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(56) Documents Cited:
GB 2137896 A **EP 1523916 A1**
JP 2004041760 A **US 20030030984 A**
US 20020096341 A

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UK CL (Edition X) **A4F**
INT CL **A47L**
Other: **OPTICS, EPODOC, WPI**

(54) Abstract Title: **Hand-held vacuum cleaner**

(57) The invention provides a hand-held cleaning appliance (10) comprising a suction conduit (14), an airflow generator (36) for generating an airflow along the suction conduit (14), separating apparatus (18) in communication with the suction conduit (14) for separating dirt and dust from the airflow, a power source (32) for supplying power to the airflow generator (36) and a handgrip (28) for enabling a user to manoeuvre the hand-held cleaning appliance. The handgrip (28) has a first end (46) and a second end (48). The airflow generator (36) is arranged adjacent the first end (46) of the handgrip (28) and the power source (32) is arranged adjacent the second end (48) of the handgrip (28). The invention further provides a hand-held cleaning appliance (10) comprising a suction conduit (14) having a longitudinal axis (Y-Y), an airflow generator (36) for generating an airflow along the suction conduit (14), separating apparatus (18) arranged in communication with the suction conduit (14) for separating dirt and dust from the airflow, a power source (32) for supplying power to the airflow generator (36) and an elongate handle (28) disposed between the airflow generator (36) and the power source (32). The elongate handle (28) is dimensioned and arranged to be gripped by a user's hand and the elongate handle (28) lies transverse to the longitudinal axis (Y-Y) of the suction conduit. By providing a hand-held vacuum cleaner (10) with such an arrangement, the hand-held vacuum cleaner (10) is easier and more comfortable to manipulate in use. The separating apparatus (18) may be a cyclonic separator.

