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(54) **Vacuum cleaner appliance with rigid filter container**

(57) A vacuum cleaner appliance is described comprising a filter container (2) for dust with rigid walls made of porous plastic material and an inlet opening (4) for the dusty air provided in one of its side walls. The filter container (2) is extractable from the frame of said vacuum cleaner appliance (1) which comprises a closing

device (3) of said filter container (2) too. The closing device (3) comprises a cover (8) and a handle (30) for the opening of the cover (8). The cover (8) is hinged to the filter container (2) in such a way as to stably remain in an inclined position when the cover (8) is open. The filter container (2) is extractable with open cover (8) by applying a force upward onto the same cover (8).

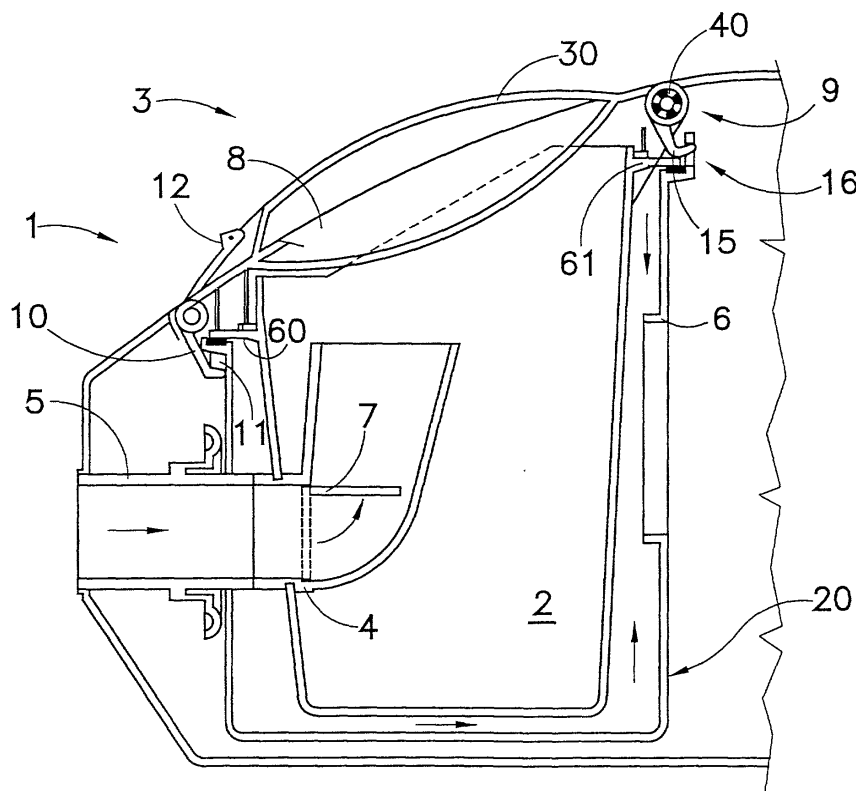


FIG.2

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Description

[0001] The present invention refers to a vacuum cleaner appliance with rigid filter container, in particular to a home vacuum cleaner. Generally the various home type vacuum cleaners in use are provided with filtering systems consisting in a bag for the filtering of the dusty air coming from the outside and the containment of the dust. Such bags are easily removable from the appliance for their substitution, however a lot of attention must be paid to the spills of dust from such bags both during the removal from the vacuum cleaner appliances and during the disposal in the dustbin.

[0002] Disadvantages in the use of such bags are bound both to their purchase cost and to the lack of knowledge on the replacement of the bag on behalf of some users.

[0003] Such reasons led vacuum cleaner producers to manufacture bagless vacuum cleaners, that is vacuum cleaners where the dust is separated from the jet of air by cyclone devices and it is collected in rigid plastic containers that must be removed from the vacuum cleaner for their emptying.

[0004] A vacuum cleaner of the aforesaid type is known from the British patent application N. 2265096 in which a vacuum cleaner is described comprising a filter container with rigid walls of sintered polymer, for instance polyethylene, with a variety of pores. The filter container is located inside a protecting cage whose upper end is open and is connected with a closing cover provided with a handle. The filter container also has an opening that must coincide with the inlet for the vacuumed dusty air.

