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(54) **NESTED PACKAGING FOR CENTRAL VACUUM CLEANER**

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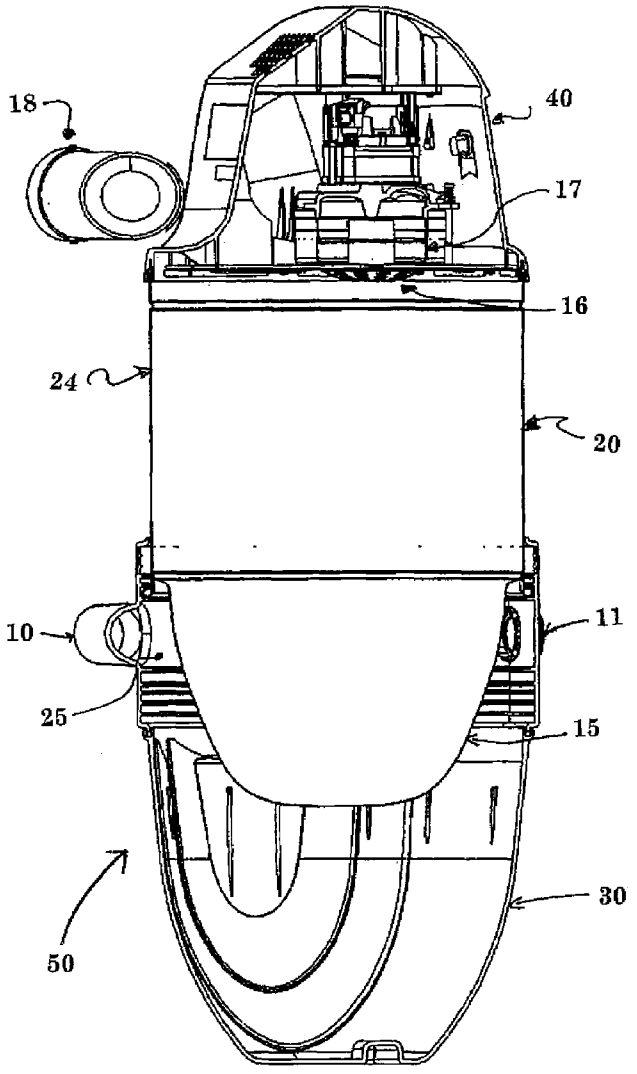
(57) **ABSTRACT**

A central vacuum power unit includes separate components that can be disassembled and nested together for compact shipment and storage. In the disassembled and nested assembly, the motor module is nested within the dust bucket, and the dust bucket is nested within the body module. For vacuuming operation, the dust bucket is attached below the body module and the motor module is stacked and attached above the body module. A filter is disposed inside the body module and filters debris from air entering the power unit. Debris is collected in the dust bucket, and filtered air is exhausted from a port in the motor module. Latches on the body module are used to attach the dust bucket underneath the body module in operation, and to secure the nested assembly for packaging and shipping.