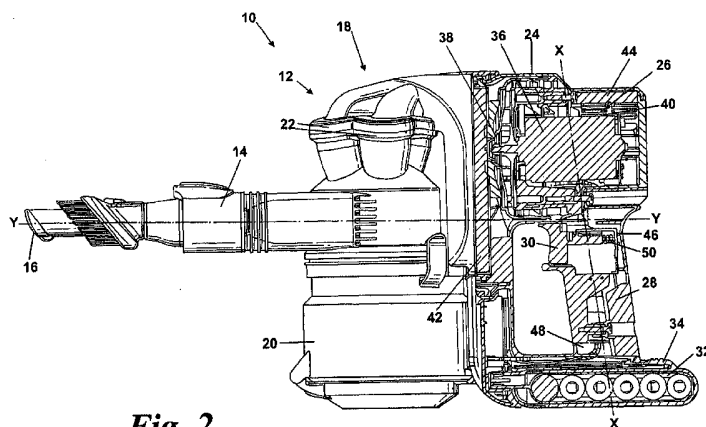


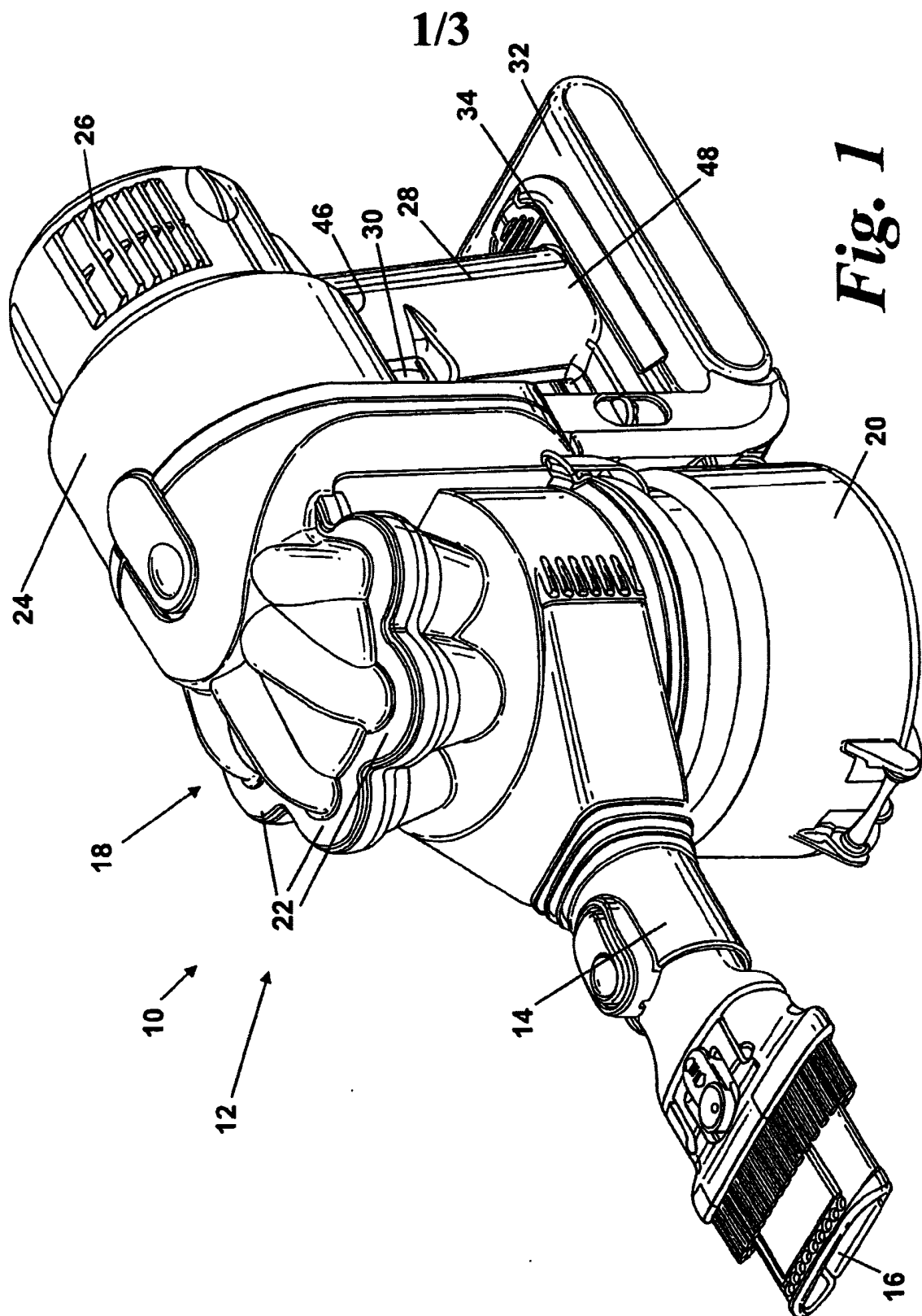
Fig. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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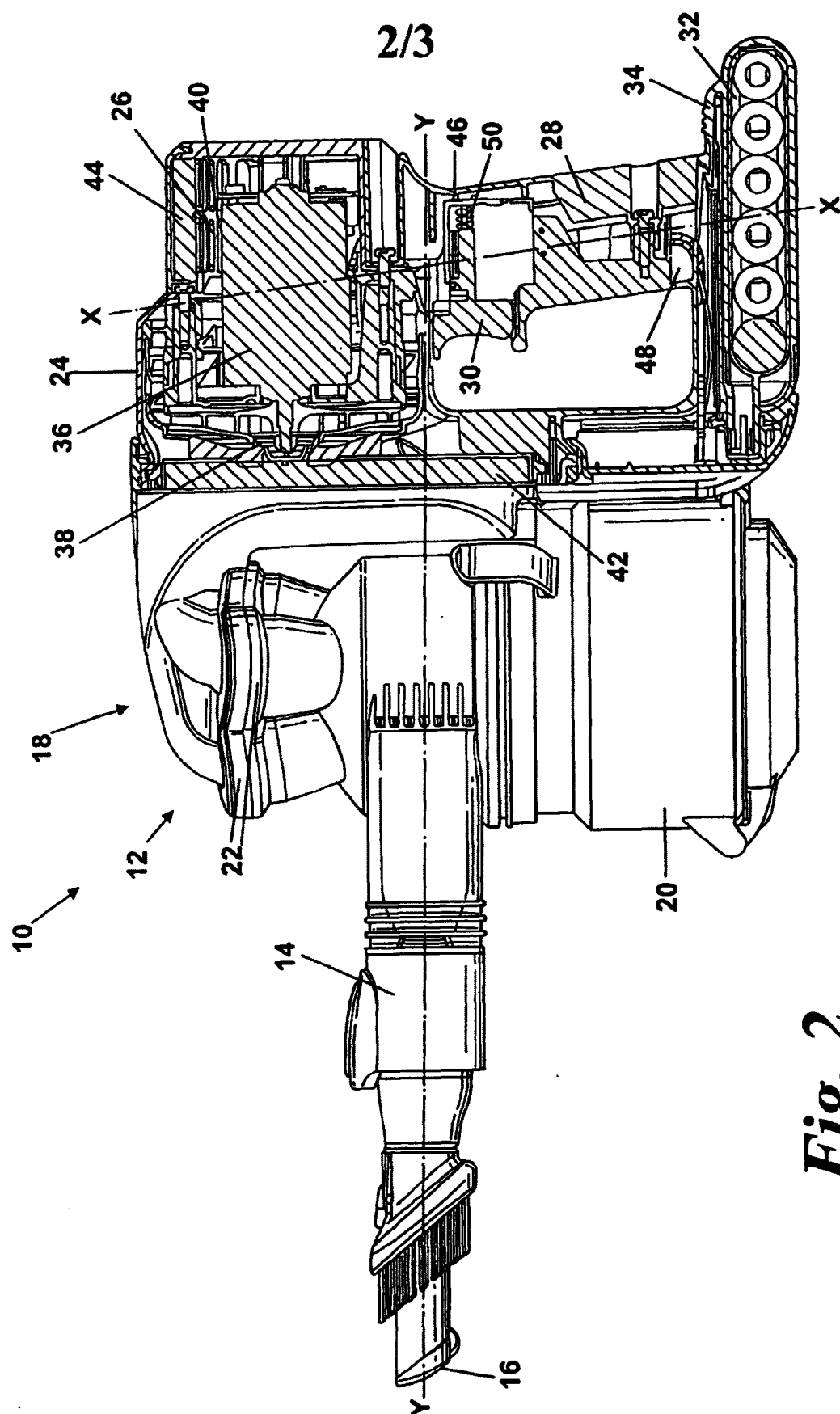


