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Newton et al.

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(54) **UPRIGHT VACUUM CLEANER**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

5,078,761 A 1/1992 Dyson
5,386,612 A 2/1995 Sham
(Continued)

FOREIGN PATENT DOCUMENTS

CN 1541605 11/2004
CN 1242720 2/2006
(Continued)

OTHER PUBLICATIONS

Search Report dated Jan. 22, 2016, directed to GB Application No. 1515105.3; 1 page.

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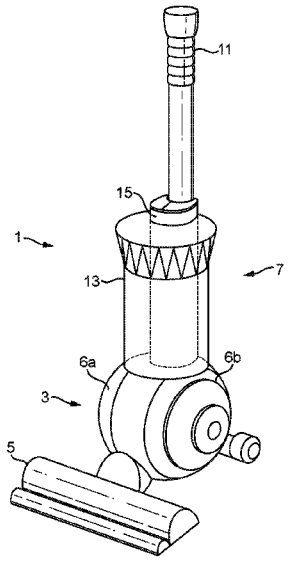
(57) **ABSTRACT**

An upright vacuum cleaner comprising a vac-motor for drawing dirty air in through a floor-engaging cleaner head on the vacuum cleaner, a separating apparatus for separating dirt from the dirty air, an elongate air duct for carrying air to or from the separating apparatus, and a suction wand which is stored on the vacuum cleaner and which can be connected to the separating apparatus via a hose as required to clean above the floor. The external surface of the air duct defines an elongate recess for receiving the stored suction wand such that the air duct partly surrounds the stored wand. This provides a compact configuration.

13 Claims, 6 Drawing Sheets



(51) **Int. Cl.**

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A47L 9/16	(2006.01)
A47L 5/22	(2006.01)
A47L 9/32	(2006.01)

(52) **U.S. Cl.**

CPC ***A47L 9/0045*** (2013.01); ***A47L 9/165*** (2013.01); ***A47L 9/1625*** (2013.01); ***A47L 9/1641*** (2013.01); ***A47L 9/1683*** (2013.01); ***A47L 9/325*** (2013.01)

(58) **Field of Classification Search**

CPC A47L 9/1683; A47L 9/0036; A47L 9/1625; A47L 5/32

USPC 15/335

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,601,641	B2	12/2013	Conrad	
2003/0101535	A1	6/2003	Gammack et al.	
2004/0194247	A1	10/2004	Macleod et al.	
2007/0209334	A1	9/2007	Conrad	
2016/0113454	A1*	4/2016	Rukavina	A47L 5/225 15/335
2016/0157689	A1*	6/2016	Muhlenkamp	A47L 5/225 134/21

FOREIGN PATENT DOCUMENTS

CN	101073481	11/2007
CN	201167922	12/2008
CN	104161485	11/2014
EP	0 827 710	3/1998
EP	0 836 826	4/1998
EP	1 438 918	7/2004
EP	1 708 603	10/2006
EP	1 771 104	4/2007
GB	2474475	4/2011
GB	2495124	4/2013
JP	8-322768	12/1996
JP	2003-210369	7/2003
KR	10-0351843	9/2002
WO	WO-2009/138811	11/2009