[0005] For the vacuum cleaner above described the operation of release of the filter container from the appliance and its relative emptying is a somewhat burdensome operation. Moreover the dust contained in the filter container can partially come out during the transport for the emptying of the filter container.

[0006] In view of the state of the art herein described, scope of the present invention is to present a vacuum cleaner provided with a rigid filter container that solves at least partially the aforesaid disadvantages.

[0007] According to the present invention, such scope is attained by means of an vacuum cleaner appliance comprising a filter container for dust with rigid walls made of porous plastic material and an inlet opening for the dusty air provided on one of its side walls, said filter container being extractable from the frame of said vacuum cleaner appliance, said vacuum cleaner appliance comprising a closing device of said filter container comprising a cover and a handle for the opening of the cover, characterized in that said cover is hinged to said filter container in such a way as to stably remain in an oblique position when the cover is open, said filter container being extractable with open cover by applying to the same cover a force upward.

[0008] Owing to the present invention it is possible to

realise a vacuum cleaner provided with a rigid filter container that is easily removable from the frame of the vacuum cleaner.

[0009] The characteristics and the advantages of the present invention will become evident from the following detailed description of an embodiment thereof, that is illustrated as a non limiting example in the drawings herein enclosed, in which:

Figure 1 is a layout of principle of a vacuum cleaner provided with rigid filter container according to the embodiment of the present invention;

Figure 2 is a schematic view of a filter container inserted into a space of the vacuum cleaner in Figure 1;

Figure 3 is a similar schematic view of the filter container once extracted from the vacuum cleaner;

Figure 4 is a schematic and magnified top view of the hinge that connects the cover to the filter container in Figure 3 in closed cover position;

Figure 5 is a schematic and magnified top view of the hinge that connects the cover to the filter container of Figure 3 in open cover position;

Figure 6 is a schematic and magnified side view of a detail comprising hook and hinge of the vacuum cleaner in Figure 2;

Figure 7 is a schematic and magnified top view of the hinge that connects the cover to the filter container in open cover position according to a variation of the embodiment of the present invention;

Figure 8 is a schematic magnified side view of a detail comprising hook and hinge according to a variation of Figure 7.

[0010] With reference to Figure 1 there is shown a layout of principle of a vacuum cleaner appliance 1 provided with a rigid filter container 2 that is normally located inside the vacuum cleaner 1 in a hollow body 20 that in figure is dotted.

[0011] The filter container 2, better visible in Figure 2, is a porous chamber made up of a sintered porous plastic material, for instance sintered polyethylene. The filter container 2 comprises a base and four walls and it is closed on the top by a closing device 3. The filter container 2 is provided with an opening 4 communicating with a duct 5 for the suction of dusty air that must be filtered by container 2 and that must then be conveyed towards the output duct 6 communicating with the motor of vacuum cleaner 1. Inside the opening 4 a sealing valve is arranged 7 that is suitable to close the opening 4 when the flow of dusty air stops.

[0012] The closing device 3 is made up of a cover 8 that is hinged in 9 to the filter container 2 is provided with one handle 30 and with means for the coupling with the hollow body 20 of a vacuum cleaner 1. Said coupling means 10 are made up of a first hook and of a second hook 15 that are fixedly mounted to opposite ends of the cover 8.

[0013] When the latter is closed the first hook 10 is in abutment with a projection 11 of a side wall of the hollow body 20 and the second hook 15 is in engagement with a hole 16 that is made on an appendix of the side wall of the hollow body 20 opposite to the previous one, as better visible in Figure 6. The first hook 10 is connected, for example by means of a spring, to a button 12 placed on the cover 8 for its release while the second hook 15 is releasable by means of opening rotation of the same cover 8.

