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Remarks:

Claims 16-17 are deemed to be abandoned due to non-payment of the claims fees (Rule 45(3) EPC).

(54) **AN AIR VENT ASSEMBLY**

(57) An air vent assembly for a ventilation system comprises a main body and a filter assembly. The main body has an airflow conduit with an airflow inlet for connection to an air supply duct and an airflow outlet defining an air supply inlet for a room. Mounting means are provided for securing the main body to a surface such as ceiling so that the conduit is located within a vent aperture

of said room. A filter assembly is connected to the main body such that airflow is channelled through the filtration unit prior to flowing through the outlet of the conduit. The filter assembly includes a chemisorption material filter such as an active carbon or an impregnated activated alumina.

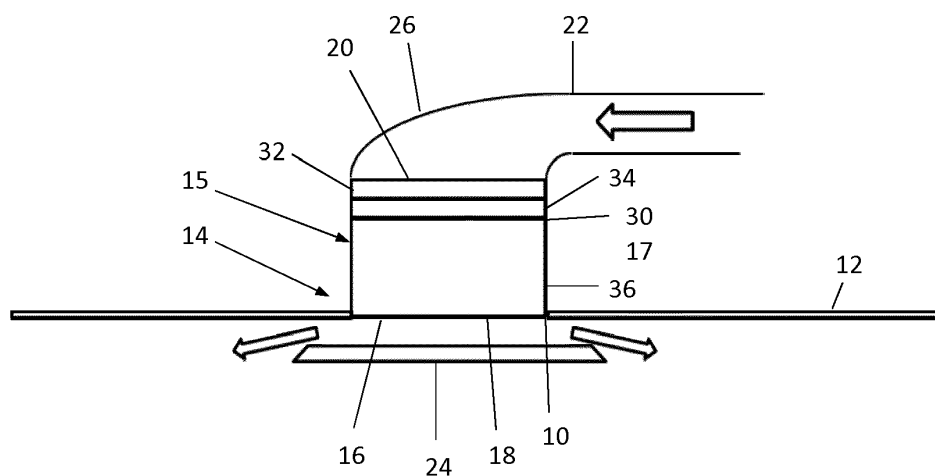


FIG 1.

Description

[0001] The present invention relates to an air vent assembly, and in particular to an air vent assembly including an integrated active carbon filter and/or particulate filter.

[0002] Air pollution is increasingly influencing planning considerations. Information sources such as the World Health Organisation define maximum safe exposure levels for harmful air pollutants, and planning constraints refer to these levels to set maximum acceptable levels of pollutant concentrations within a property. The ambient outdoor air quality in urban areas is often found to be poor, with high concentrations of potentially harmful gases and particulates found to be present in the atmosphere. In areas where such high levels of pollutants are found to be present, planning constraints will typically be imposed that are directed towards solutions for mitigating the effect of these pollutants on human health. Such planning constraints are directed in particular to new housing developments, where the property developer and/or the builder is required to install to reduce the levels of pollutants entering the property. Generally an ambient pollution survey will be carried out before planning consent is considered.

[0003] Two pollutants that are commonly the subject of planning restrictions are particulate matter, and in particular PM_{2.5} and PM₁₀ air born particles, and NO_x (NO and NO₂). Large filtration units are installed into properties to handle these pollutants. These filtration units generally include a large housing containing some or all of a coarse pre-filter, particulate filter to treat PM_{2.5} / PM₁₀ air-born particles, and an activated carbon filter to treat NO_x gases.

[0004] The filter unit handles the entire air supply volume for the ventilation needs of the property served, which for residential properties in the UK will be approximately 0.5 air changes per hour. The air supply passes through the filter unit before branching to the numerous rooms of the property. The filtration units are therefore very large due to the volume of air that must pass through a single unit handling the air supply for an entire property. In order to minimise pressure drop across the size of the unit must be maximised to lower air velocity of a given flow rate. The size of the unit must also be sufficiently large to ensure an adequate dwell time through the filter.

[0005] Large filter units of this type are connected into the ventilation system of a property, and are located at a location in the property where sufficient space is available to house the unit. Typically the layout of a property, particularly flats and apartments, do not include space for a filter unit of this size. Therefore a storage location must be created by lowering a section of the ceiling, or forming a dedicated enclosure within the property. The resulting loss of space within the property is highly undesirable. Installers are also faced with the dilemma of having to install the unit where space allows, while needing to ensure that access to the unit is readily available for periodic maintenance.

[0006] It is therefore desirable to provide an improved air vent assembly, which addresses the above described problems and/or which offers improvements generally.

[0007] According to the present invention there is provided an air vent assembly as described in the accompanying claims.