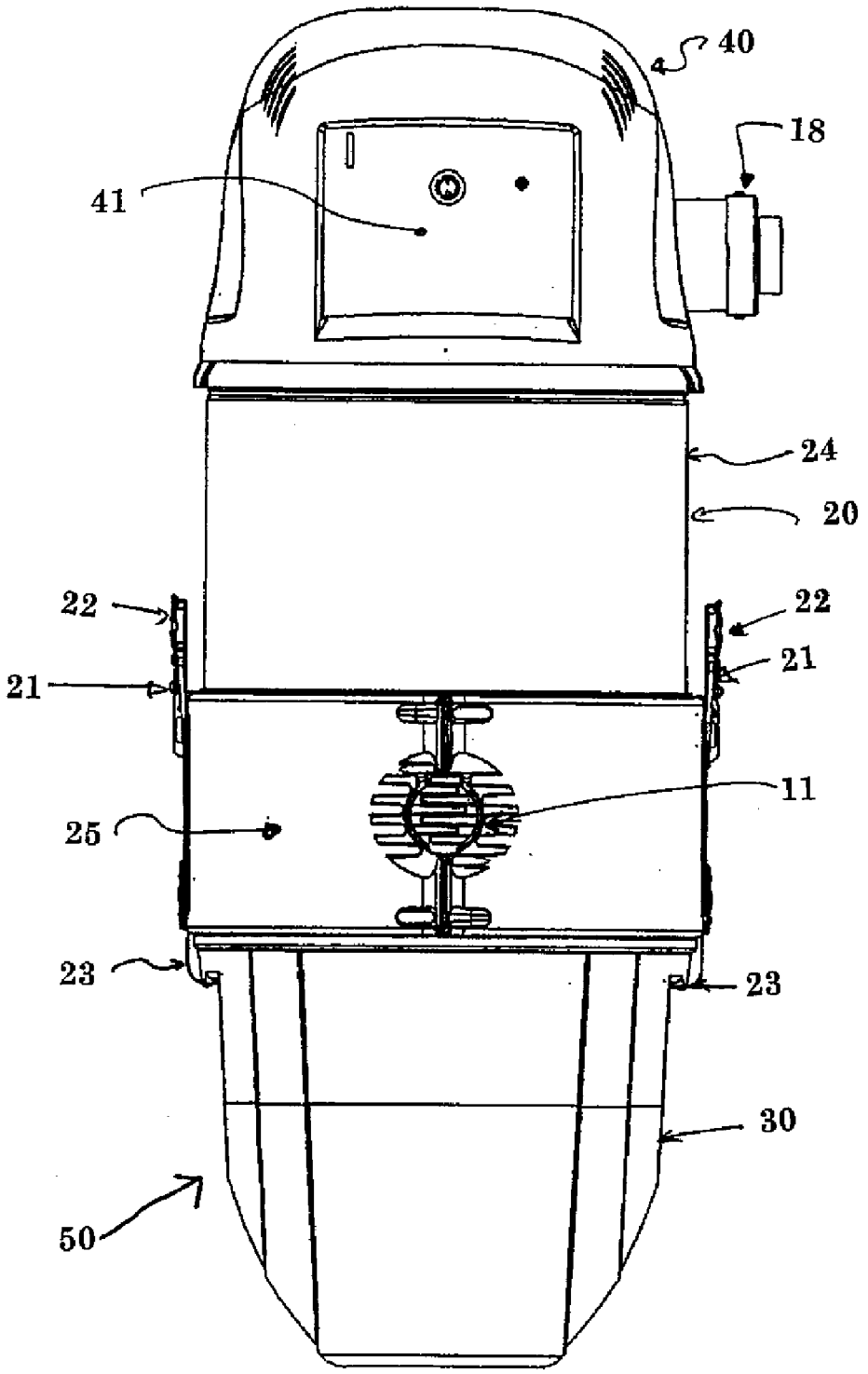


Figure 1

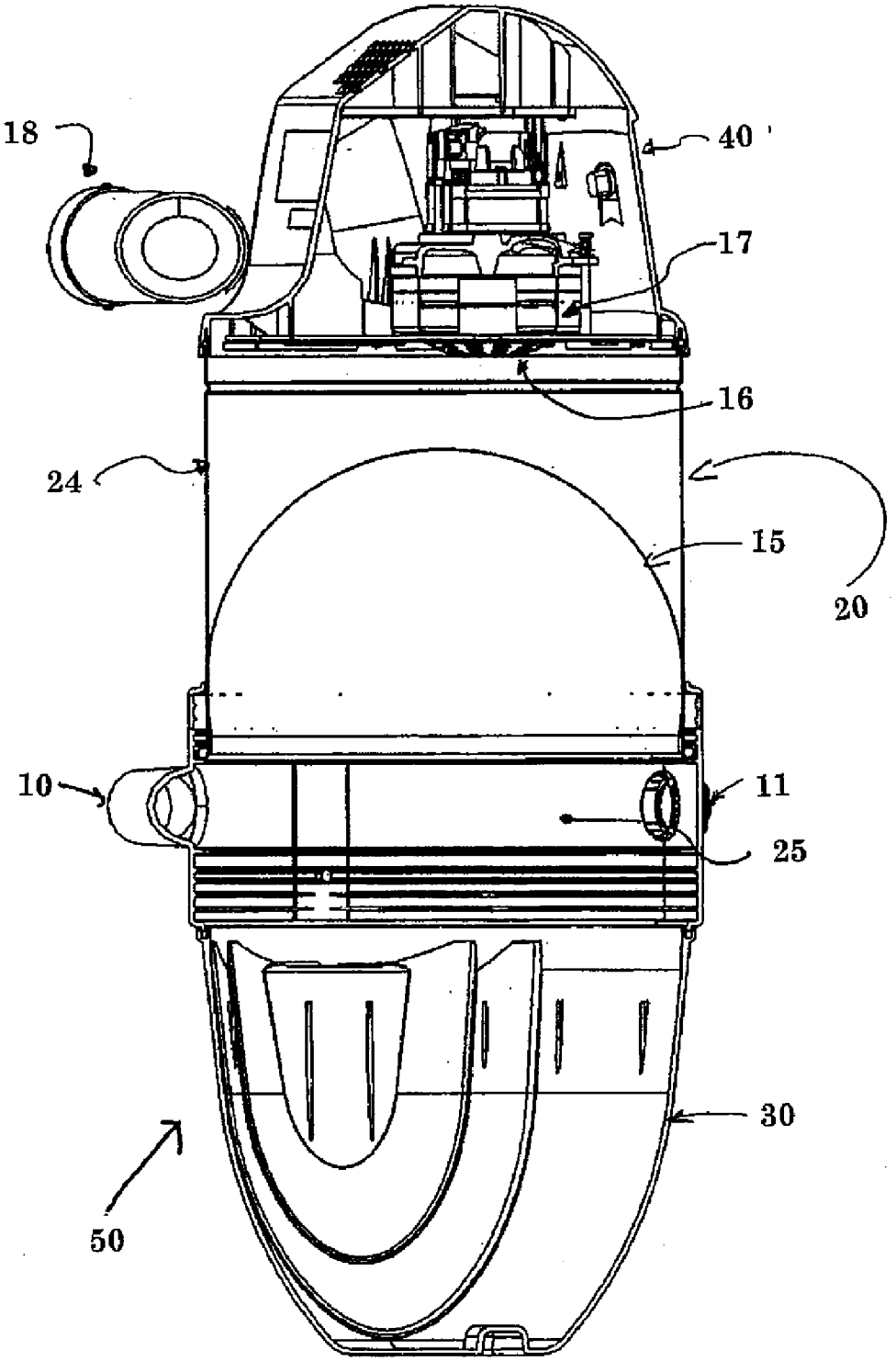


Figure 2

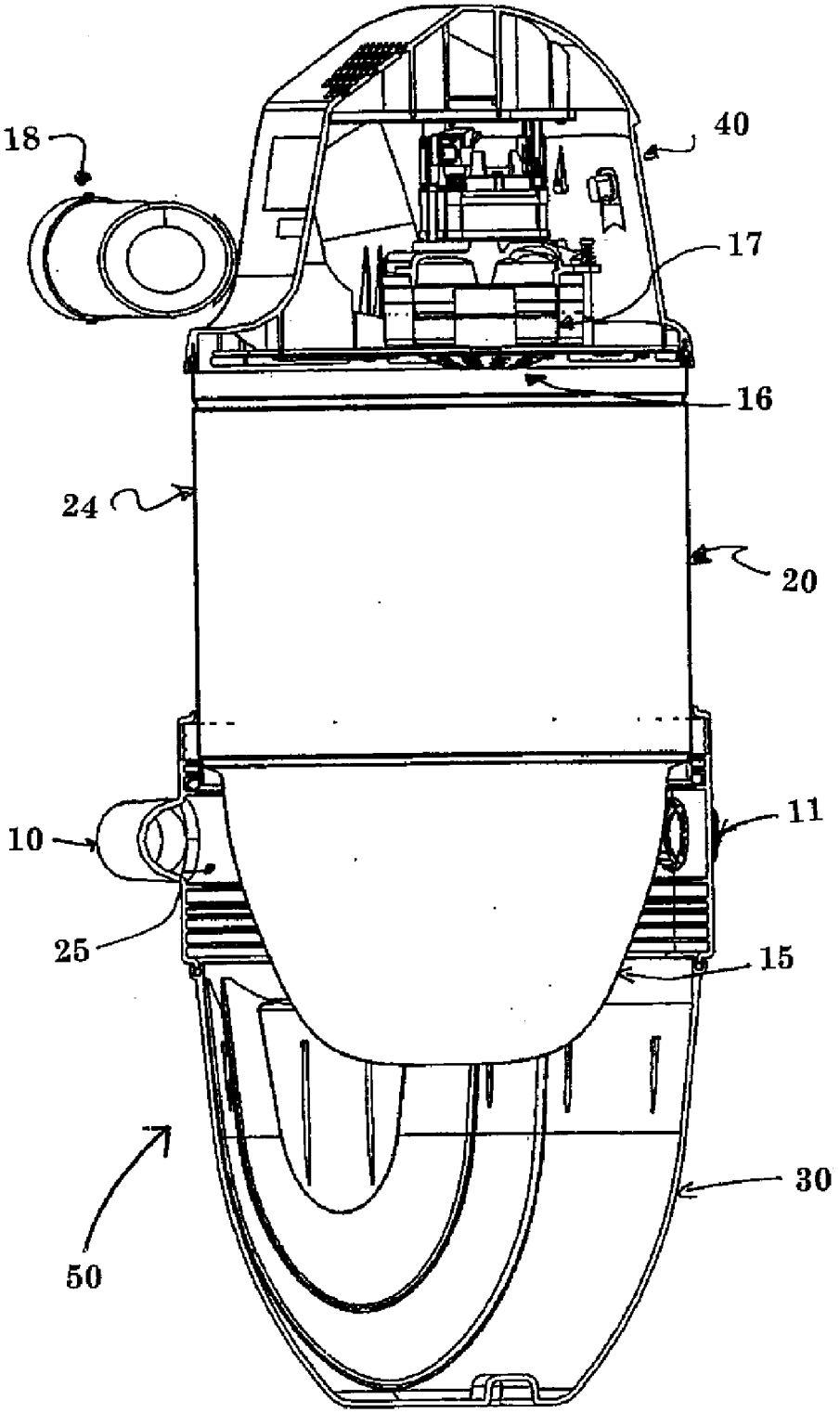


Figure 3

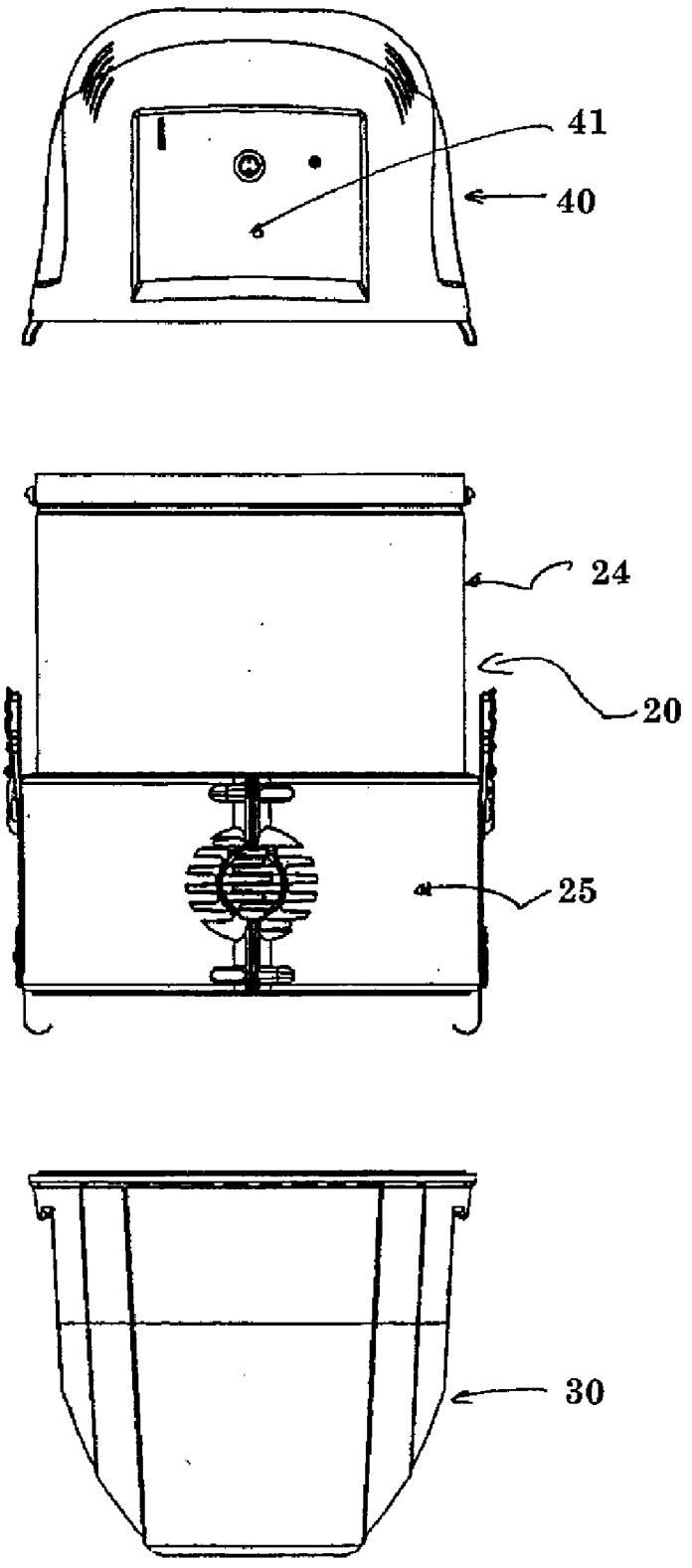


Figure 4

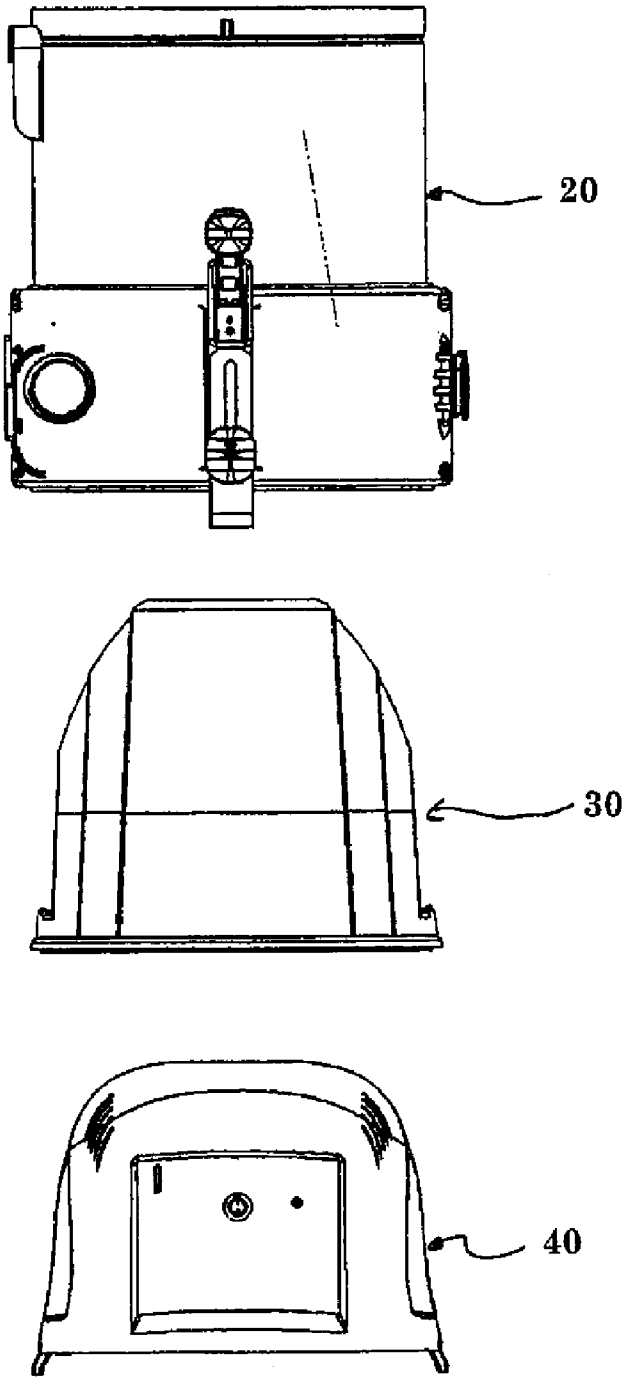


Figure 5

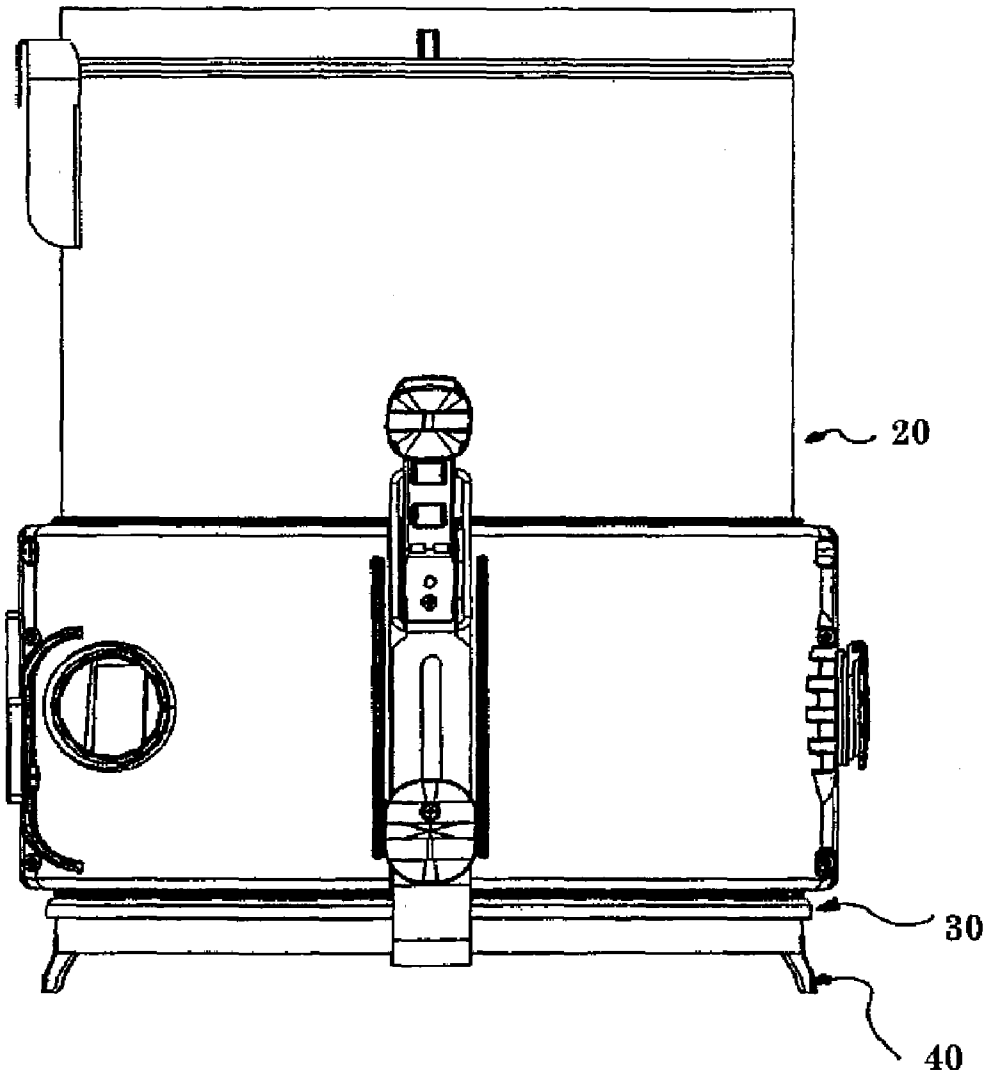


Figure 6

NESTED PACKAGING FOR CENTRAL VACUUM CLEANER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates generally to central vacuum cleaners and, more particularly, to a central vacuum cleaner with a nested packaging configuration.

[0003] 2. Description of Related Art

[0004] Central vacuum cleaner systems are well known and in wide use. A conventional system typically includes a power unit (including the vacuum motor and dust receptacle), tubes or pipes plumbed throughout the house (typically inside the house walls), outlets at various locations throughout the house, and a vacuum tool(s) that connects to the outlet, typically via a long, flexible hose. The vacuum tool may be, for example, a powered carpet brush with a beater bar and lamp, an extension wand, a crevice tool, an upholstery tool, and so on.