[0014] The cover 8 is hinged in 9 to the filter container 2 by means of a connection device 40, better visible in Figures 4 and 5, that is made up of two pairs of toothed gear wheels with involute profile 41 and 42 with the gear wheels 41 fixedly mounted to the cover 8 and the gear wheels 42 fastened and fixedly mounted to the filter container 2. Between the gear wheels 41 a spring 43 is arranged, that is appropriately calibrated with reference to the weight of the dust of the filter container 2, that compresses each gear wheel 41 on a corresponding gear wheel 42. Each of the gear wheels 41 and 42 are made up of four equal teeth of the saw type teeth with involute profile and the maximum stroke of a wheel 41 on a gear wheel 42 is represented by a distance smaller than the height of the tooth, that is a value corresponding to an opening of the cover 8 smaller than 90°.

[0015] When the vacuum cleaner 1 is in use the flow of dusty air coming from the duct 5 enters through the opening 4 into the filter container 2 where it gets filtered thus leaving its dust content, and finally it is conveyed toward the duct 6 communicating with the motor of the vacuum cleaner. The cover 8 is normally closed with the hook 10 in abutment with the projection 11 and the hook 15 in engagement with the hole 16; in addition the cover is provided with bottom extensions that abut with appropriate gaskets that are arranged on appendixes 60, 61 of the filter container 2, said appendixes 60, 61 in turn rest on appropriate gaskets of the hollow body 20. In the connection device 40 the gear wheels 41 and 42 are in a position corresponding to the maximum stroke, with the upper ends of their teeth adjacent, as visible in Figure 4.

[0016] Once the vacuuming operation of dusty air is over, a user can operate on the button 12 so as to release the hook 10 of the cover 8 and can easily open the cover 8 by making it rotate in such a way so as to release the hook 15. It is necessary to apply only a slight force on the cover 8 for its rotation since the same rotation of the cover is facilitated by the device 40, precisely by the action of the spring 43 that thrusts the gear wheels 41 toward the corresponding gear wheels 42 so that the teeth of the gear wheels 41 slide on the involute profiles of teeth of the gear wheels 42. The action of rotation given to the cover 8 continues up to a position in which the cover is oblique as regards a horizontal axis in the case of Figure 6, thus forming an angle smaller than 90°, and in which the cover 8 stably remains. This is due to the connection device 40 in which the gear

wheels 41 and 42 are arranged in a position corresponding to the minimum stroke, that is with the teeth of the gear wheels 41 inserted in the grooves between the teeth of the gear wheels 42, as visible in Figure 5. In this way the same user by operating with upward force on the handle 30 that is fixedly mounted to the cover 8, can lift the filter container 2 for the emptying of the dust and the possible cleaning of the same, as visible in Figure 3 where the filter container 2 already extracted is shown. In addition, the sealing valve 7 of the opening 4 of the filter container 2 prevents spills of dust outside during the transport of the container in the place suitable for the emptying of the dust.

[0017] A variation to the embodiment of the above described present invention provides the sole difference of a different connection device 50 between cover 8 and filter container 2, shown in the Figures 7 and 8. In this case such device 50 comprises a pair of gear wheels 51 that are fixedly mounted to the cover 8 and each provided with four equal teeth with involute profile but in which the teeth have bevelled ends and with a spring 53 interposed between the gear wheels 51. Each gear wheel 51 is compressed by the spring 53 on gear wheels 52 that are fastened and fixedly mounted to the filter container 2 and provided with inclined planes bevelled at their ends; each gear wheel 51 can slide on the corresponding gear wheel 52. The maximum stroke of each gear wheel 51 on a gear wheel 52 is represented by a distance that is substantially equal to the height of the tooth. When the cover 8 is open the teeth of the gear wheels 51 are inserted between the inclined planes of the gear wheels 52, as shown in Figure 8. With such connection device 50 a user must apply a higher force to the handle 30 as compared with the previous case, that is with the device 40, in order to open and to close the cover 8, but such force has equal intensity both for the opening and for the closing of the cover 8.

[0018] A peculiarity of the vacuum cleaner appliance 1 previously described consists in the possibility to slip the filter container 2 vertically off the frame of the vacuum cleaner 1 with a single hand and a single movement. In fact the opening system of the cover 8 with the latter locked in position of maximum opening, allows a user to empty the filter container 2 of its dust content with a single action and with a single movement without any contact with dusty features. The same logic is followed for the putting back in position of the filter container 2 and for the closing of the cover 8.

