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(54) **Power tool and debris extraction system therefor**

(57) The invention relates to the provision of a power tool, such as a sander, which has a working portion which, when moved with respect to a workpiece creates debris. The invention provides a debris collection bag mounted in a housing on the power tool body which al-

lows for the collection of debris from the vicinity of the working portion. The debris collection bag is selectively removable for discarding the debris and/or washing.

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Description

[0001] The present invention relates to a power tool and to a debris extraction system therefor.

[0002] Although the following description refers almost exclusively to a power tool in the form of a sanding device, it will be appreciated by persons skilled in the art that the present invention can be used with any power tool in which debris is generated and a debris extraction system is required, such as a power tool in the form of a jigsaw and/or the like.

[0003] Sanding devices are known and are used for rapidly sanding a required surface to make said surface smooth, remove one or more layers of a particular substance therefrom, such as paint or varnish and/or for preparing the surface for application of one or more substance layers thereon, such as paint or varnish. These sanding devices typically include a body portion housing drive means for driving the movement of a sanding plate in one or more required directions. Sanding material having a suitably abrasive surface, such as sand paper, is attached to an outer surface of the sanding plate with the abrasive surface outermost. The abrasive surface of the sanding material is then positioned in contact with a wall surface requiring sanding and rapid movement of the sanding material against the wall surface driven by said drive means results in the sanding process.

[0004] It is well known that powered sanding devices, such as a device of the type described above, generate substantial amounts of debris in use. This debris can be harmful to the user if inhaled, can get into the user's eyes, typically making the user's eyes sore, restricts the user's view of the surface being sanded and covers the locality in which the sanding is taking place with a layer of debris, which is undesirable. In order to reduce or prevent these problems, sanding devices can be provided with debris extraction systems. The majority of these debris extraction systems utilize a suction pump which generates an air flow for sucking air surrounding the sanding plate to a position remote from the sanding plate. The debris is then filtered from the airflow via the use of a selectively permeable bag or via filter means.

[0005] A problem with these conventional debris extraction systems is that the bag or filter means can quickly become clogged. As the air pressure builds up against the clogged bag or filter means, this either forces the bag off the sanding device, thereby resulting in spillage of already collected debris into the surrounding area or greatly reduces the efficiency with which debris can be extracted from the sanding surface. Furthermore, removal of the bag from the sanding device often results in spillage of debris, thereby typically requiring the sanding device to be moved to an outdoors location or over a bin for emptying. This is inconvenient and time consuming for the user and may not always be possible.

[0006] It is therefore an object of the present invention to provide a power tool and debris extraction system for use therewith which overcomes the abovementioned

problems and which allows easy and efficient removal of debris therefrom.

[0007] According to a first aspect of the present invention there is provided a power tool, said power tool including a working portion which generates debris in use, drive means for selective actuation to provide driving movement of the working portion in use and debris extraction means for extracting debris from the area at and adjacent to said working portion of said power tool to a position remote from said working portion and wherein said debris extraction means includes at least one housing in which a debris collection bag is removably located therein.

[0008] The debris extraction means typically includes the use of one or more air flows for transporting debris generated via use of the working portion of the tool with an object or surface, from a locality adjacent the working portion of the tool to a location remote from the working portion of the tool. For example, suction means can be provided with the device for sucking the debris and air from the working portion of the tool to the housing and debris collection bag remote from the working portion of the tool.

[0009] The advantage of providing the debris collection bag to be removably located with the housing, allows the bag to be removed, replaced and/or repaired as often as required. Since the bag is located in the housing during use, the housing limits or prevents the spread of debris as a result of the bag becoming full, allows the user to easily transport the bag to a required location for emptying without moving the entire power tool and without spillage of debris.

[0010] Preferably the housing is detachably attached to the power tool to allow removal of the housing therefrom and/or for cleaning said housing. The debris collection bag can be removed with the housing from the power tool, thereby allowing the debris collection to be transported in the housing to a suitable disposal point for emptying the debris from the housing.

[0011] The housing is detachably attached to said power tool via any or any combination of complementary screw threaded means, bayonet fitting, friction fit, screws, clips, ties and/or the like.

[0012] Preferably the housing and the debris collection bag are located at the rear of the power tool and typically remote from the working portion of the power tool, i.e. the saw, sanding plate, drill head and/or the like.