Fig. 2

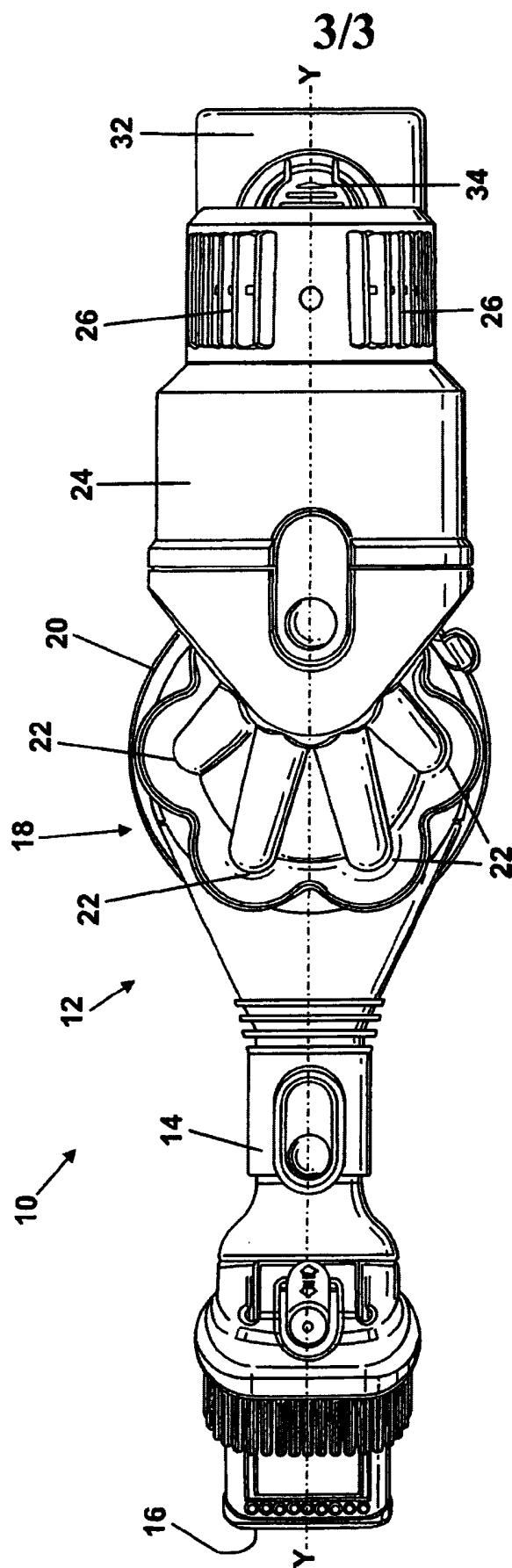


Fig. 3

A Cleaning Appliance

The invention relates to a hand-held cleaning appliance. More particularly, the invention
5 relates to a hand-held vacuum cleaner.

