cleaner body,
wherein the wheel assembly comprises:
a wheel supporter including a fixing portion coupled with the inside of the cleaner body and a shaft which is the center axis of rotation; and
a wheel body coupled with the shaft at the outside of the cleaner body,
wherein the fixing portion and the shaft are integrally formed by an insert injection molding.

2. The vacuum cleaner according to Claim 1, wherein a bearing to be coupled with the shaft is provided at the wheel body, and the bearing and the wheel body

are integrally formed by the insert injection molding

3. The vacuum cleaner according to Claim 2, wherein a support portion supporting the bearing is provided in the wheel body, a guide portion which guides a rotation of the support portion is provided in the cleaner body. 5
4. The vacuum cleaner according to Claim 1, further comprising a coupling member coupled with the shaft to prevent a separation of the wheel body in a condition where the wheel body and the shaft are coupled with each other. 10
5. The vacuum cleaner according to Claim 1, wherein the fixing portion is provided with a support portion which supports the shaft to be protruded, and the support portion surrounds the circumference of the shaft. 15
20
6. The vacuum cleaner according to Claim 5, wherein a coupling groove is provided in the circumference of the shaft, a protruded portion which is inserted into the coupling groove is provided in the support portion. 25
7. The vacuum cleaner according to Claim 6, wherein the protruded portion is provided in the inner peripheral surface of the support portion. 30
8. The vacuum cleaner according to Claim 5, wherein a storage portion which saves a lubricant applied to the shaft is provided in the support portion. 35
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Fig.1