[0005] In use, one end of the hose is connected to a wall outlet and the other end is connected to a tool. The power unit is then activated and the area within reach of the flexible hose and tool may be cleaned. Dirt, dust and debris is sucked through the hose, through the tubes or pipes and to the power unit where it is filtered and collected.

[0006] In order to provide sufficient vacuum power, filtering capability, dirt and debris collection volume, and to minimize leakage, the central vacuum power unit tends to be quite large. Conventional power units are built and shipped as a single unitary piece with a typical diameter in a range of 12-16 inches and a height in a range of 30-48 inches. Much of this volume is empty and is used only for airflow. An item of this size is very bulky and cumbersome to handle, especially when packaged. In addition, the costs associated with shipping such a large, cumbersome, air-filled item can be excessive.

[0007] In view of these drawbacks of conventional central vacuum power units, there is a strong need for a central vacuum power unit that could be packaged and shipped in a more compact and efficient manner.

SUMMARY OF THE INVENTION

[0008] The present invention provides a nested packaging design and method for compact and efficient packaging of a power unit of a central vacuum cleaner. The power unit is divided into components or sections that can be disassembled and nested together for shipping and handling in a much smaller configuration. The disassembled, nested and packaged central vacuum power unit of the present invention is approximately half the size of the assembled unit. Shipping, handling and storage issues associated with conventional central vacuum cleaners are minimized or eliminated by the present invention.