* cited by examiner

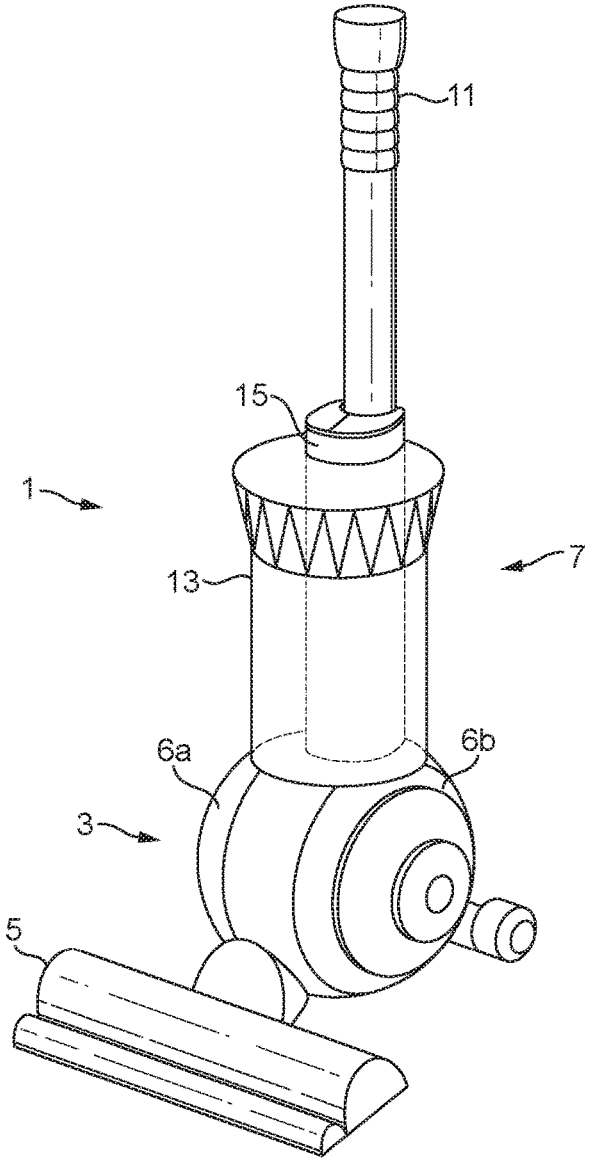

FIG. 1

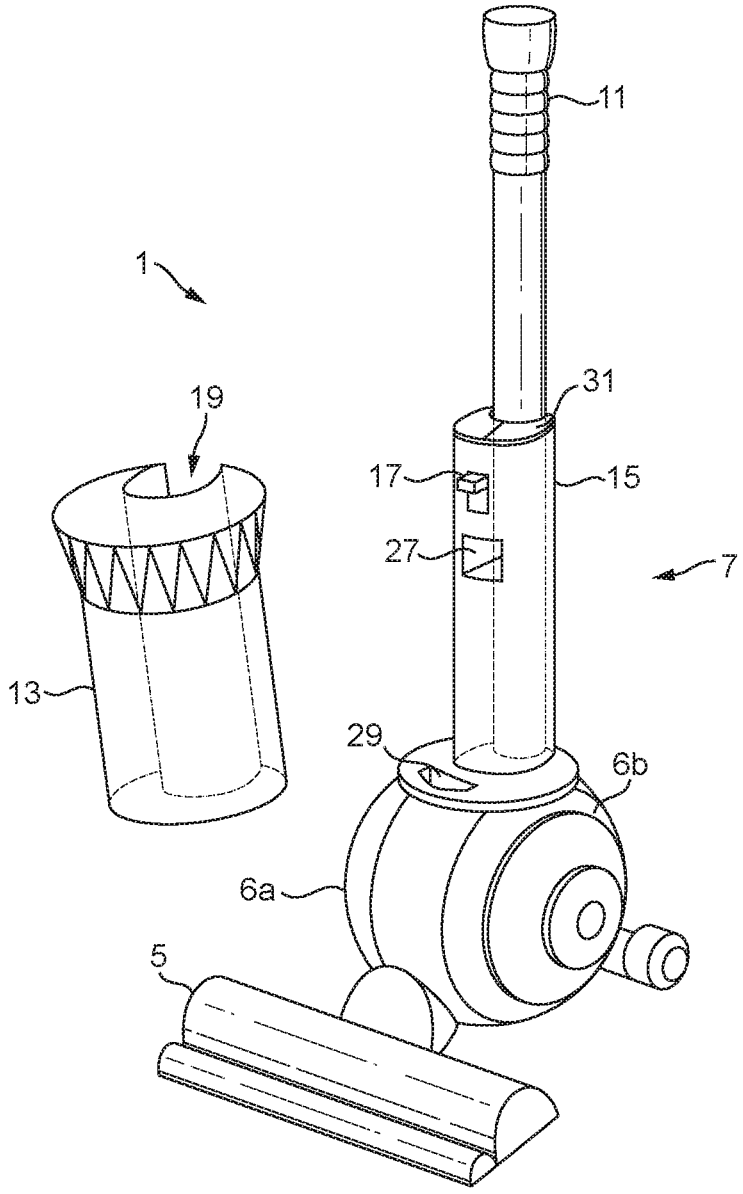

FIG. 2

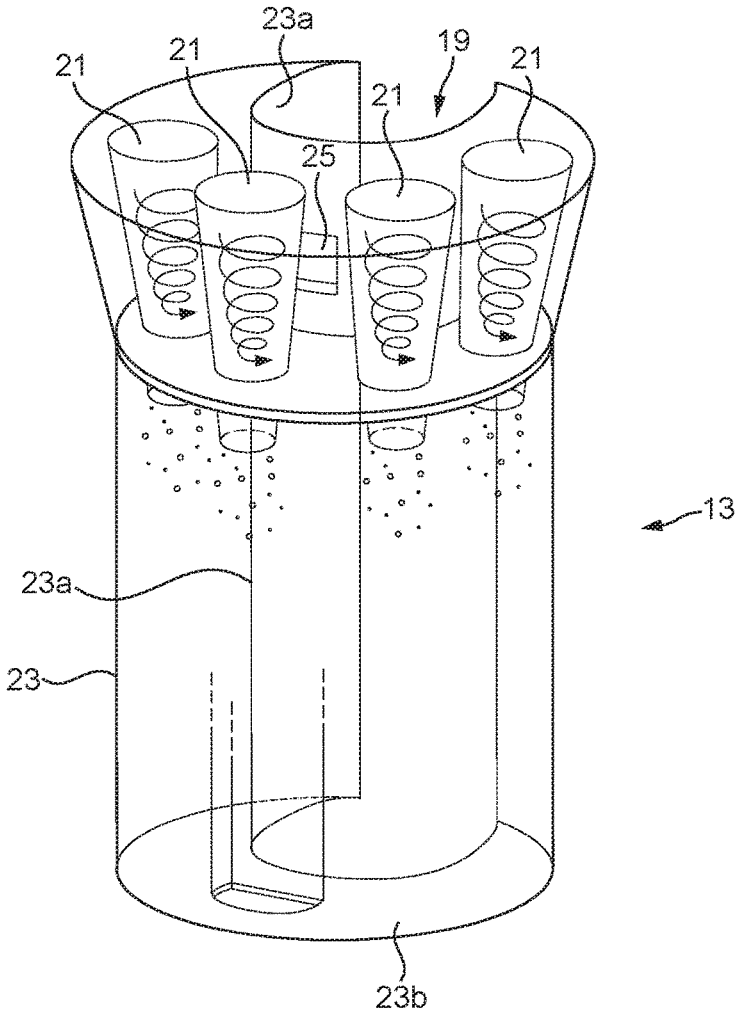

FIG. 3

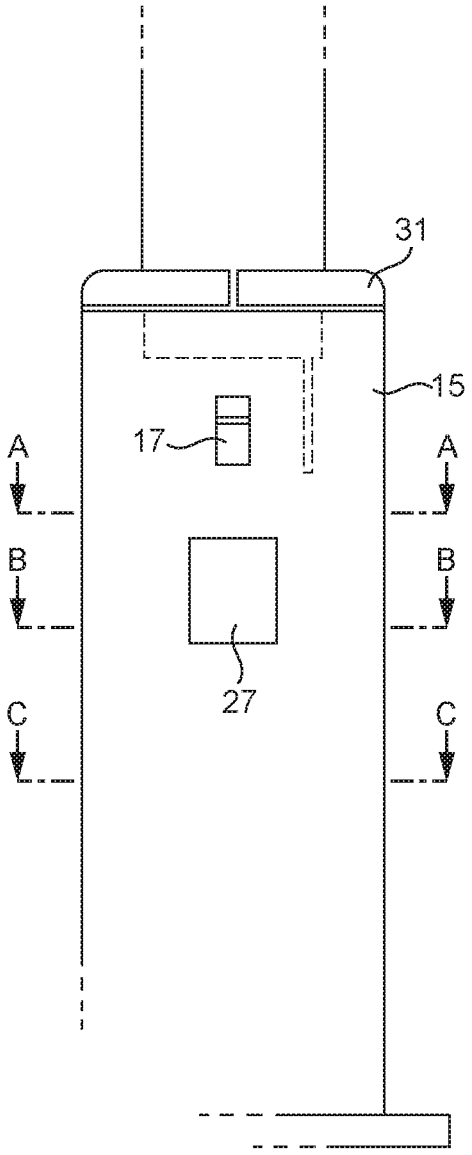

FIG. 4

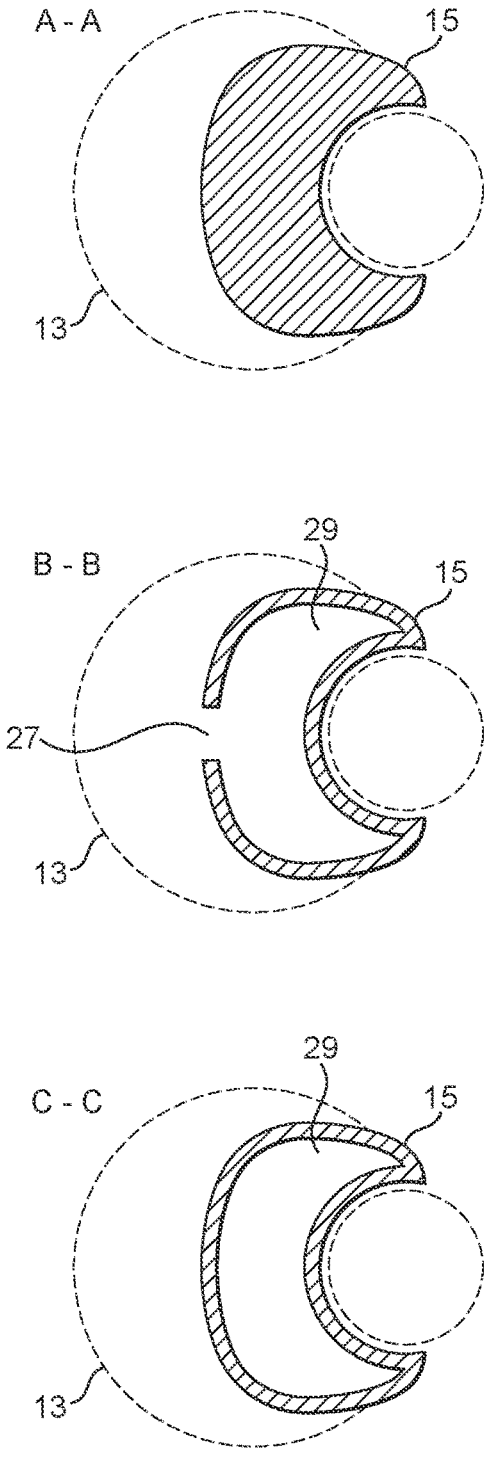

FIG. 5

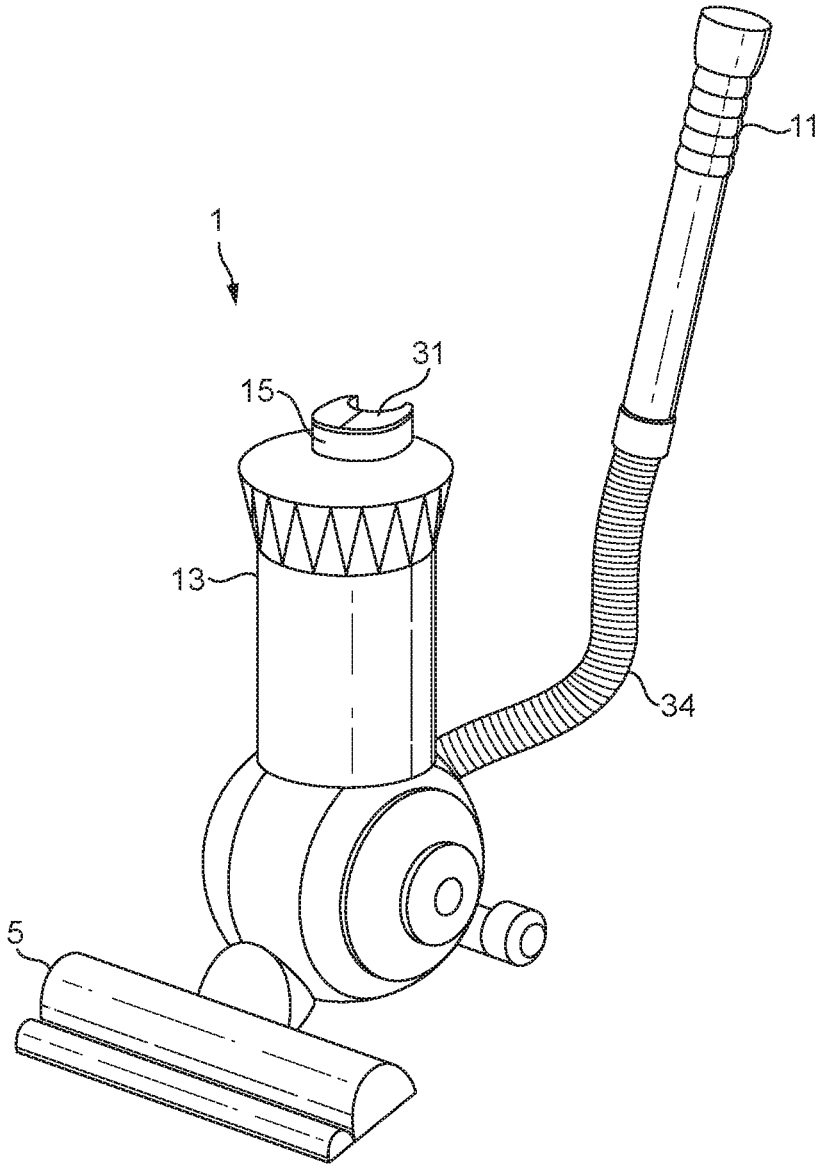

FIG. 6

UPRIGHT VACUUM CLEANER

REFERENCE TO RELATED APPLICATIONS

This application claims the priority of United Kingdom Application No. 1515105.3, filed Aug. 25, 2015, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to upright vacuum cleaners.

BACKGROUND OF THE INVENTION

Upright cleaners typically have a wheeled head assembly, which carries a fixed cleaner head in plane-parallel contact with the floor surface. This head assembly is mounted on a reclining 'upright' body which carries a handle at its upper end. In the conventional floor-cleaning mode, a user reclines the 'upright' body until the handle is at a convenient height, and then uses the handle manually to push the cleaner across the floor, maintaining the cleaner head in plane parallel contact with the floor surface.

It is often desirable to vacuum-clean above the level of a floor. For example, it may be desirable to vacuum-clean shelving, stairs or the upper corners of a room. It is usually completely impractical to use the main cleaner head for this purpose: the cleaner will almost certainly be too heavy and cumbersome, and the cleaner head itself too large. Instead, many modern upright vacuum cleaners are provided with a suction wand which connects to the main separating apparatus onboard the vacuum cleaner via a flexible hose. This wand and hose assembly allows the upright vacuum cleaner to be operated, as required, in the manner of a cylinder (or "canister") vacuum cleaner—making "above-the-floor" cleaning much more practical.