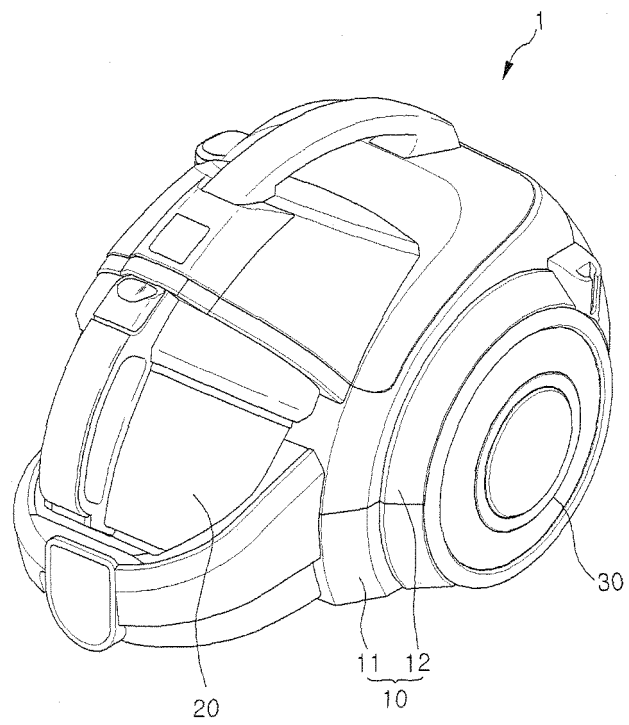


Fig.2

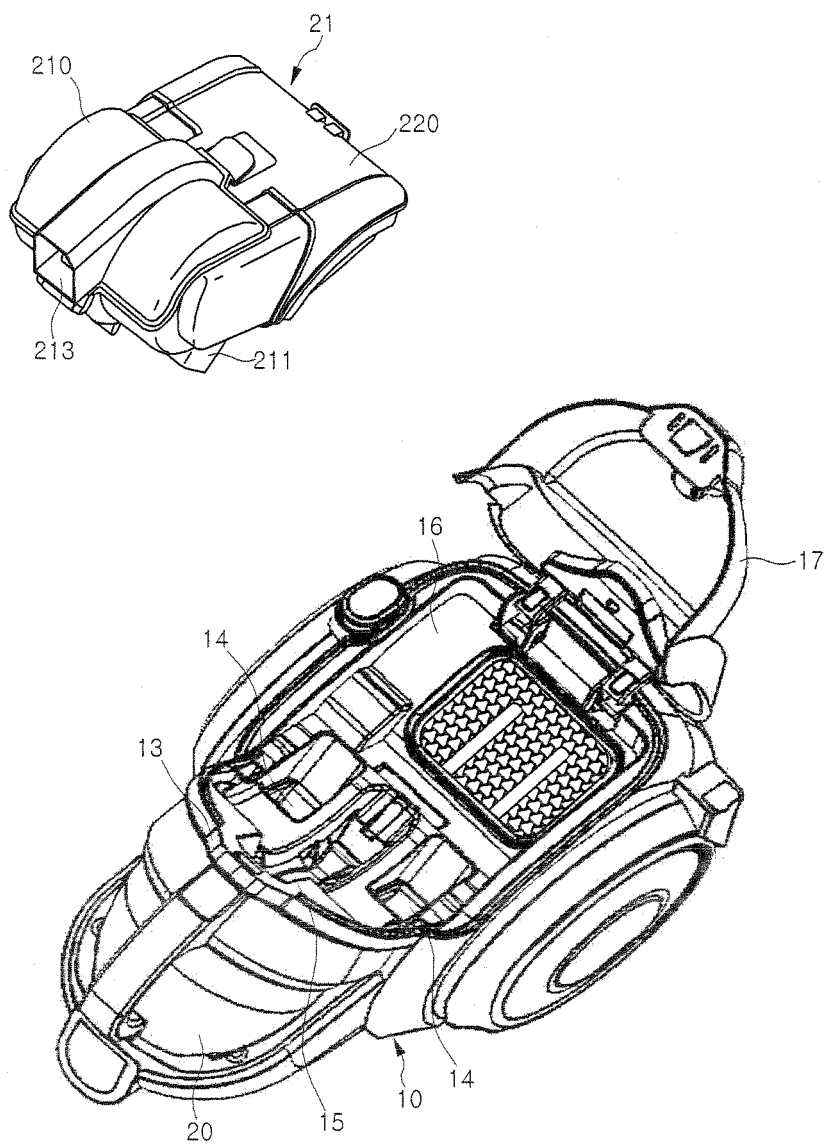


Fig.3

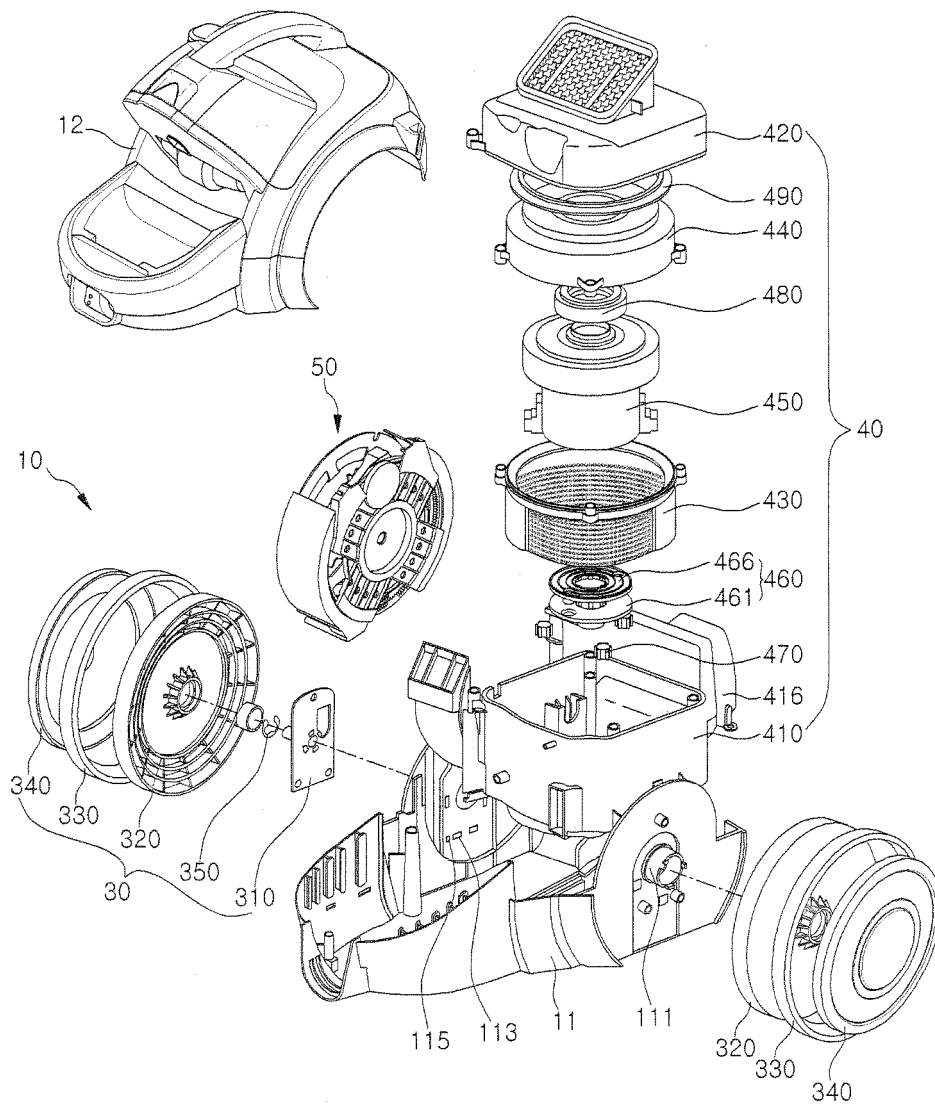


Fig. 4

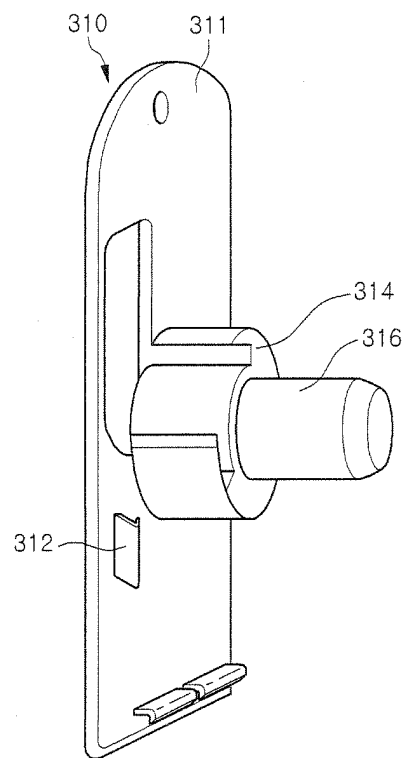


Fig. 5

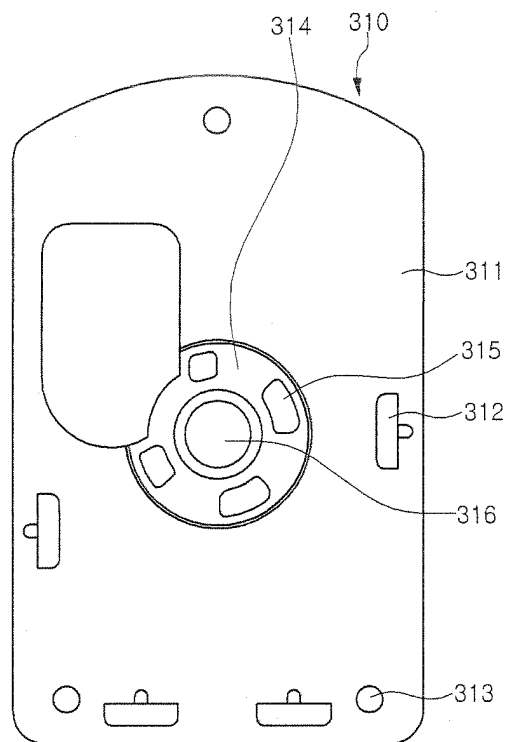


Fig. 6

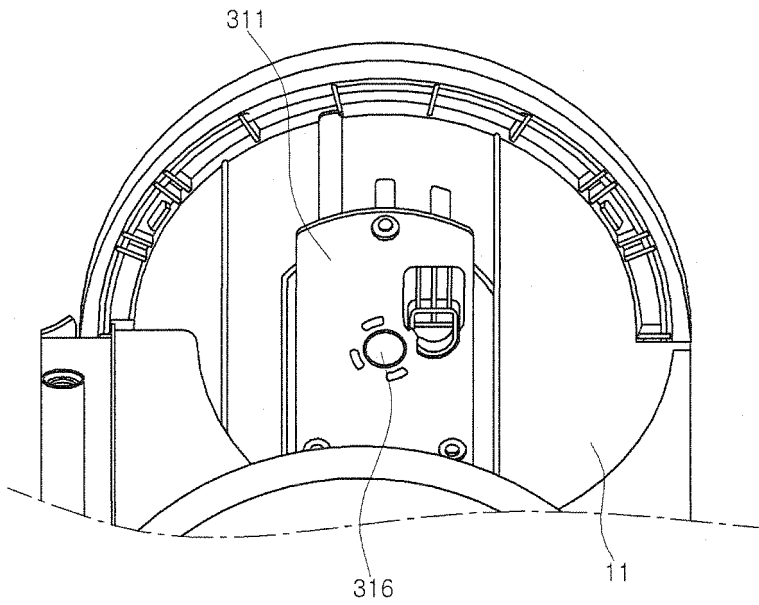


Fig. 7

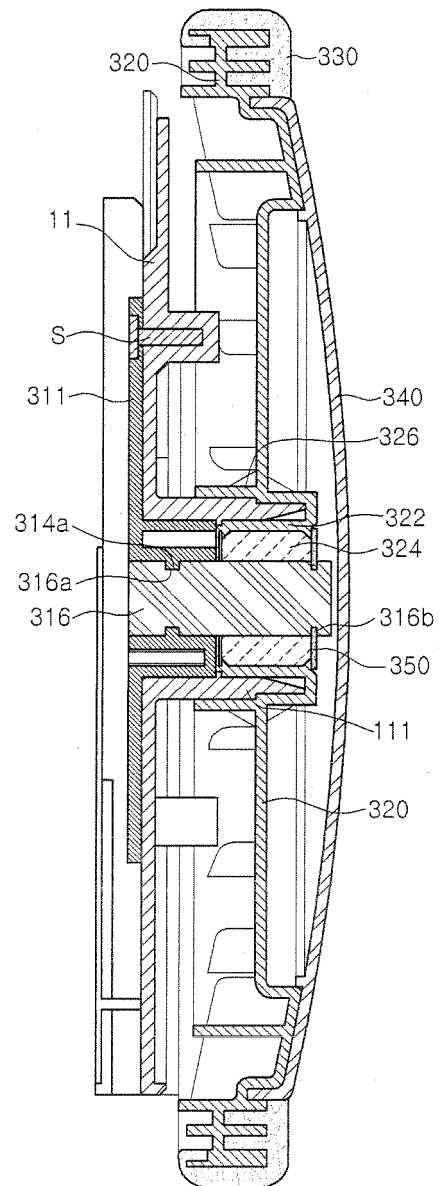