[0009] Accordingly, one embodiment of the invention is a central vacuum power unit comprising at least two functional and separate components. The components are attached in a stacked assembly during operation, and are detachable for configuration in a nested assembly during non-operation.

[0010] Another embodiment of the invention is a nested packaging assembly for a central vacuum power unit. The assembly includes a cylindrical body module, a dust bucket nested within the body module, and a motor module nested within the dust bucket.

[0011] Another embodiment of the invention is a method for packaging a central vacuum cleaner for transit or storage. At least two functional components of the vacuum cleaner are detached and nested within each other.

[0012] Another embodiment of the invention is a method for operation of a central vacuum cleaner. The method comprises stacking a motor module above a body module, and the body module above a dust bucket, for vacuuming operations; and nesting the motor module within the dust bucket, and the dust bucket within the body module, for shipment or storage.

[0013] Other features and advantages of the invention will be apparent from the following detailed description, taken in conjunction with the accompanying drawings which illustrate, by way of example, various features of embodiments of the invention,

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. **1** is a front view of an assembled central vacuum power unit according to the present invention.

[0015] FIG. **2** is a front, partially sectional view of the central vacuum power unit of FIG. **1** in an operating state.

[0016] FIG. **3** is a front, partially sectional view of the central vacuum power unit of FIG. **1** in an inactive state.

[0017] FIG. **4** is a front view of the components of a disassembled central vacuum power unit according to the present invention.

[0018] FIG. **5** is a front view of the components of the disassembled central vacuum power unit of FIG. **4**, arranged in a configuration to facilitate nested packaging.