[0008] In an embodiment of the invention there is provided an air vent assembly for a ventilation system comprising a main body and a filter assembly. The main body comprises an airflow conduit having an airflow inlet for connection to an air supply duct and an airflow outlet defining an air supply inlet for a room. Mounting means is provided for securing the main body such that the conduit is located within a vent aperture of said room. A filter assembly is connected to the main body such that airflow is channelled through the filtration unit prior to flowing through the outlet of the conduit. The filter assembly includes a chemisorption material filter. Preferably the chemisorption material is an active carbon or an impregnated activated alumina.

[0009] Combining the filter assembly with the vent allows filtration to be provided locally within each room, rather than filtering all of the supply airflow for the property using a single large filtration unit. Providing a plurality of dedicated air filtration units locally at each inlet within each room of the property removes the need for a single large filtration unit that handles filtration for the entire property. Therefore there is no longer any need to find or create space to house the large filtration unit. In a further benefit, the filtration units are easily and directly accessible from within each room for servicing, period maintenance and replacement of the filters. Furthermore, as each filtration unit is only handling the flow for a single room, the size of each filtration unit is significantly reduced relative to the size of a single filtration unit, allowing the filtration units to easily fit within a ceiling void.

[0010] The filter assembly is preferably connected to the main body such that it is accessible via the vent aperture of the room to which the main body is mounted. As such, only a single aperture is required in the ceiling, rather than providing a separate maintenance access. This is achieved by ensuring the filter assembly is of a size that is equal or less than the outlet of the vent, and smaller than the ceiling aperture, and by mounting the filter assembly such that it is within a reachable distance from the vent outlet.

[0011] Preferably the filter assembly is mounted directly to the main body, which enables the vent and filter assembly to be provided and installed as a single unit, and places the filter assembly in an easily accessible location. Preferably the filter assembly is mounted at least partially within the conduit of the main body.

[0012] Preferably the filter assembly includes both an active carbon filter or impregnated activated alumina and a particulate filter, enabling the vent assembly to satisfy planning requirements with a single product solution. The particulate filter is adapted to filter at least PM₁₀ and preferably also PM_{2.5} particulates. Preferably the filter

assembly also includes a pre-filter.

[0013] The chemisorption material is preferably adapted to change colour based on its chemical condition, and preferably based on its level of saturation. The material changes colour during its operational life cycle, with the colour giving an indication of its degree of saturation and hence its efficacy. As such, as user is able to immediately determine from viewing the filter whether it needs to be changed. The colour changing chemisorption material may be impregnated activated alumina or activated carbon. A chemical reaction during filtering, such as oxidation of the material, causes a change in the colour of the filter media.

[0014] Preferably the filter assembly is arranged such that at least a portion of the chemisorption filter is visible. This means that the material can be viewed when the parts of the filter assembly are assembled and installed in use. This enables the user to determine whether the filter requires changing without having to remove or disassemble the filter assembly. The visible portion is arranged to be viewed from beneath the filter assembly. The visible portion may be arranged to be viewed when the entire air vent assembly is assembled, or may require the diffuser plate to be removed to provide a line of sight into the duct to view the filter assembly.

[0015] Preferably a transparent section is arranged to enable a portion of the chemisorption filter to be viewed when the air vent is fully assembled and installed. The transparent section may comprise a viewing window, and may be an open window or may include a transparent material such as transparent plastic. The viewing window is preferably provided in a base panel of the filter assembly.

[0016] In another aspect of the invention there is provided a ventilation system comprising an air supply duct; and a plurality of vent assemblies as defined above. Preferably the ventilation system comprises an air supply fan connected to the air supply duct for supplying air to each of the plurality of vent assemblies to positively supply air to the vents.

[0017] Preferably the plurality of vent assemblies are installed in a plurality of ventilated spaces, such as the habitable rooms of a residential property, with the filter assembly of each vent assembly being connected to the main body such that the filter assembly is directly accessible from the respective ventilated space for maintenance.

[0018] The present invention will now be described by way of example only with reference to the following illustrative figure in which:

Figure 1 shows a cross section of a vent assembly according to an embodiment of the invention.

[0019] A ventilation system for ventilation of a residential property comprises at least one air inlet supplying air from the external atmosphere, and at least one air outlet exhausting air from the property. At least one fan unit is

provided for forced air supply and/or extraction. The inlet to the air supply fan is connected to the air inlet of the ventilation system. The outlet of the supply fan is connected to a network of supply ducting. A series of air vents or terminal units are connected along the supply ducting, with typically an air vent being provided in each habitable room of the property.