Hand-held vacuum cleaners are known from, for example, GB 1 207 278. This document discloses a hand-held vacuum cleaner having an elongate main body with an air inlet, a suction conduit and a dust bag for separating dirt and dust from an airflow. A
10 motor and fan assembly is provided in the main body together with a power source. A handgrip is located on the upper part of the hand-held vacuum cleaner. The handgrip extends parallel to the elongate main body at a shallow angle to the suction conduit, and both the airflow generator and the power source are located in the main body underneath the handgrip. JP 2004-041760 discloses a hand-held vacuum cleaner having
15 a similar handgrip arrangement. However, in this case, the motor and fan assembly and the power source of the hand-held vacuum cleaner are arranged so that the centre of gravity of the machine is located at the centre of the handgrip.

An alternative arrangement of handgrip is shown in US 1,871,624. This document
20 discloses a hand-held vacuum cleaner having a cylindrical main body and a handgrip arranged at one end. A curved suction conduit is located at an end opposite to the handgrip. The handgrip is arranged transversely to the longitudinal axis of the cylindrical main body and approximately parallel to the suction conduit. This arrangement may give the user a stronger wrist position in use than the handgrip
25 arrangements disclosed in GB 1 207 278 and JP 2004-041760. However, the heavy components of the vacuum cleaner (for example, the motor and fan assembly) are located forwardly of the handgrip relative to a user's hand when the vacuum cleaner is in use. Therefore, the centre of mass of the respective hand-held vacuum cleaner will be located forwardly of the handgrip. This may result in the hand-held vacuum cleaner
30 described above being tiring and uncomfortable to use because the user will have to

exert additional effort in order to maintain the hand-held vacuum cleaner in a fixed orientation.

It is an object of the present invention to provide a hand-held vacuum cleaner which is easier to manipulate in use than known arrangements. It is a further object of the present invention to provide a hand-held vacuum cleaner in which the arrangement of the handgrip, the motor and fan assembly and the power source allow the hand-held vacuum cleaner to be manipulated easily and comfortably.

The invention provides a hand-held cleaning appliance comprising a suction conduit, an airflow generator for generating an airflow along the suction conduit, separating apparatus in communication with the suction conduit for separating dirt and dust from the airflow, a power source for supplying power to the airflow generator and a handgrip for enabling a user to manoeuvre the hand-held cleaning appliance, the handgrip having a first end and a second end, wherein the airflow generator is arranged adjacent the first end of the handgrip and the power source is arranged adjacent the second end of the handgrip. By providing such an arrangement, when a user grips the handgrip, the small resulting moment between the centre of mass of each of these components and the user's hand results in a hand-held vacuum cleaner which is easier to manipulate in use.

Preferably, the airflow generator is arranged directly adjacent the first end of the handgrip. More preferably, the power source is arranged directly adjacent the second end of the handgrip. This arrangement allows the hand-held vacuum cleaner to be used easily and comfortably by a user.

Preferably, the handgrip has a longitudinal axis which passes through at least a part of the airflow generator. More preferably, the handgrip has a longitudinal axis which passes through at least a part of the power source.

The invention further provides a hand-held cleaning appliance comprising a suction conduit having a longitudinal axis, an airflow generator for generating an airflow along

the suction conduit, separating apparatus arranged in communication with the suction conduit for separating dirt and dust from the airflow, a power source for supplying power to the airflow generator and an elongate handle disposed between the airflow generator and the power source and dimensioned and arranged to be gripped by a user's hand, wherein the elongate handle lies transverse to the longitudinal axis of the suction conduit. By providing a hand-held cleaning appliance with such an arrangement, a user is able to maintain a comfortable wrist position and movement of the hand-held vacuum cleaner feels comfortable.

- 10 Preferably, the elongate handle lies at an angle to the longitudinal axis in the range of 80 to 90°. More preferably, the elongate handle lies at an angle to the longitudinal axis which is close to a right angle.

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

Figure 1 is an isometric view of a hand-held vacuum cleaner according to the invention;

Figure 2 is a partially cut-away side view of the hand-held vacuum cleaner of Figure 1; and

Figure 3 is a plan view of the hand-held vacuum cleaner of Figure 1.