[0019] FIG. **6** is a front view of the components of the disassembled central vacuum power unit of FIG. **5**, in a nested configuration.

DETAILED DESCRIPTION OF THE INVENTION

[0020] FIG. **1** is a front view of an assembled central vacuum power unit **50** according to the present invention. Power unit **50** may be used in household or commercial applications. Power unit **50** has a cylindrical configuration, is approximately 12-16 inches in diameter and, when assembled, is approximately 40 inches in height. Power unit **50** comprises three separate, functional sections or components: a central body module **20**, a dust bucket **30** attached below body module **20** and a motor module **40** attached above body module **20**.

[0021] Since the components are essentially stacked one on top of the other, the assembled configuration of FIGS. **1-3** is referred to as the "stacked assembly".

[0022] Body module **20** is the largest section of the power unit and is essentially a large cylinder or canister. As will be described below, the large empty volume of body module **20** is necessary to hold and accommodate inflation and deflation of a vacuum filter bag or media **15** attached therein. It comprises an upper metal tube or wrapper **24** and a lower skirt **25**. A vacuum inlet **10** and utility port **11** are formed in, or defined by, skirt **25**. Slide latches **21** are attached to, or formed integrally with, skirt **25** for holding dust bucket **30** in place. In one embodiment, skirt **25** comprises two plastic, semi-circular components. Filter **15** (FIGS. **2-3**) is attached within the interior of body module **20** above vacuum inlet **10** and utility port **11** and filters dust, debris, etc. from the air flow entering power unit **50** through inlet **10** and/or port **11**.

[0023] Motor module **40** is attached above body module **20**. For ease of repair and replacement, all factory serviceable

electronics and active mechanical components are housed within module **40**, including a vacuum motor **17** and associated electrical controls and mounting hardware. Motor **17** is a conventional motor mounted and configured for operation within module **40** in a manner familiar to those of ordinary skill in the art. User interface **41** is formed on the exterior of module **40**, and may include items such as an on/off switch, a debris level indicator, a motor service indicator, a motor power indicator and a vacuum level indicator. Motor module also includes an air passage and an exhaust port to exhaust air flowing upward from body module **20**. A detachable or integrally-formed muffler **18** is typically provided on the exterior of module **40** around the exhaust port. A secondary filter **16** may also be provided in motor module **40**.

[0024] Dust bucket **30** is attached below body module **20** to capture and accumulate dirt, debris, etc. that is removed by filter **15** from the air flowing through power unit **50**. Dust bucket **30** may be attached and configured in alternative ways that are known or will be apparent to those of skill in the art. Importantly, where a filter **15** is interposed between an air inlet **10** and outlet **18**, the dust bucket **30** should be configured and oriented in a manner that captures dirt and debris that filter **15** removes from the airflow.

[0025] Central vacuum power unit **50** is typically assembled on site at the time of installation. When completely assembled, body module **20** may be attached or hung on a wall or other structure, with motor module **40** attached above body module **20** and dust bucket **30** attached below body module **20**. This design assures that, when assembled on site, all modules are properly aligned to compress gaskets that are integral to the modules and prevent or minimize leakage during operation of unit **50**.

[0026] During operation of motor **17**, as shown in FIG. **2**, vacuumed debris and air enters body module **20** of power unit **50** at inlet **10**. Alternatively, for local applications, vacuumed debris and air may enter power unit **50** via a flexible hose and tool attached at utility port **11**. The air flows in an upward direction from inlet **10** and/or port **11** to exhaust port **18** in motor module **40**. Filter **15**, interposed therebetween, inflates and filters dust and debris from the airflow and keeps it in the space below filter **15**. Secondary filter **16** is mounted above filter media **15** and provides additional filtering and acts as a backup in the event that filter media **15** fails, or debris, etc. gains access to the space above filter **15** during installation, maintenance, inspection, etc. of power unit **50**. Filtered air is exhausted from power unit **50** via muffler **18**.

[0027] When motor **17** is turned off, as shown in FIG. **3**, filter **15** deflates and collapses into the lower portion of body module **20** and partially into dust bucket **30**. The deflation and collapse of filter **15** may be assisted by an integral weight. During this motion, dust and debris attached to the lower surface of filter **15** detaches and falls into dust bucket **30**, where it is collected and held.

[0028] Two slide latches **21** couple dust bucket **30** to body module **20**. When dust bucket **30** becomes full of dust and debris, latch levers **21** formed on the upper portions of latches **21** are rotated down, thereby lowering latch hooks **23** formed on the lower portions of latches **21**. With hooks **23** lowered, bucket **30** can be removed and emptied of the dust and debris collected therein. Once emptied, bucket **30** is reattached by placing it on hooks **23** and rotating latch levers **22** upward to raise hooks **23** and secure bucket **30** below body module **20**.