[0013] Preferably the housing has one or more apertures located therein for the passage of airflow therethrough.

[0014] Preferably the debris collection bag is formed from a material which is sufficiently porous to allow air flow therethrough but which prevents the flow of debris therethrough. Thus, a material is chosen having a suitable pore size, such as a polypropylene woven fabric.

[0015] The debris collection bag is typically formed, at least in part, from a substantially flexible material and the housing is typically formed from a substantially rigid

material.

[0016] The present invention has the advantage that the housing provides an improved aesthetic appearance to the power tool whilst providing efficient debris extraction. The provision of the debris collection bag being removably located in the housing allows emptying of the bag without the problems of spillage associated with the prior art. The debris collection bag can be used a plurality of times and is typically formed from a material which allows the same to be washed and cleaned, thereby allowing reuse of the same.

[0017] According to a second aspect of the present invention there is provided a debris extraction system for use with a power tool, said debris extraction system including at least one housing or cartridge in which a debris collection bag is removably located therein said housing or cartridge detachably attachable to the power tool.

[0018] Preferably the housing is provided with attachment means for detachably attaching said housing to said power tool in use and to allow removal of the collection bag for cleaning. In one embodiment the debris collection bag is capable of being washed and reused to avoid the need for replacement of the bag on every emptying of the same.

[0019] According to a further aspect of the present invention there is provided a sanding device, said sanding device including sanding means for sanding a required surface, drive means for driving movement of said sanding means in one or more required directions and debris extraction means for extracting debris adjacent said surface to a position remote from said surface and wherein said debris extraction means includes at least one housing in which a debris collection bag is removably located therein.

[0020] According to a yet further aspect of the present invention there is provided a debris extraction system for use with a sanding device, said debris extraction system including at least one housing in which a debris collection bag is removably located therein.

[0021] An embodiment of the present invention will now be described with reference to the accompanying figures, wherein:

Figure 1 illustrates a side view of part of a sanding device according to an embodiment of the present invention;

Figure 2 illustrates the view of Figure 1 with the debris collection apparatus of the invention removed; and

Figure 3 is an exploded view of the debris collection means of the present invention shown in figure 1.

[0022] Referring to the Figures 1 and 2, there is illustrated the part of a hand held power tool, in this case in the form of a sanding device 2, through which debris

such as dust, shavings or any combination of debris passes to be extracted. The sanding device includes a body portion, a sanding plate, a handle portion 8 attached to body portion and a debris extraction system 10 detachably attached to the rear 12 of the body portion 4.

[0023] The body portion 4 houses a motor and drive mechanism (not shown) which drives the movement of the sanding plate in one or more required directions. A removable sanding member having the required abrasive properties on an outer surface thereof is detachably attached to the sanding plate in use, with the abrasive surface outermost. Movement of the sanding member against a particular surface results in sanding of said surface. A user typically holds the device 2 via handle portion 8 against the surface and moves the device across the surface in a required direction in addition to the movement of the sanding plate via the drive means.

[0024] Control means in the form of a switch is provided on the body portion 4 to allow a user to move the sanding device between an 'on' condition, wherein the sanding plate is movable, and an 'off' condition, wherein the sanding plate is stationary, as required. The motor and drive mechanism is powered by mains power supply delivered to the device along an electrical cable. However, one or more batteries can be provided with the sanding device in addition to or as an alternative to said mains power supply.

[0025] In order to allow a user to clearly see the surface that they are sanding, to increase the efficiency of the sanding process and to improve the environment for the user of the device, debris extraction system 10 is provided with the sanding device. The debris extraction system includes a housing 18, which is detachably attached to an outlet aperture 20 via a bayonet fitting 22. Figure 1 illustrates the housing and the system in a fitted position for use. Figure 2 illustrates the housing removed and shows the bayonet fittings 22. Thus to reposition the housing the bayonet housing is first inserted into the aperture 20 as indicated by arrow 21 and then rotated as indicated by arrow 23.

[0026] Figure 3 illustrates the components of the debris extraction system 10. The same includes the outer housing 18, a debris collection bag 24, fitted to a neck portion 25 and an annular end fitting 27 in which the bayonet fittings 22 are formed.