Fig. 8

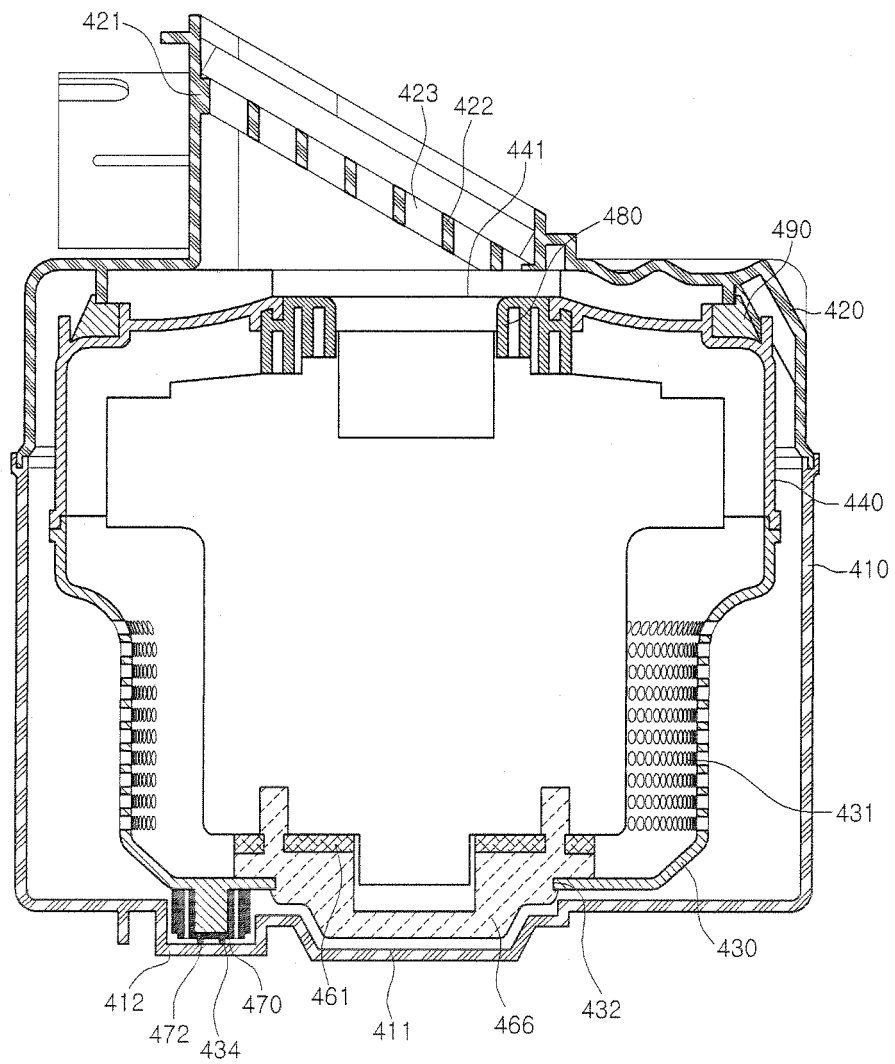


Fig. 9

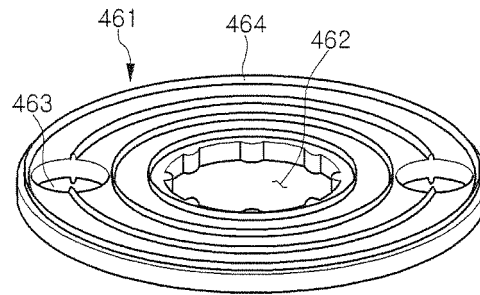


Fig. 10

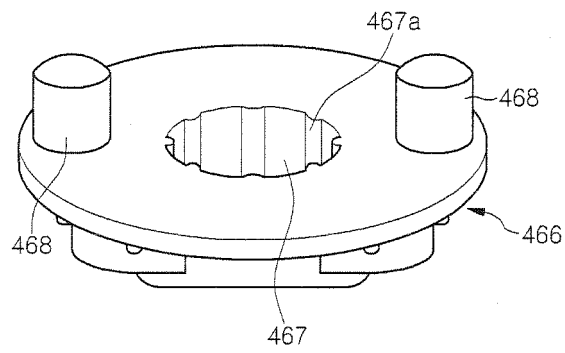


Fig. 11

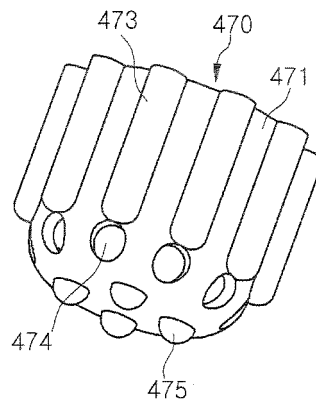


Fig.12

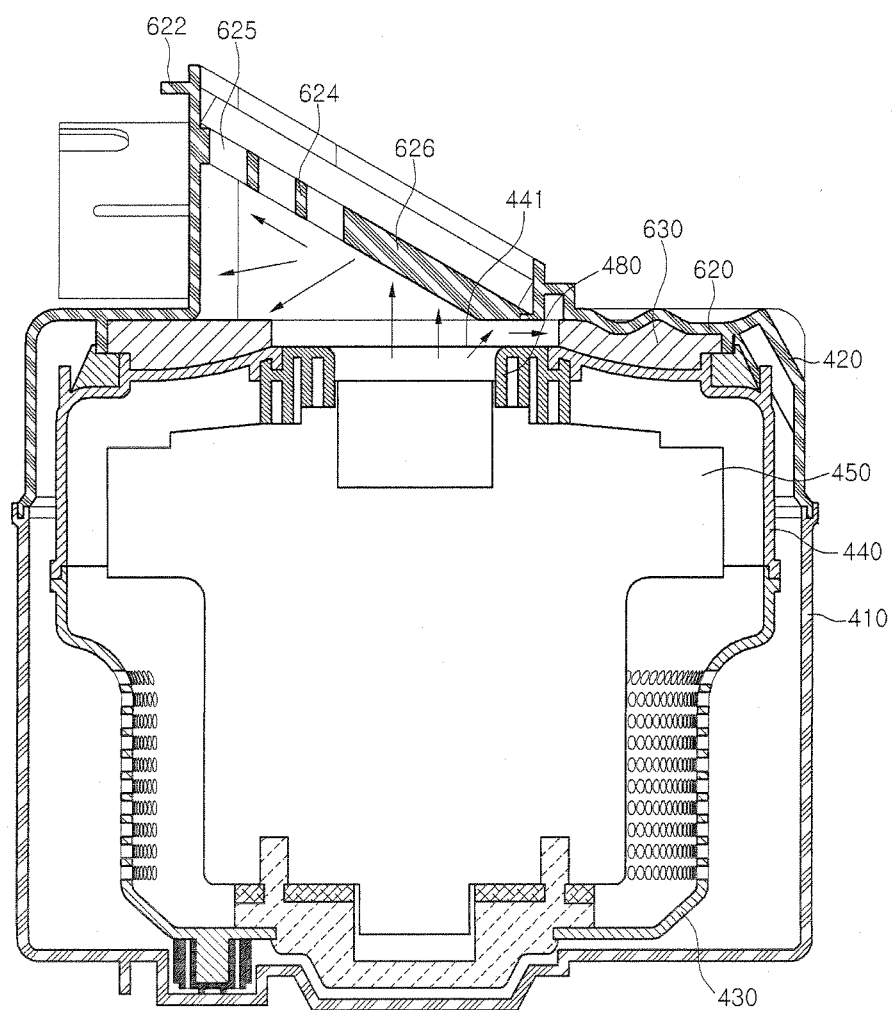


Fig.13

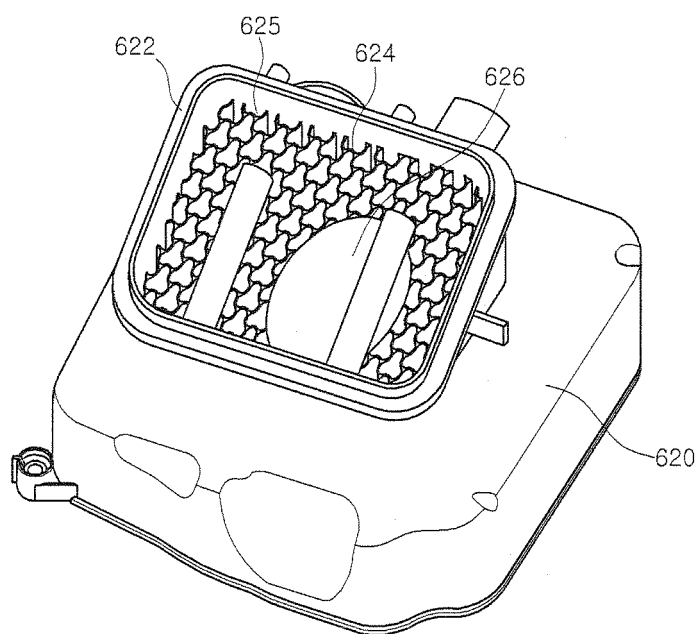


Fig.14

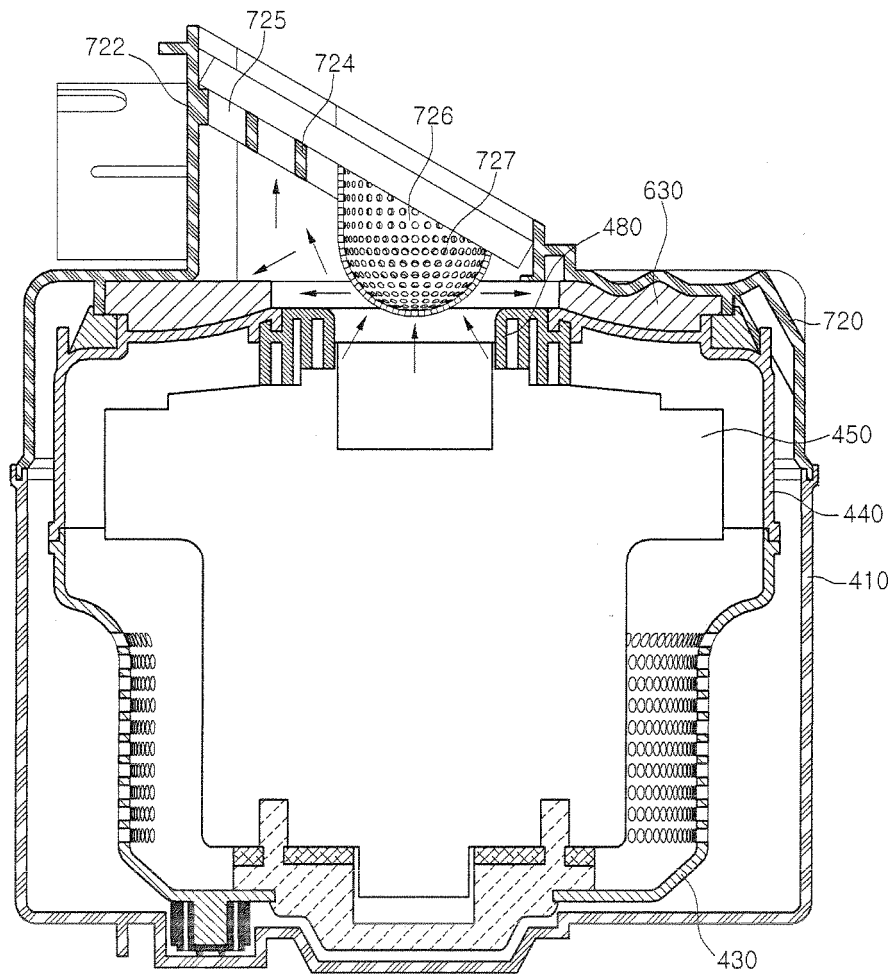