Claims

1. Vacuum cleaner appliance comprising a filter container (2) for dust with rigid walls of porous plastic material and an inlet opening (4) for the dusty air provided in one of its side walls, said filter container (2) being extractable from the frame of said vacuum cleaner appliance (1), said vacuum cleaner appli-

ance (1) comprising a closing device (3) of said filter container (2) comprising a cover (8) and a handle (30) for the opening of the cover (8), **characterized in that** said cover (8) is hinged to said filter container (2) in such a way as to stably remain in an inclined position with open cover (8), said filter container (2) being extractable with open cover (8) by applying a force upward onto the same cover (8).

2. Vacuum cleaner appliance according to claim 1, **characterized in that** said cover (8) is provided with means for the locking (10, 15) with the frame (20) of the vacuum cleaner (1), said locking means (10, 15) being releasable from the frame of the vacuum cleaner (1) during the stage of opening of the cover (8). 10
3. Vacuum cleaner appliance according to claim 2, **characterized in that** said locking means (10, 15) comprise a first (10) and a second (15) hook that are fixedly mounted to the ends of the cover (8). 20
4. Vacuum cleaner appliance according to claim 3, **characterized in that** when the cover (8) is closed said first hook (10) is in abutment with an external projection (11) of a side wall of a hollow body (20) where said filter container (2) is housed, and said second hook (15) is engaged in a hole (16) that is made on a side wall of said hollow body (20) opposite to the previous one. 25 30
5. Vacuum cleaner appliance according to claim 4, **characterized in that** said second hook (15) is releasable from said hole (16) by means of rotation of said cover (8). 35
6. Vacuum cleaner appliance according to claim 1, **characterized in that** said filter container (2) is provided with a sealing valve (7) so as to prevent leaks of dust from the filter container (2) in correspondence of its opening (4) for the inlet of dusty air. 40
7. Vacuum cleaner appliance according to claim 1, **characterized in that** said cover (8) is hinged to said filter container (2) by means of a connection device (40) comprising a first and a second pair of involute profile toothed gear wheels (41, 42), said first pair of gear wheels (41) being turnable with the cover (8) and said second pair of gear wheels (42) being fastened and fixedly mounted to the filter container (2), and a spring (43) being interposed between each gear wheel (41) of said first pair that compresses said each gear wheel (41) of the first pair of gear wheels on the corresponding gear wheel (42) of the second pair of gear wheels. 45 50 55
8. Vacuum cleaner appliance according to claim 7, **characterized in that** each gear wheel (41, 42) of

said first and second pair of gear wheels is provided with four equal saw type teeth with involute profile, the maximum stroke of each gear wheel (41) of the first pair on the corresponding gear wheel (42) of the second pair being smaller than the height of the tooth.

9. Vacuum cleaner appliance according to claim 8, **characterized in that** when the cover (8) is closed the upper ends of the teeth of the corresponding gear wheels of said first and second pairs of gear wheels (41, 42) are adjacent to each other, while when the cover (8) is open each gear wheel (41) of the first pair of gear wheels is geared on the corresponding gear wheel (42) of the second pair of gear wheels.
10. Vacuum cleaner appliance according to claim 1, **characterized in that** said cover (8) is hinged to said filter container (2) by means of a connection device (50) comprising a first and a second pair of gear wheels (51, 52) said first pair of gear wheels (51) being rotatable with the cover (8) and said second pair of gear wheels (52) being fastened and fixedly mounted to the filter container (2), each gear wheel (51) of said first pair of gear wheels is provided with four equal teeth with involute profile but with bevelled ends and a spring (53) being interposed between each gear wheel (51) of said first pair that compresses said each gear wheel (51) of the first pair of gear wheels on the corresponding gear wheel (52) of the second pair of gear wheels, each gear wheel (52) of said second pair of gear wheels being provided with inclined planes with bevelled ends so that each gear wheel (51) of said first pair of gear wheels can slide on the corresponding gear wheel (52) of the second pair of gear wheels, the maximum stroke of each gear wheel (51) of the first pair on the corresponding gear wheel (52) of the second pair being substantially equal to the height of the tooth.