[0027] The bag 24 is formed from a porous material having a plurality of pores therein which are of such a size so as to allow air flow therethrough but which prevents the flow of debris therethrough. The debris collection bag 24 is removably fitted in housing 18 via a substantially rigid neck portion 25 typically formed from plastics and the substantially flexible porous material is typically heat sealed to the plastic during manufacturing. An attachment portion in the form of an annular end fitting 27 is located over neck portion 25 to trap and secure the same between the end fitting and the housing 18. The attachment of the end fitting to the housing is typi-

cally by a snap fit or threaded engagement and where required seals can be provided to prevent air loss at the join.

[0028] The housing is provided with a series of apertures 30 which allow air flow therethrough.

[0029] In use a pump (not shown) provided in body portion 4 of the power tool directs air flow, and therefore debris such as dust generated from the sanding process, from the sanding surface through a passage 26 formed in body portion 4, through outlet aperture 20 and into the debris extraction system 10. The air and debris passes through the fitting 27 and into the debris collection bag 24 in housing 18. The bag 24 serves to collect the debris and prevent the same passing further through the extraction system but the plurality of apertures 30 provided in the housing 18 allow the air which passes through the pores in the bag 24 to exit the housing as indicated by arrows 28. Thus the debris transported in the airflow from the power tool is prevented from passage through apertures 30 by the material from which the debris collection bag 24 is formed.

[0030] Once the debris extraction system bag 24 becomes full, the user can detach housing 18 from body portion 4 by releasing the bayonet fitting. The user then disconnects the housing from the fitting 27 to remove the debris collection bag 24 and transports the bag, typically in the housing to prevent spillage, to a suitable location for emptying of bag 24. The bag can then be thrown away, reused or washed for reuse. The housing 18 is formed from a substantially rigid material which allows easy transportation of the same without spillage of the debris therein and also prevent tears or other damage to the bag during use.

[0031] The present invention therefore provides a significant improvement in the extraction and collection of debris and other debris from power tools of the type such as a sanding device.

Claims

1. A power tool, said power tool including a working portion which generates debris in use, drive means for selective activation to provide driving movement of the working portion in use and debris extraction means for extracting debris from the area at and adjacent to said working portion to a position remote from said working portion and wherein said debris extraction means includes at least one housing in which a debris collection bag is removably located.
2. A power tool according to claim 1 wherein the extraction means includes an air flow passage through which debris from the working portion or adjacent thereto passes to the location remote from the working portion of the tool.
3. A power tool according to claim 2 wherein the air flow through the at least one passage is generated via a suction means.
4. A power tool according to claim 1 wherein the debris collection bag is removably located within the housing to allow the debris collection bag to be emptied and replaced for repeated use.
5. A power tool according to claim 4 wherein the housing is detachably mounted to the power tool and, when detached, allows retention and transport of the debris collection bag to a required location for emptying.
6. A power tool according to claim 5 wherein the housing is detachably attached to said power tool via any or any combination of complimentary screw threaded means, bayonet fitting, friction fit, screws, clips, ties and/or the like.
7. A power tool according to claim 1 wherein the housing and debris collection bag are located at the rear of the working portion on the power tool.
8. A power tool according to claim 1 wherein the housing has one or more apertures located to allow the passage of air therethrough.
9. A power tool according to claim 1 wherein the housing and/or debris collection bag is formed with at least a portion of the walls formed of air permeable material.
10. A power tool according to claim 1 wherein the debris which is located is predominantly fine particles of debris, wood and/or metal.
11. A debris extraction system for use with a power tool, said debris extraction system including at least one housing in which a debris collection bag is removably located therein and said housing or detachably attached to the power tool.
12. A debris extraction system according to claim 11 wherein the housing is provided with attachment means for detachably attaching said housing to said power tool in use and to allow removal of the collection bag for cleaning.
13. A powered sanding tool, said sanding tool including a working portion in the form of an abrasive surface for sanding a workpiece, drive means for driving movement of said working portion in one or more required directions and extraction means for extracting debris from an area at or adjacent said workpiece and working portion to a location remote from said surface and wherein said extraction means includes at least one housing in which a de-

bris collection bag is removably located, said housing communicating with the working portion via at least one aperture at or adjacent to the working portion and one or more passages connecting the said at least one aperture with the said housing.

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- 14.** A powered sanding tool according to claim 13 wherein said housing has the debris collection bag removably located therein.