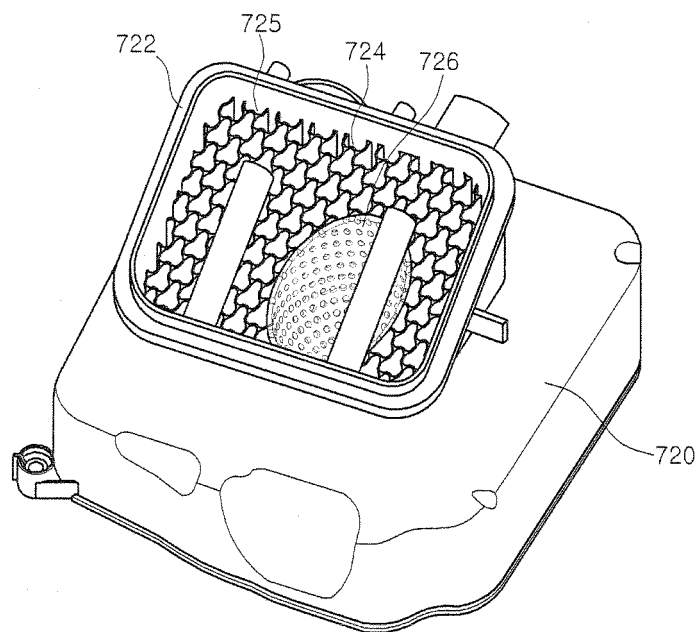


Fig.15



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2009/001275

A. CLASSIFICATION OF SUBJECT MATTER A47L 9/00(2006.01)i, A47L 5/08(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) IPC A47L 5/00, A47L 5/08, A47L 9/00, Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean Utility models and applications for Utility models since 1975 Japanese Utility models and applications for Utility models since 1975 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS (KIPO internal) Keywords: "cleaner, wheel, inserting and injection"		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5249328 A (GOLDSTAR CO., LTD.) 05 OCT. 1993 See column 5, line 43 - column 10, line 27; figure 2 - figure 5	1 - 8
A	JP 3184857 B2 (TEC CORP.) 27 APR. 2001 See paragraph 7 - paragraph 33; figure 2	1 - 8
A	JP 2573367 B2 (MITSUBISHI ELECTRIC HOME APPLIANCE CO. LTD. ET AL.) 24 OCT. 1996 See the entire document	1 - 8
A	US 5115537 A (THE SCOTT FETZER COMPANY) 26 MAY 1992 See column 2, line 60 - column 7, line; figure 7	1 - 8
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 16 NOVEMBER 2009 (16.11.2009)		Date of mailing of the international search report 17 NOVEMBER 2009 (17.11.2009)
Name and mailing address of the ISA/ Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer Telephone No.

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