SUMMARY OF THE INVENTION

Aspects of the present invention are concerned with upright vacuum cleaners in which the wand is stored onboard the vacuum cleaner when the wand is not in use, and seek to provide an improved arrangement for storing the wand.

According to aspects of the present invention there is provided an upright vacuum cleaner comprising a vac-motor for drawing dirty air in through a floor-engaging cleaner head on the vacuum cleaner, a separating apparatus for separating dirt from the dirty air, an elongate air duct for carrying air to or from the separating apparatus, and a suction wand which is stored on the vacuum cleaner and which can be connected to the separating apparatus via a hose as required to clean above the floor, wherein the external surface of the air duct defines an elongate recess for receiving the stored suction wand such that the air duct partly surrounds the stored wand.

In effect, the stored wand is nested in the elongate recess, advantageously providing a compact storage configuration.

The separating apparatus may be removably connected to the elongate air duct, although this is not essential. The external surface of the separating apparatus may define an elongate channel for receiving the elongate air duct such that the separating apparatus partly surrounds the elongate duct. Thus, the wand is nested in the elongate recess formed by the external surface of the air duct and the elongated air duct is in turn nested in elongate recess in the separating apparatus, making the storage configuration even more compact.

In a particularly compact configuration, the separating apparatus also partly surrounds the stored wand when the separating apparatus is connected to the elongate air duct.

The elongate air duct may form part of an upright chassis which runs up the rear of the vacuum cleaner, behind the separating apparatus. The elongate air duct itself may run centrally up the rear of the vacuum cleaner.

The upright chassis may support a switch assembly incorporating one or more power switches for operating the vacuum cleaner. The switch assembly may be located towards the upper end of the upright chassis, above the top of the separating apparatus.

The upright chassis may support a catch assembly for securing the separating apparatus on the vacuum cleaner. This catch assembly may be located towards the upper end of the upright chassis.

The separating apparatus may be any kind of separating apparatus, but is preferably a cyclonic separating apparatus, in which case the separating apparatus may comprise a dust collector for collecting dust ejected from one or more cyclone chambers, and the elongate channel may be formed in the wall of the dust collector.

The wand may be retractable into the hose for storage. In this arrangement, the elongate recess may be arranged to receive and partly surround both the stored suction wand and the hose.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

FIG. **1** is a perspective view of an upright vacuum cleaner according to the present invention;

FIG. **2** is a perspective view of the upright vacuum cleaner in FIG. **1**, with the separating apparatus removed from the upright chassis;

FIG. **3** is a perspective view of the separating apparatus;

FIG. **4** is a front view of the upright chassis;

FIG. **5** is a series of sectional views showing three different sections through the upright chassis; and

FIG. **6** is a perspective view of the vacuum cleaner with the suction wand removed for use.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. **1**, the upright vacuum cleaner **1** comprises a rolling head assembly **3**, which includes a fixed cleaner head **5** and a pair of large dome-shaped wheels **6***a*, **6***b*, and an 'upright' body **7** which can be reclined relative to the head assembly **3** and which includes a handle **11** for manouevring the cleaner **1** across the floor. In use, a user grasps the handle **11** and reclines the upright body **7** until the handle **11** is disposed at a convenient height for the user; the user can then roll the vacuum cleaner **1** across the floor using the handle **11** in order to pick up dust and other debris on the floor. This general floor-cleaning mode of operation for an upright vacuum cleaner is illustrated in, for example, GB2474475A.

The dust and debris is drawn in through a downward-facing suction inlet on the cleaner head **5** by a motor-driven fan housed between the dome-shaped wheels **6***a*, **6***b*. From here, the dirt-laden air stream is ducted in conventional manner under the fan-generated suction pressure to a cyclonic separating apparatus **13**, where dirt is separated from the air before the relatively clean air is then expelled back to the atmosphere.