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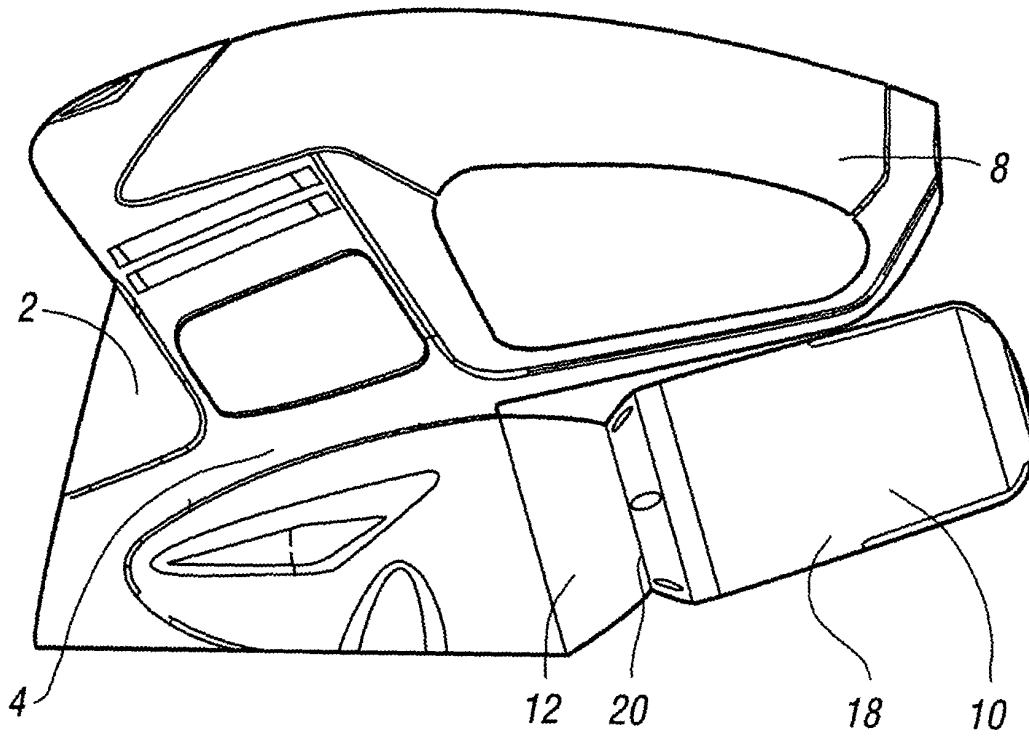