[0020] The air supply and/or air extraction from a habitable room is achieved via the air vents. An air vent arrangement is shown in Figure 1. An aperture 10 is formed in a ceiling 12 or wall of a room. An air vent 14, otherwise referred to as a terminal unit, is secured within the aperture 10. The air vent 14 supplies air to the room from the air supply fan. The air vent 14 includes a main body 15 comprising a primary conduit 17 that lines the aperture 10 and extends into the ceiling void. The main body 15 preferably includes a flange plate (not shown) that surrounds the aperture for securing the vent 14 to the ceiling. The primary conduit 17 includes a first opening at a first end 16 defining a supply inlet 18 to the room, and a second opening at a second end 20 that is connected to the supply ducting 22 via a transition section 26. A diffuser 24 is located in front of the supply inlet 18 to direct airflow through the supply opening into the room. The diffuser 24 is connected to the main body 15 of the vent 14.

[0021] The ventilation system comprises a main supply ducting section and a series of branched supply ducts 22 extending to the series of vents 14. Each vent 14 is associated with a corresponding room of the property and is located locally within that room. Each vent 14 is provided with a dedicated filtration unit 30 that is accessible from the room serviced by the vent, via the vent itself or the vent aperture 10. In the embodiment shown in Figure 1 the filtration unit 30 is mounted within the primary conduit 17. The filtration unit 30 includes a coarse pre-filter 32 for filtering any large debris within the airflow, a particulate filter 34 for filtering particulates such as PM_{2.5} (≤ 2.5 micron) and PM₁₀ (2.51 - 10 micron) from the airflow. The filtration unit also includes a chemisorption filter 36 for removing NO_x from the airflow. By way of example, a filtration unit 30 may comprise a filter housing having a diameter of 125 mm, with a filter face area of approximately 12272 mm², a carbon filter length of approximately 163 mm, with a filter dwell time of approximately 0.2 seconds. The chemisorption filter media may be active carbon filter and/or impregnated activated alumina.

[0022] The filtration unit 30 is connected to the main body 15 of the vent 14. The term connected as used herein means operatively and fluidly connected such airflow from the supply duct 22 passes through the filtration unit 30 prior to exiting the vent 14 via the outlet 18. The filtration unit 30 may be mounted within the primary conduit 17 such that it may be removed from the vent 14 via the supply inlet 18 without removing the main body 15 from the ceiling, with only removal of the diffuser 24 required. Alternatively, the filtration unit could be mounted to the inner end 20 of the conduit 17, within the transition

section 26 or within the supply ducting 22 immediately proximate the vent 14, with access being achieved via the primary conduit 17 or by removal of the main body 15.

[0023] Providing a plurality of dedicated air filtration units locally at each inlet within each room of the property removes the need for a single large filtration unit that handles filtration for the entire property. Therefore there is no longer any need to find or create space to house the large filtration unit. In a further benefit, the filtration units are easily and directly accessible from within each room for servicing, period maintenance and replacement of the filters. Furthermore, as each filtration unit 30 is only handling the flow for a single room, the size of each filtration unit 30 is significantly reduced relative to the size of a single filtration unit, allowing the filtration units 30 to easily fit within a ceiling void.

[0024] The invention therefore provides a more practical filtration solution by treating air only as it is supplied to each room, or each supply diffuser if multiples are used. This solution is applicable to any ventilation system, but is particularly relevant to residential systems where the problems of spatial constraints and the provision of adequate maintenance are most acute. By dividing airflow in this manner, the individual filtration units may be considerably reduced in size whilst providing equivalent dwell time and pressure loss, making installation more straightforward and keeping energy consumption to a minimum. Maintenance is also considerably less complicated, since access for filter changing will be from the room served, and thus no special access provision are required.

[0025] The vent or terminal unit 14 is preferably suitable for both supply and extract use and incorporates the means of airflow adjustment that includes mean to lock the airflow, for balancing and commissioning purposes in addition to the vent 14 including a means of air filtration incorporating coarse, particulate and adsorption filters, air direction guidance for use in supply mode, and filtration and humidity sensing for use in extract mode.

[0026] Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon. Furthermore, while the invention is described in use in a residential ventilation system, it will be appreciated that the invention could be implemented in the ventilation of any series of spaces requiring multiple vents for a series of dedicated spaces.

Claims

1. An air vent assembly for a ventilation system comprising;

a main body comprising a conduit having an inlet for connection to an air supply duct and an outlet defining an air supply inlet for a room, and mounting means for securing the main body within a vent aperture of said room; and a filter assembly connected to the main body such that airflow is channelled through the filtration unit prior to flowing through the outlet of the conduit, the filter assembly including a filter comprising a chemisorption material.

2. An air vent assembly according to claim 1 wherein the chemisorption material is an active carbon filter.

3. An air vent assembly according to claim 1 or 2 wherein the filter assembly is connected to the main body such that it is accessible via the vent aperture of the room to which the main body is mounted.