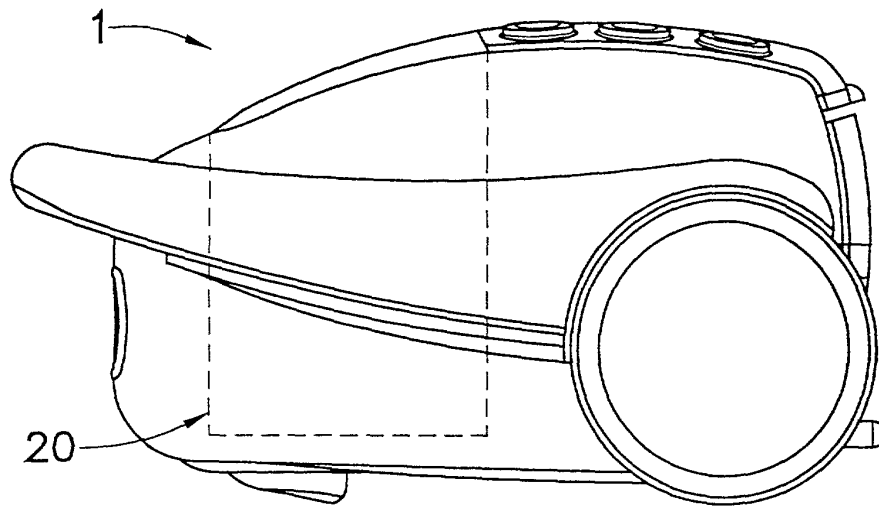


FIG. 1

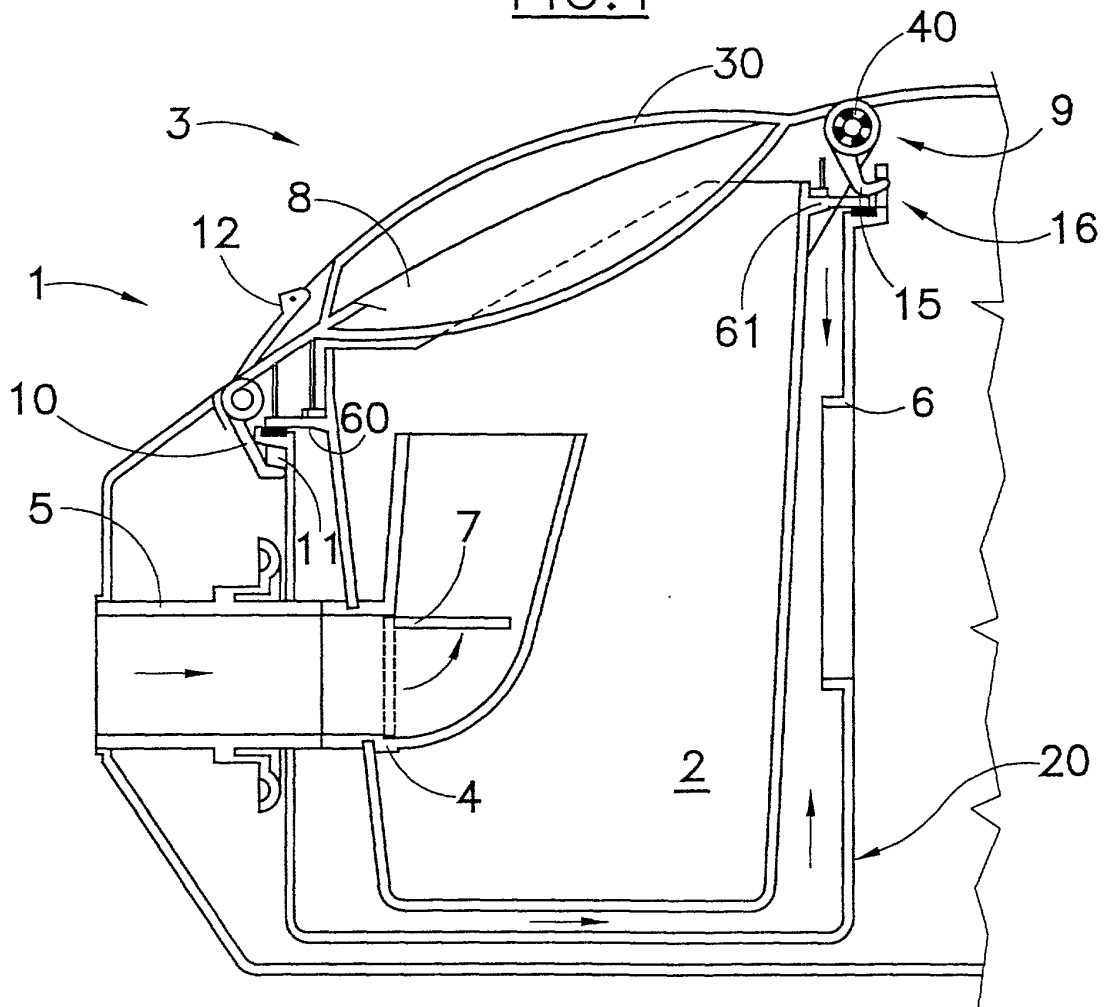


FIG. 2

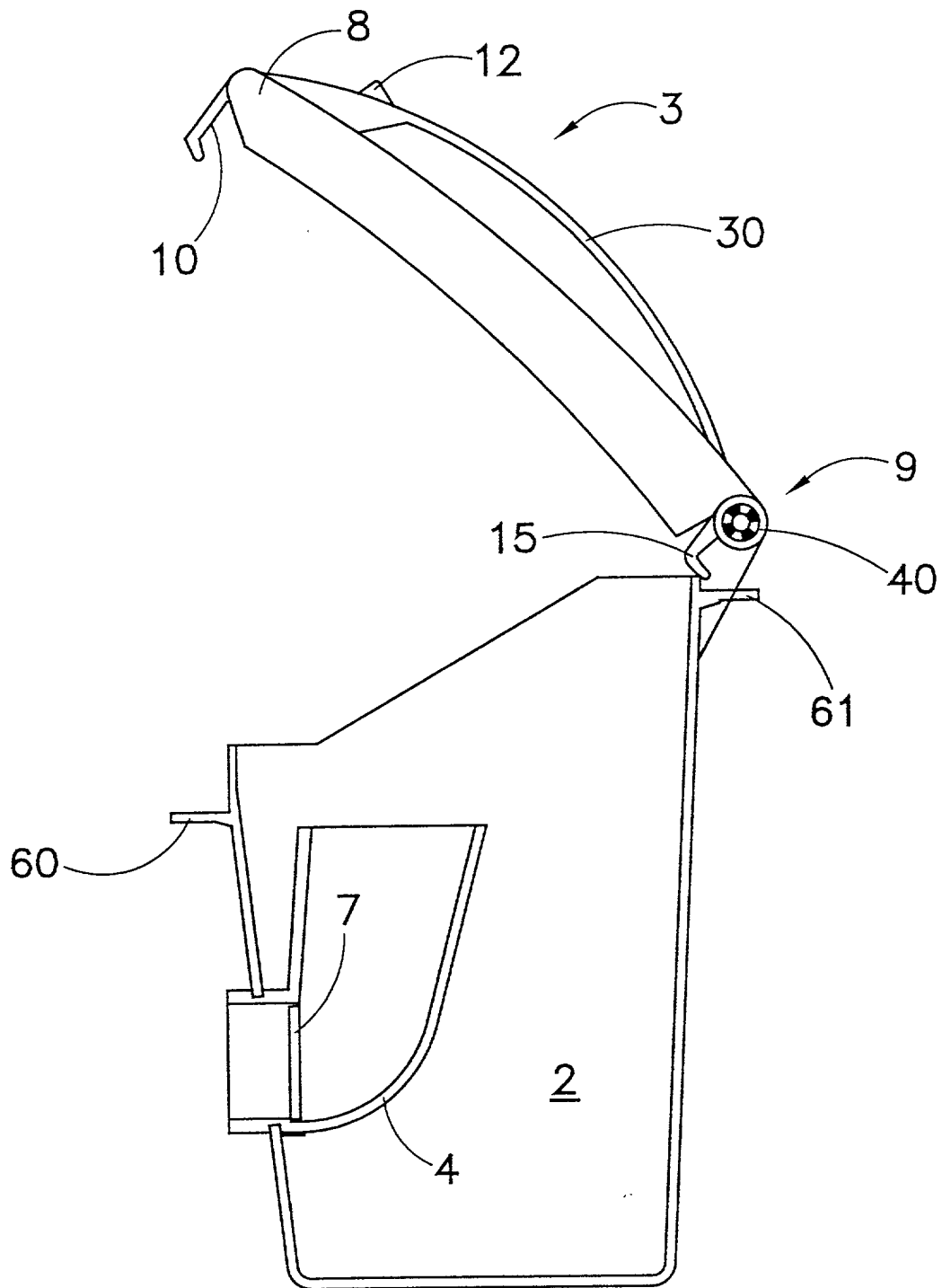


FIG.3