The separating apparatus **13** is removably mounted on an upright chassis **15** which runs centrally up the rear of the vacuum cleaner **1**. The separating apparatus **13** mounts on to the front of this upright chassis **15**, such that the upright chassis **15** sits behind the separating apparatus **13**. A catch **17** is provided near the top end of the upright chassis **15** which secures the separating apparatus in place on the upright chassis **15** and which can be operated manually to release the separating apparatus from the upright chassis **15**. The catch **17** is represented only schematically in the Figures. In practice, any suitable conventional catch may be used. One possible design of catch **17** is described in EP1771104B, for example.

The external surface of the separating apparatus **13** defines an elongate channel **19** which runs up the rear of the separating apparatus **13**. When the separating apparatus **13** is mounted in position on the upright chassis **15**, the upright chassis **15** is nested within this elongate channel **19**—see FIG. **1**. This provides a compact arrangement.

The upright chassis forms an air duct **29** which runs centrally up the rear of the cleaner **1**—see FIGS. **4** and **5**.

A lower end of the air duct **29** connects to the cleaner head **5** via a flexible hose (not shown) routed between the dome-shaped wheels **6***a*, **6***b*. An upper end of the air duct **29** connects to an inlet **25** on the separating apparatus **13** (see FIG. **3**) via an opening **27** in the front exterior wall of the upright chassis **15**, which opening **27** is arranged for sealing connection to an inlet **25** on the separating apparatus **13**—see FIG. **3**. The air duct **29** thus carries the dirty air from the cleaner head **5** to the separating apparatus **13**.

Inside the separating apparatus **13**, a plurality of cyclone chambers **21** is provided at the top of the separating apparatus **13**—see FIG. **3**. The cyclone chambers **21** are arranged around the top of the elongate channel **19** so that the cyclone chambers **21** in effect partly surround the top of the elongate channel **19**. Four cyclone chambers **21** are shown in FIG. **3**, but in practice the number may vary.

A dust collector **23** is located below the cyclone chambers **21**. The dust collector **23** is generally horseshoe-shaped in cross-section, and partly surrounds the entire lower section of the elongate channel **19**. A wall **23***a* of the dust collector **23** forms part of the elongate channel **19**.

In use, the dirty air enters the separating apparatus **13** through the inlet **25** in the wall of the elongate channel **19** at the rear of the separating apparatus **13**. From here, the dirty air is ducted to respective tangential inlets on the cyclone chambers **21** in parallel (the physical ducting and tangential inlets have been omitted for clarity) and cyclonic dust separation takes place inside each of the cyclone chambers **21** in conventional manner. The air exits through the top of the cyclone chambers **21** and is then ducted down through the dust collector **23** to an outlet **27** in the base **23***b* of the dust collector **23** which in turn connects to a vac-motor inlet **29** on the upright chassis (the air outlets from the cyclone chambers and the physical ducting to the outlet **27** have again been omitted for clarity).

The separated dirt exits through the open bottom ends of the cyclone chambers **21** and is deposited in the dust collector **23**. Conventional provision may be made for periodic emptying of the dust collector, as required, for example via a manually operated hatch in the base of the dust collector.

The separating apparatus **13** is a single-stage cyclonic separating apparatus. Multi-stage cyclonic separation may be provided as an alternative to single-stage cyclonic separation. For example, the four cyclone chambers in FIG. **3** may be arranged into two stages connected in series, each stage comprising two of the cyclone chambers **21** connected in parallel (in practice there may be many more than two cyclone chambers in each stage in order to reduce the pressure drop across each stage). In this arrangement, two separate dust collectors would need to be provided—one for each stage. This may be achieved simply by partitioning the dust collector **23** accordingly, for example.

A switch assembly is provided at the top of the upright chassis which incorporates a manually operated ON/OFF power switch **31**. Additional power switches may be provided, for example to operate a motor-driven brush bar inside the cleaner head **5**.

Referring now to FIG. **6**, the vacuum cleaner **1** additionally comprises a suction wand **33** which can be used to perform above-the-floor cleaning tasks such as cleaning curtains or the upper corners of a room.