4. An air vent assembly according to claim 3 wherein the filter assembly is mounted directly to the main body.

5. An air vent assembly according to claim 4 wherein the filter assembly is mounted at least partially within the conduit of the main body.

6. An air vent assembly according to any preceding claim wherein the filter assembly includes both a chemisorption material filter and a particulate filter.

7. An air vent assembly according to any preceding claim wherein the filter assembly also includes a pre-filter.

8. An air vent assembly according to any preceding claim wherein the chemisorption material changes colour based on its chemical condition.

9. An air vent assembly according to claim 8 wherein the chemisorption material changes colour based on its level of saturation.

10. An air vent assembly according to any preceding claim wherein the filter assembly is arranged such that at least a portion of the chemisorption filter is visible when the air vent is fully assembled.

11. An air vent assembly according to claim 8 comprising a transparent section arranged to enable a portion of the chemisorption filter to be viewed when the air vent is fully assembled and installed.

12. An air vent assembly according to claim 9 wherein the transparent section comprises a viewing window.

13. An air vent assembly according to any preceding claim wherein the chemisorption material is impreg-

nated activated alumina

14. A ventilation system comprising:

an air supply duct; and 5
a plurality of air vent assemblies as defined in
any preceding claim connected to said air supply
duct.

15. A ventilation system according to claim 13 further 10
comprising an air supply fan connected to the air
supply duct for supplying air to each of the plurality
of vent assemblies.

16. A ventilation system according to claim 13 or 14 15
wherein the plurality of vent assemblies are installed
in a plurality of ventilated spaces, with the filter as-
sembly of each vent assembly being connected to
the main body such that the filter assembly is directly
accessible from the respective ventilated space for 20
maintenance.

17. Mechanical ventilation with heat recovery according
to any one of claims 13 to 15 wherein the system 25
includes a mechanical ventilation with heat recovery
unit.

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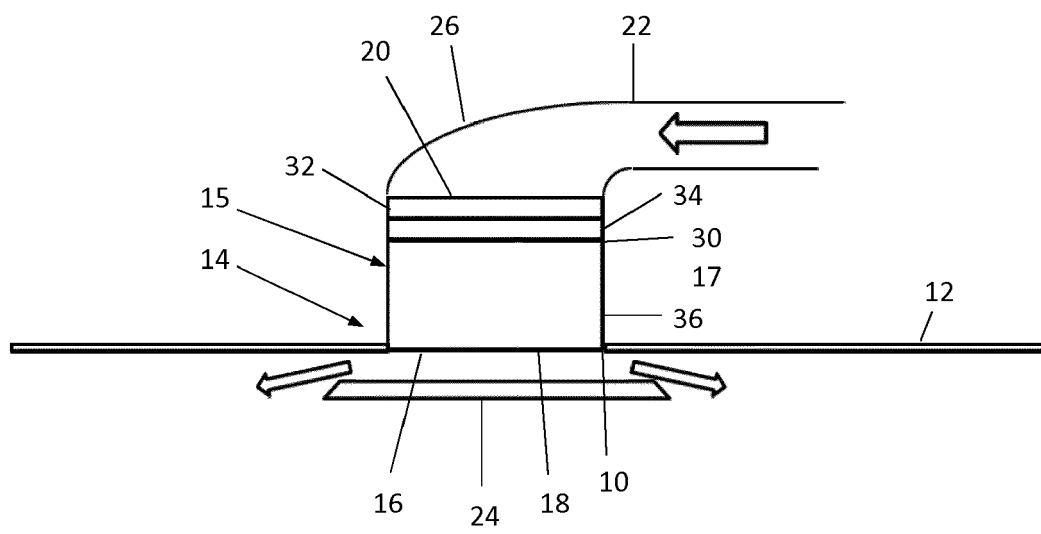


FIG 1.



EUROPEAN SEARCH REPORT

Application Number
EP 16 15 1600

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	KR 101 425 867 B1 (JUNG DONG HWAN [KR]) 7 August 2014 (2014-08-07)	1-7, 13-17	INV. F24F3/16
Y	* the whole document *	8-12	F24F11/00 F24F13/28 F24F13/08
X	KR 101 296 089 B1 (JUNG DONG HWAN [KR]) 19 August 2013 (2013-08-19) * paragraph [0022] - paragraph [0037] * * figures *	1	
X	US 5 240 487 A (KUNG KIRK [CA]) 31 August 1993 (1993-08-31) * column 1, line 54 - column 6, line 17 * * figures *	1	
Y	WO 2014/036598 A1 (VENT MEN PTY LTD [AU]) 13 March 2014 (2014-03-13) * paragraph [0045] * * figures *	8-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 November 2016	Examiner Mattias Grenbäck
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			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 15 1600

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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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21-11-2016

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82