FIG. 1

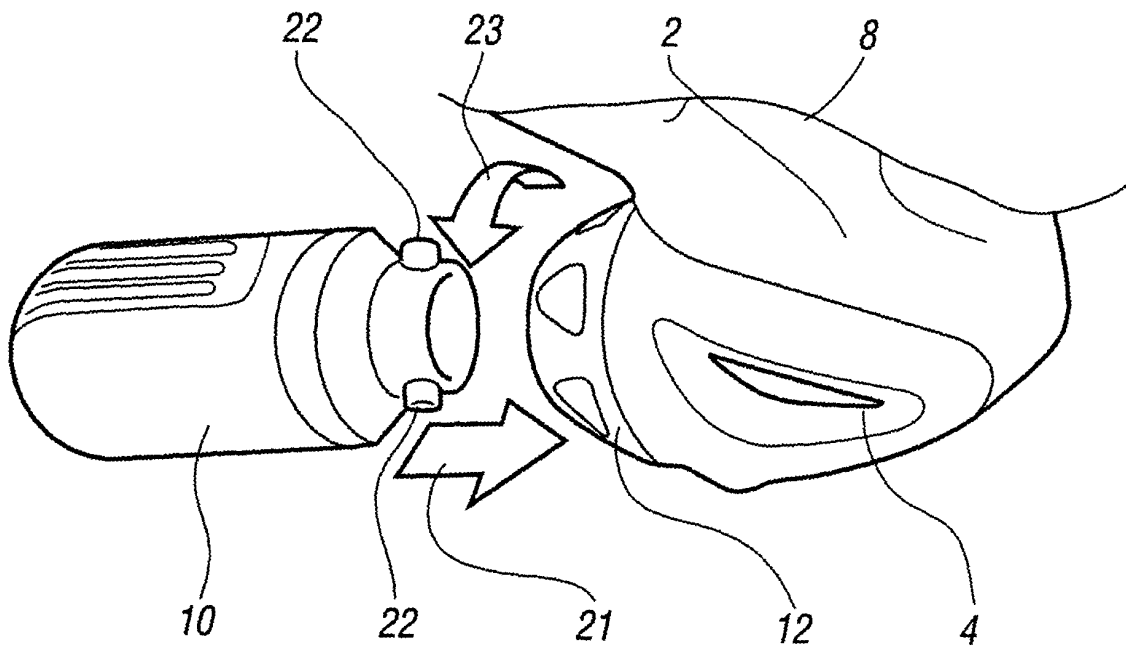
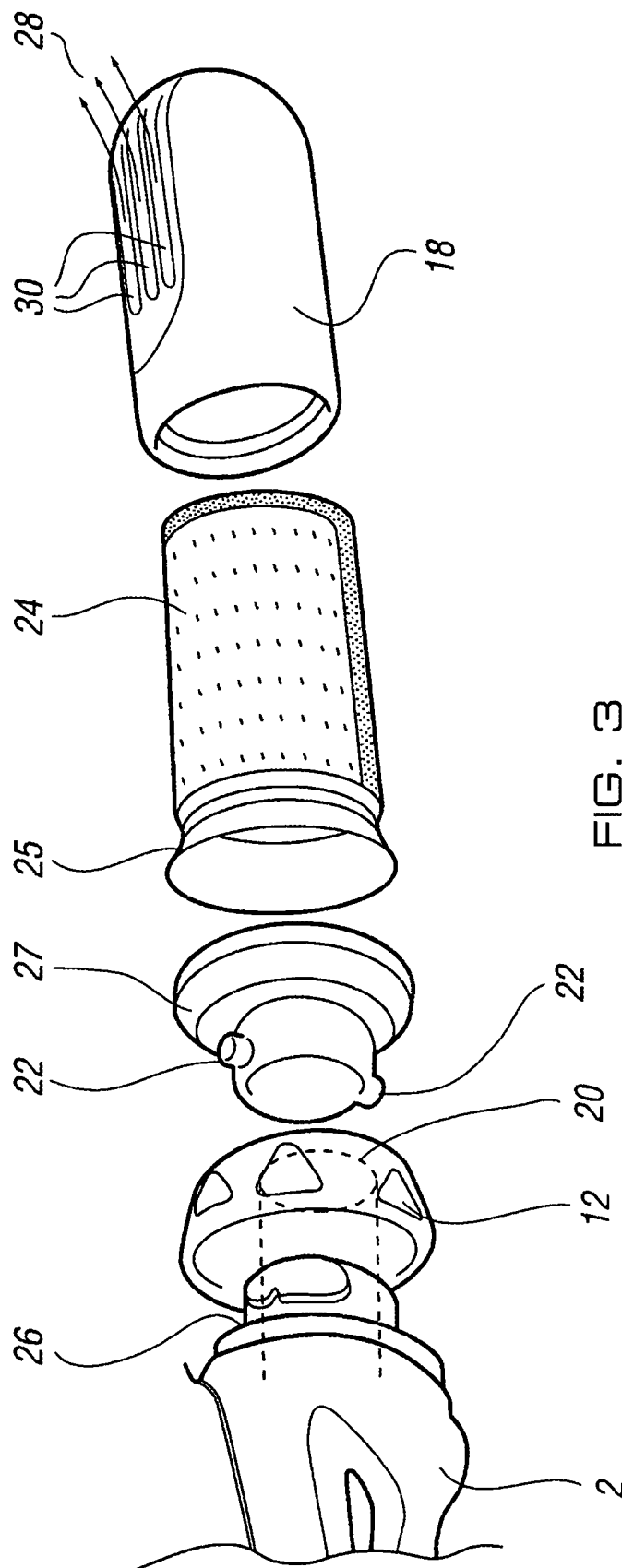


FIG. 2





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EUROPEAN SEARCH REPORT

Application Number
EP 04 25 4798

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 198 00 045 A (BOSCH GMBH ROBERT) 3 September 1998 (1998-09-03) * column 2, line 31 - column 2, line 33 *	1-14	B24B55/10
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A	EP 1 247 612 A (BOSCH GMBH ROBERT) 9 October 2002 (2002-10-09) * the whole document *	1-14	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B24B
Place of search		Date of completion of the search	Examiner
Munich		18 October 2004	Müller, A
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 25 4798

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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18-10-2004

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