Figure 1 shows a hand-held vacuum cleaner 10. The hand-held vacuum cleaner 10 comprises a main body 12. The main body 12 includes a suction conduit 14 having a suction opening 16. The main body 12 also includes cyclonic separating apparatus 18 for separating dirt and dust from an airflow drawn in through the suction opening 16. The cyclonic separating apparatus 18 is in communication with the suction conduit 14 and the suction opening 16. The cyclonic separating apparatus 18 comprises an upstream cyclone 20 and a plurality of downstream cyclones 22 but further detail is not material to the invention and therefore will not be described.

The main body 12 further includes a motor housing 24 having a plurality of exhaust vents 26 formed therein. A flowpath extends from the suction opening 16, through the suction conduit 14, the cyclonic separating apparatus 18 and the motor housing 24 to the exhaust vents 26. A handgrip 28 is located below the motor housing 24 for manipulating the hand-held vacuum cleaner 10 when in use. The handgrip 28 is arranged so that the cyclonic separating apparatus 18 is located between the handgrip 28 and the suction opening 16. The handgrip 28 includes a trigger switch 30 which is positioned on the side of the handgrip 28 closest to the suction opening 16 such that the trigger switch 30 can be manipulated by a user's index finger. A power source 32 is connected to the handgrip 28 through a mounting portion 34.

Figure 2 shows the hand-held vacuum cleaner 10 in more detail. An airflow generator 36 is located in the motor housing 24. In this embodiment, the airflow generator 36 takes the form of a motor and fan assembly. The airflow generator 36 has an inlet 38 and an outlet 40. A pre-motor filter 42 is located upstream of the inlet 38 for filtering fine particulates from the airflow. A post-motor filter 44 is located downstream of the outlet 40. The pre-motor filter 42 and the post-motor filter 44 are located in the flowpath.

The handgrip 28 takes the form of an elongate handle and has a first end 46, a second end 48 and an axis X-X. The first end 46 of the handgrip 28 is connected to the motor housing 24. The airflow generator 36 is located adjacent the first end 46 of the handgrip 28. In this embodiment, the handgrip 28 and the airflow generator 36 are arranged such that the axis X-X of the handgrip 28 passes through at least a part of the airflow generator 36.

The mounting portion 34 removably receives the power source 32. When fitted to the hand-held vacuum cleaner 10, the power source 32 is located directly adjacent the second end 48 of the handgrip 28. In this embodiment, the power source 32 and the

handgrip 28 are arranged so that the axis X-X passes through at least a part of the power source 32.

In other words, the handgrip 28 is arranged to lie between the airflow generator 36 and the power source 32. In this embodiment, the axis X-X passes through at least a part of each of the airflow generator 36 and the power source 32. Further, the axis X-X of the handgrip 28 lies transverse to a longitudinal axis Y-Y of the suction conduit 12. The longitudinal axis Y-Y passes through the suction opening 16. In this embodiment, the axis X-X is arranged at an angle to the longitudinal axis Y-Y which is close to 90°. This arrangement feels comfortable for a user.

The trigger switch 30 is located towards the first end 46 of the handgrip 28. The trigger switch 30 is located between the power source 32 and the airflow generator 36 and is capable of switching the airflow generator 36 on or off. The trigger switch has on and off positions. The trigger switch moves from left to right as seen in Figure 2. The off position is located to the left, and the on position to the right. In the off position the trigger switch 30 is in an open state and the airflow generator 36 will be switched off. In the on position the trigger switch 30 will be closed and the airflow generator 36 will be switched on. The trigger switch 30 includes a spring 50 which biases the trigger switch 30 towards a normally open state. This arrangement allows the trigger switch 30 to be operated easily by a user's index finger. This in turn allows the hand-held vacuum cleaner 10 to be operated with one hand.

In use, a user grips the handgrip 28 to manipulate the hand-held vacuum cleaner 10 in use. When the user squeezes the trigger switch 30, the airflow generator 36 operates. The user must maintain pressure on the trigger switch 30 in order to keep the airflow generator 36 operating. This means that the user is likely to release the trigger switch 30 when he or she does not require a cleaning action, e.g. when moving from one room to another. If the user releases the trigger switch 30, the spring 50 will bias the trigger switch 30 to the off position and operation of the airflow generator 36 will cease. This

reduces unnecessary use of the airflow generator 36 and results in a saving of battery life and motor life.