[0029] The components of power unit **50** are easily disassembled and nested together for storage or packaging and shipping. As shown in FIG. **4**, dust bucket **30** and motor module **40** are easily detached from central body module **20**. The three components are then oriented as shown in FIG. **5** to compactly nest together. Essentially, motor module **40** is nested within dust bucket **30**, and these two components are in turn nested within body module **40**.

[0030] Motor module **40**, which is the heaviest and most dense component, is placed at the bottom in an upright orientation. Next, dust bucket **30** is flipped upside down and placed over motor module **40**, which nests within the hollow interior of bucket **30**. Lastly, body module **20** is placed over and around bucket **30** in an upright orientation to yield the compactly nested configuration illustrated in FIG. **6**. Latch hooks **23** may be secured underneath motor module **40** and dust bucket **30**, and rotated upward, to cinch and secure the three components together.

[0031] The nested packaging configuration illustrated in FIG. **6**, referred to as the "nested assembly", is much more compact than that of conventional power units, and permits a significant reduction in packaging size and bulk. Preferably, it occupies approximately half or less of the space of the assembled, stacked assembly of FIGS. **1-3**.

[0032] Other components and accessories associated with power unit **50**, such as the detached muffler **18**, associated mounting hardware, wall mounting plates and pipe/hose attachment items, can be placed inside of body module **20** on top of dust bucket **30**. In this manner, they do not cause an increase in the packaging size. Other packaging items such as plastic bags, cardboard and foam inserts, etc., can be added to the stack to prevent damage during shipping.

[0033] The particular embodiments of the invention described in this document should be considered illustrative, rather than restrictive. Modification to the described embodiments may be made without departing from the spirit of the invention as defined by the following claims.

1. A central vacuum power unit comprising at least two functional and separate components, wherein:
- the components are attached in a stacked assembly during operation; and
- the components are detachable for configuration in a nested assembly during non-operation.

2. A central vacuum power unit as claimed in claim **1**, wherein one of the components is a motor module that houses an electrical motor and electrical control components.

3. A central vacuum power unit as claimed in claim **2**, wherein another of the components is a dust bucket, wherein the motor module nests within the dust bucket in the nested assembly.

4. A central vacuum power unit as claimed in claim **3**, wherein another of the components is a body module, wherein the motor module and dust bucket nest within the body module in the nested assembly.

5. A central vacuum power unit as claimed in claim **4**, wherein the motor module is mounted above the body module and the dust bucket is mounted below the motor module in the stacked assembly.

6. A central vacuum power unit as claimed in claim **5**, wherein the body module includes exterior side latches that secure the dust bucket underneath the body module in the stacked assembly, and that secure the nested components together in the nested assembly.

7. A central vacuum power unit as claimed in claim **1**, wherein the nested assembly is substantially more compact than the stacked assembly.

8. A central vacuum power unit as claimed in claim **7**, wherein the nested assembly occupies approximately half of the space of the stacked assembly.

9. A nested packaging assembly for a central vacuum power unit comprising:

a cylindrical body module;

a dust bucket nested within the body module; and

a motor module nested within the dust bucket.

10. A nested packaging assembly as claimed in claim **9**, and further comprising:

means for attaching the dust bucket below the body module during vacuum operation; and

means for attaching the motor module above the body module during vacuum operation.

11. A nested packaging assembly as claimed in claim **10**, wherein the means for attaching the dust bucket below the body module also secure the nested packaging assembly.

12. A nested packaging assembly as claimed in claim **9**, and further comprising detached attachments to the power unit that are contained within the cylindrical body module above the dust bucket and the motor module.

13. A method for packaging a central vacuum cleaner for transit or storage comprising:

detaching at least two functional components; and

nesting at least one of the functional components within another of the functional components.

14. A method as claimed in claim **13**, wherein the detaching step comprises:

detaching a dust bucket mounted underneath a body module; and

detaching a motor module mounted above the body module.

15. A method as claimed in claim **14**, wherein the detaching step further comprises removing the dust bucket from latches attached to the body module.

16. A method as claimed in claim **13**, wherein the nesting step comprises:

nesting a motor module within a dust bucket; and

nesting the motor module and the dust bucket within a cylindrical body module.

17. A method as claimed in claim **16**, wherein the nesting step further comprises securing the motor module and the dust bucket within the body module with latches attached to the body module.

18. A method for operation of a central vacuum cleaner comprising:

stacking a motor module above a body module, and the body module above a dust bucket, for vacuuming operations; and

nesting the motor module within the dust bucket, and the dust bucket within the body module, for shipment or storage.

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