The removable wand **33** is connected to the separating apparatus **13** via a flexible hose **34**. A so-called changeover valve—not shown—is used selectively to connect the separating apparatus **13** either to the cleaner head **5** or, alternatively, to the wand **33** when the wand **33** is being used. Any conventional changeover valve arrangement may be used.

The handle **11** is supported on the suction wand **33**—and so comes away with the suction wand **33** when the wand is removed from the upright body **7**—but to use the wand a user actually grasps the opposite end of the wand **33**, adjacent the hose **35**. This allows the user easily to manipulate the wand **33** for cleaning.

The wand **33** is stored in a generally vertical orientation onboard the vacuum cleaner **1** when it is not in use. An elongate recess **35** is formed by the rear external wall of the air duct **29**. The stored wand **33** sits in this recess **35** so that the wand **33** is in effect nested in the recess **35**. This provides a compact storage configuration.

When the wand **33** is in its stored position, nested in the recess **35**, and the separating apparatus **13** is mounted on the upright chassis **7** so that it is connected to the air duct **29**, the separating apparatus **13** partly surrounds both the upright chassis and the wand—see FIG. **5** which illustrates the separating apparatus **13** and wand **33** in dotted outline. This provides a particularly compact configuration.

In an alternative embodiment (not illustrated), the wand **33** is retractable inside the hose **34** for storage on board the vacuum cleaner **1**. In this arrangement, both the wand **33** and hose **34** are stored in a generally vertical orientation onboard the vacuum cleaner **1**, nested within the elongate recess **35**. The elongate recess **35** thus partly surrounds both the stored wand **33** and the hose **34**.

The invention claimed is:

1. An upright vacuum cleaner comprising:

a vac-motor for drawing dirty air in through a floor-engaging cleaner head on the vacuum cleaner;

a separating apparatus for separating dirt from the dirty air;

an elongate air duct for carrying air to or from the separating apparatus; and

a suction wand which is stored on the vacuum cleaner and which can be connected to the separating apparatus via a hose as required to clean above the floor,

wherein the external surface of the air duct defines an elongate recess for receiving the stored suction wand such that the air duct partly surrounds the stored wand.

2. The upright vacuum cleaner of claim **1**, wherein the separating apparatus is removably connected to the elongate duct, the external surface of the separating apparatus defin-

ing an elongate channel for receiving the elongate duct such that the separating apparatus partly surrounds the elongate duct.

3. The upright vacuum cleaner of claim **2**, wherein, when the separating apparatus is connected to the elongate air duct, the separating apparatus also partly surrounds the stored wand.

4. The upright vacuum cleaner of claim **1**, wherein the elongate air duct forms part of an upright chassis which runs up the rear of the vacuum cleaner behind the separating apparatus.

5. The upright vacuum cleaner of claim **4**, wherein the elongate air duct runs centrally up the rear of the vacuum cleaner.

6. The upright vacuum cleaner of claim **4**, wherein the upright chassis comprises a switch assembly incorporating one or more power switches for operating the vacuum cleaner.

7. The upright vacuum cleaner of claim **6**, wherein the switch assembly is located towards an upper end of the upright chassis, above the top of the separating apparatus.

8. The upright vacuum cleaner of claim **4**, wherein the upright chassis comprises a catch assembly for securing the separating apparatus on the vacuum cleaner.

9. The upright vacuum cleaner of claim **8**, wherein the catch assembly is located towards an upper end of the upright chassis.

10. The upright vacuum cleaner of claim **1**, wherein the separating apparatus is a cyclonic separating apparatus.

11. The upright vacuum cleaner of claim **10**, wherein an external surface of the separating apparatus defines an elongate channel for receiving the elongate duct such that the separating apparatus partly surrounds the elongate duct, and the elongate channel is formed in the wall of a dust collector forming part of the cyclonic separating apparatus.

12. The upright vacuum cleaner of claim **1**, wherein the wand is retractable inside the hose for storage.

13. The upright vacuum cleaner of claim **12**, wherein the elongate recess is arranged to receive and partly surround both the stored suction wand and the hose.

* * * * *