When operating, the airflow generator 36 draws a flow of dirt- and dust-laden air into the suction opening 16, through the suction conduit 14 and into the cyclonic separating apparatus 18. Dirt- and dust-laden air enters the upstream cyclone 20 and larger dirt and dust particles are separated by cyclonic motion. These particles are then collected in the upstream cyclone 20.

The partially-cleaned airflow then enters the plurality of downstream cyclones 22. The downstream cyclones 22 are able to separate smaller particles of dirt and dust from the partially-cleaned airflow than the upstream cyclone 20. The cleaned air exits the cyclonic separating apparatus 16 and passes sequentially through the pre-motor filter 42, the airflow generator 36 and the post-motor filter 44 before being exhausted from the hand-held vacuum cleaner 10 through the exhaust vents 26.

In use, a user may wish to clean a variety of surfaces which may be orientated at different angles. Therefore, a user will need to lift and move the hand-held vacuum cleaner 10 into a variety of positions and orientations in order to clean effectively. The location of the handgrip 28 between the airflow generator 36 and the power source 32 allows the hand-held vacuum cleaner 10 to be manipulated easily in use. This is because the user's hand will be located between the two heaviest components of the hand-held vacuum cleaner 10. This results in a "dumbbell-like" configuration in which the weight of the hand-held vacuum cleaner 10 is distributed on both sides of the user's hand.

The transverse arrangement of the longitudinal axis Y-Y of the suction conduit 14 with respect to the axis X-X of the handgrip 28 results in the suction conduit 12 forming a substantially straight extension of the user's forearm when the user's wrist is essentially straight. This arrangement feels comfortable for the user, especially when the hand held vacuum cleaner 10 is used for a period of time. Further, the location of the longitudinal axis Y-Y of the suction conduit 14 close to the centre of the hand-held vacuum cleaner

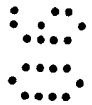
10 means that the longitudinal axis Y-Y of the suction conduit 14 will be coincident, or close to, the longitudinal axis of rotation of the user's forearm. This results in little or no axial displacement of the suction opening 14 when the hand-held vacuum cleaner 10 is rotated.

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The invention is not limited to the features of the specific embodiment described above. Variations will be apparent to the person skilled in the art. For example, the specific locations of the airflow generator or power source may be varied. The airflow generator may lie directly adjacent the first end of the handgrip. The airflow generator may lie
 10 above or below the handgrip. Additionally, the power source may lie directly adjacent the second end of the handgrip. The power source may lie above or below the handgrip. What is important is that the airflow generator lies adjacent a first end of the handgrip and the power source lies adjacent a second end of the handgrip.

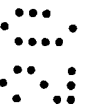
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The angular relationship between the longitudinal axis of the suction conduit and the axis of the handgrip can be varied. It is preferred that the angle between the longitudinal axis of the suction conduit and the axis of the handgrip is in the range of 80 to 90°. However, what is important is that these axes are transverse to one another such that the manipulation of the hand-held vacuum cleaner by a user feels comfortable.



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A cyclonic separating unit need not be used. Other separating apparatus such as a bag-type filter could be used. Further, the hand-held vacuum cleaner need not be fitted with a rechargeable power source. Standard batteries or a power lead could be used. Further, the invention is not limited to hand-held vacuum cleaners. Other types of hand-held
 25 cleaning appliances could be used, for example, carpet shampooers, wet and dry machines or blower vacuum devices.



CLAIMS

1. A hand-held cleaning appliance comprising a suction conduit, an airflow generator for generating an airflow along the suction conduit, separating apparatus in communication with the suction conduit for separating dirt and dust from the airflow, a power source for supplying power to the airflow generator and a handgrip for enabling a user to manoeuvre the hand-held cleaning appliance, the handgrip having a first end and a second end, wherein the airflow generator is arranged adjacent the first end of the handgrip and the power source is arranged adjacent the second end of the handgrip.

2. A hand-held cleaning appliance according to claim 1, wherein the airflow generator is arranged directly adjacent the first end of the handgrip.

3. A hand-held cleaning appliance according to claim 1 or 2, wherein the power source is arranged directly adjacent the second end of the handgrip.

4. A hand-held cleaning appliance according to any one of claims 1 to 3, wherein the handgrip has a longitudinal axis which passes through at least a part of the airflow generator.

5. A hand-held cleaning appliance according to any one of claims 1 to 4, wherein the handgrip has a longitudinal axis which passes through at least a part of the power source.