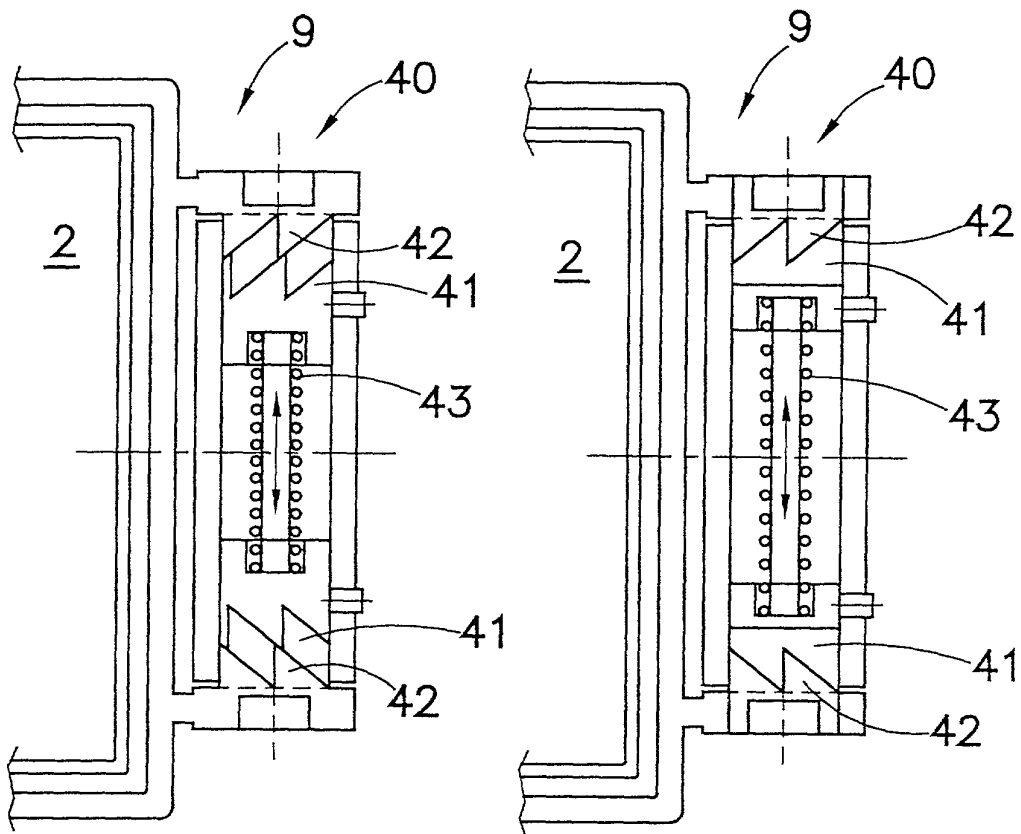


FIG. 4

FIG. 5

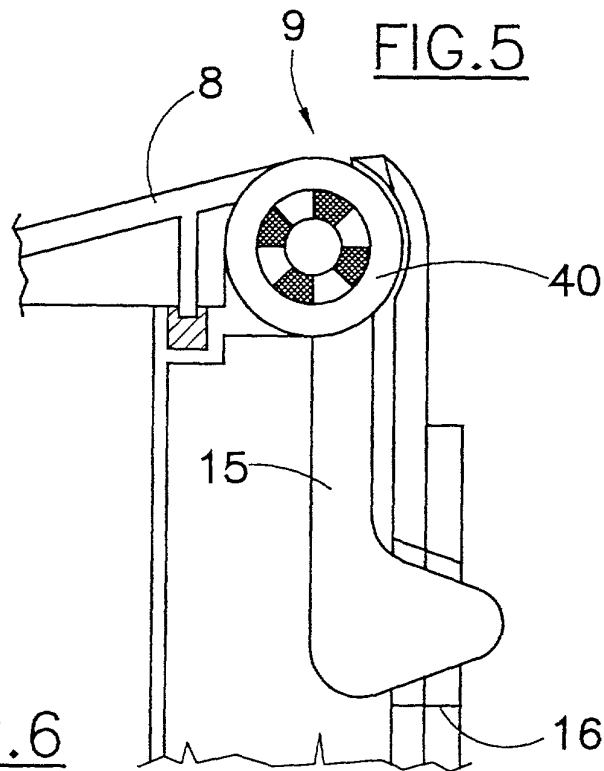


FIG. 6

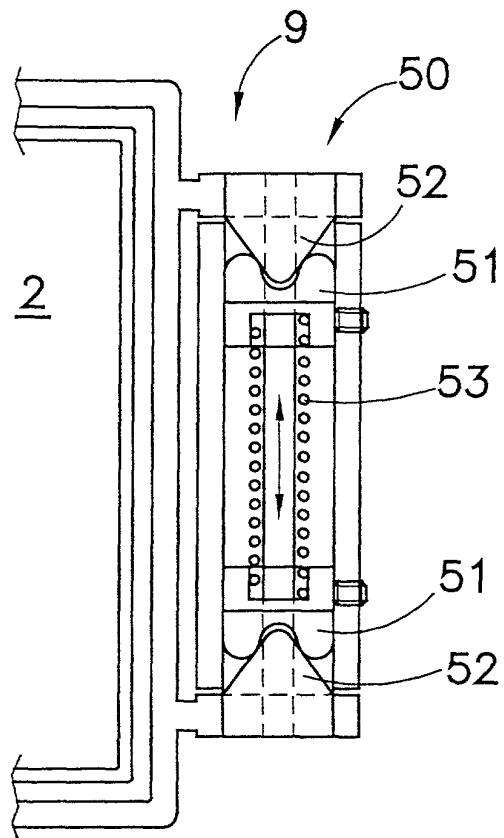


FIG. 7