6. A hand-held cleaning appliance according to any one of the preceding claims, wherein the airflow generator is arranged above the handgrip and the power source is arranged below the handgrip.

7. A hand-held cleaning appliance according to any one of the preceding claims, wherein the suction conduit has a suction opening which is located remote from the handgrip.

5 8. A hand-held cleaning appliance according to claim 7, wherein the separating apparatus is located between the suction opening and the handgrip.

9. A hand-held cleaning appliance according to any one of the preceding claims, wherein a trigger switch is located on the handgrip for switching the airflow
10 generator on or off.

10. A hand-held cleaning appliance according to claims 7 and 9, wherein the trigger switch is located on the side of the handgrip which is closest to the suction opening.

15 11. A hand-held cleaning appliance according to claim 9 or 10, wherein the trigger switch includes resilient means for biasing the trigger switch into an off position.

12. A hand-held cleaning appliance according to any one of the preceding claims, wherein the power source is removably attached to the second end of the handgrip.

20 13. A hand-held cleaning appliance according to any one of the preceding claims, wherein the separating apparatus comprises a cyclonic separator.

25 14. A hand-held cleaning appliance according to any one of the preceding claims, wherein the hand-held cleaning appliance is a hand-held vacuum cleaner.

15. A hand-held cleaning appliance comprising a suction conduit having a longitudinal axis, an airflow generator for generating an airflow along the suction conduit, separating apparatus arranged in communication with the suction conduit for
30 separating dirt and dust from the airflow, a power source for supplying power to the airflow generator and an elongate handle disposed between the airflow generator

and the power source and dimensioned and arranged to be gripped by a user's hand, wherein the elongate handle lies transverse to the longitudinal axis of the suction conduit.

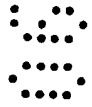
- 5 16. A hand-held cleaning appliance according to claim 15, wherein the elongate handle lies at an angle to the longitudinal axis in the range of 80 to 90°.

17. A hand-held cleaning appliance according to claim 15 or 16, wherein the elongate handle lies at an angle to the longitudinal axis which is close to a right angle.

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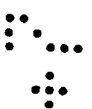
18. A hand-held cleaning appliance according to claim any one of claims 15 to 17, wherein the separating apparatus is located between the suction conduit and the elongate handle.

- 15 19. A hand-held cleaning appliance according to any one of claims 15 to 18, wherein the suction conduit has a suction opening and the longitudinal axis passes through the suction opening.



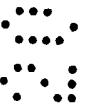
20. A hand-held cleaning appliance according to claim 19, wherein the suction opening is remote from the elongate handle.

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21. A hand-held cleaning appliance according to any one of claims 15 to 20, wherein a trigger switch is located on the elongate handle for switching the airflow generator on or off.

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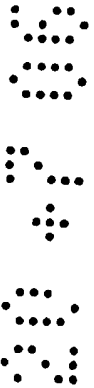
22. A hand-held cleaning appliance according to claim 20 and 21, wherein the trigger switch is located on the side of the elongate handle which is closest to the suction opening.

- 30 23. A hand-held cleaning appliance according to claim 21 or 22, wherein the trigger switch includes resilient means for biasing the trigger switch into an off position.

24. A hand-held cleaning appliance according to any one of the preceding claims,
wherein the separating apparatus comprises a cyclonic separator.

5 25. A hand-held cleaning appliance according to any one of the preceding claims,
wherein the hand-held cleaning appliance is a hand-held vacuum cleaner.

26. A hand-held cleaning appliance as substantially hereinbefore described with
reference to the accompanying drawings.





For Innovation

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Application No: GB0614235.0

Examiner: Mr Darren Williams

Claims searched: 1-26

Date of search: 9 October 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-5, 7, 8, 12, 14, 15, 18, 20, 25	JP 2004041760 A (MATSHUSHITA) see figures and English abstract provided
Y	1-12, 14-23, 25	GB 2137896 A (HOOVER) see figure 2
Y	1-25	EP 1523916 A1 (BLACK & DECKER) see figure 3
Y	1-25	US 2002/0096341 A (HAGAN) see handle arrangement of figure 1
Y	1-25	US 2003/0030984 A (FUNG) see handle arrangement of figure 1

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

A4F

Worldwide search of patent documents classified in the following areas of the IPC

A47L

The following online and other databases have been used in the preparation of this search report

OPTICS, EPODOC, WPI