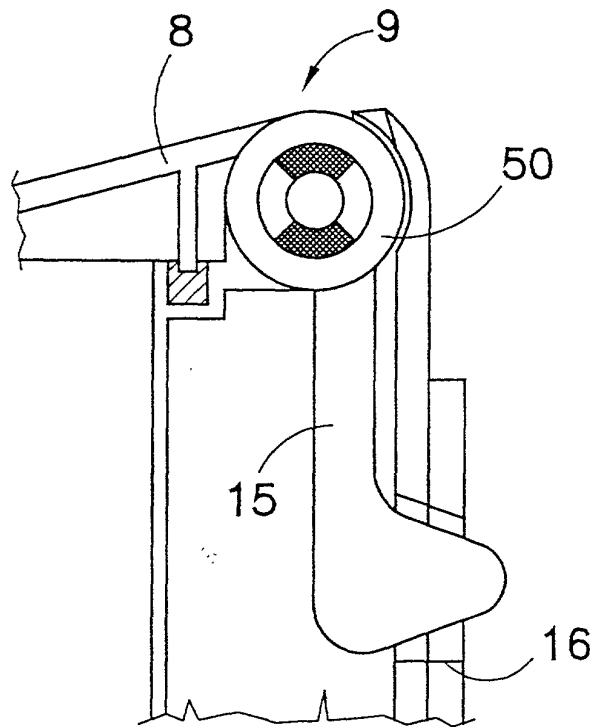


FIG. 8



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Application Number
EP 00 83 0733

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 8 April 2002	Examiner Cabral Matos, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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