The present invention provides an extraction unit suitable for use with gaseous fluids comprising: a first panel member comprising means for connection to a plurality of fluid ducts, said means for connection to a plurality of fluid ducts comprising at least one extraction unit fluid inlet and at least one extraction unit fluid outlet; a second panel member comprising means for mounting at least one fan module thereto, and means for connection to the first panel member, the unit being configured such that with the first and second panel members connected to one another and at least one fan module mounted to the second panel member, a fluid flowpath is provided through the fan module between at least one extraction unit fluid inlet and at least one extraction unit fluid outlet.
AIR EXTRACTION UNIT

The present invention relates to air extraction systems. In particular, but not exclusively, the present invention relates to air extraction systems for use in buildings.

It is known to provide central air extraction units in buildings, the units having a fan mounted in a housing. The housing is connected via air inlet ducts to locations of the building from which it is desired to extract air.

The system works by drawing air from respective areas of a building through the air inlet ducts, before rejecting the air to the outside of the building through an air outlet duct.

Air extraction units are costly to install and require regular maintenance in order to prevent accumulation of excessive amounts of airborne dust and other material in the unit. Maintenance of units is costly due at least in part to difficulties encountered in accessing interior surfaces of the units, including the fan contained within each unit.

Air extraction units are also vulnerable to theft or damage during the construction phase of a building. This is at least in part because air extraction systems are often installed and connections made to air inlet and air outlet ducts before doors and/or windows are installed in a building.

In a first aspect of the present invention there is provided an extraction unit suitable for use with gaseous fluids comprising: a first panel member comprising means for connection to a plurality of fluid ducts, said means for connection to a plurality of fluid ducts comprising at least one extraction unit fluid inlet and at least one extraction unit fluid outlet; a second panel member comprising means for mounting at least one fan module thereto, the second panel member further comprising means for connection to the first panel member, the unit being configured such that with the first and second panel members connected to one another and at least one fan module mounted to the second panel member, a fluid flowpath is provided through the fan module between at least one extraction unit fluid inlet and at least one extraction unit fluid outlet.

Embodiments of the invention have the advantage that the first panel member may be installed at a "first fix" phase of installation, during the early stages of construction of a
new building. During this phase, the first panel member may be connected to one or more inlet ducts and one or more outlet ducts of the building.

The second panel member may be installed as a "second fix" when security of the building is such that theft of or damage to the second panel member is unlikely. For example, at the second fix stage, doors and windows have typically already been installed in a new building.

Prior art air extraction units are typically installed at the first fix stage as complete units comprising fans and their associated hardware, including control systems. Their security is therefore a source of concern for construction companies since the units are costly to replace.

At the second fix stage the second panel member may be installed together with one or more fan modules. Associated electrical connections may also be completed at this time such as those associated with power supply and system control.

Preferably the means for connection to the first panel member comprises quick-release connection means.

The quick-release nature of the connection between the first and second panel members allows attachment of the second panel member to the first panel member in a convenient and efficient manner. Furthermore, when maintenance of the air extraction unit is required, the second panel member may be easily detached from the first panel member. At this time, internal surfaces of the first and second panel members may be cleaned.

Access to one or more fan modules within the extraction unit is also conveniently provided upon removal of the second panel member. Thus, fan modules may also be cleaned and serviced at this time.

Preferably the second panel member is provided with at least one anti-backdraft device corresponding to each fan module.

The presence of an anti-backdraft device prevents flow of air through the air extraction unit in a reverse direction.
Preferably the at least one anti-backdraft device is provided at a location downstream of the fan module mounting means.

Preferably the extraction unit comprises means for mounting a plurality of fan modules therein.

Preferably each of the plurality of fan modules is arranged to draw fluid from a respective extraction unit fluid inlet.

This feature has the advantage that independent control of a flowrate of fluid being drawn through a respective air inlet may be achieved by varying a pumping speed of a respective fan module.

This feature further enables air extraction systems of a more compact size to be installed in a building, since more than one fan module can be co-located with other fan modules in the same unit.

Preferably the at least one anti-backdraft device is provided between an air outlet of each fan module and the at least one air outlet of the extraction unit, such that when an anti-backdraft device corresponding to a particular fan module is closed, the air outlet of said fan module is isolated from both the at least one air outlet of the extraction unit and the air outlet of another fan module mounted to the second panel member.

This feature has the advantage that, if a first fan and one or more other fans are provided in the air extraction unit, and the first fan is pumping air at a higher rate than the one or more other fans, such that the air pressure at the air outlet of the first fan exceeds the air pressure at the air outlet of the one or more other fans, the anti-backdraft device of the other fan will close, thereby to prevent a reverse flow of air through the other fan module. Thus, air being pumped by one fan from a first area of a building cannot flow through the air extraction unit in a reverse direction thereby to contaminate a second area of the building with air from said first area.

In addition, in windy weather conditions, the anti-backdraft device prevents any backdraft of outside air beyond the anti-backdraft device.
Preferably, the at least one fan module is provided with a humidity sensor.

Preferably, the at least one fan module is configured to increase and decrease a pumping speed of the fan module in response to an increase or decrease in humidity, respectively, of air being pumped through the fan module.

This feature has the advantage that a rate of air extraction from a given area of the building may be changed depending upon the moisture content of air in the room, thereby improving a comfort level of a person using the room. Furthermore, damage to or deterioration of furnishings or articles in an area may be reduced or prevented by avoiding a build-up of moisture in the area.

An air extraction unit having fan modules configured in this manner provides further benefits, including reduced energy consumption of a building, and reduced acoustic vibrations. This is because the pumping speed of a fan is increased (and hence acoustic vibrations) only when a humidity level of an area of a building (such as a bathroom) is increased. Thus, treated air in the building environment (e.g., heated, cooled and/or air-conditioned) is not extracted from the building at a rate exceeding that necessary to maintain a comfortable environment in the building during normal usage of facilities in the building (such as kitchens, bathrooms etc).

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

FIGURE 1 is a perspective view of an air extraction unit according to an embodiment of the invention;

FIGURE 2 is a top view of a first panel member of the embodiment of FIGURE 1;

FIGURE 3 is a front view of the first panel member of the embodiment of FIGURE 1;

FIGURE 4 is a view of an inside surface of the first panel member of the embodiment of FIGURE 1;

FIGURE 5 is a perspective view of a second panel of the embodiment of FIGURE 1;
FIGURE 6 is a front view of the second panel member of the embodiment of FIGURE 1;

FIGURE 7 is a front view of the second panel member of the embodiment of FIGURE 1 with anti-backdraft components fitted; and

FIGURE 8 is a perspective view of an air extraction unit of the embodiment of FIGURE 1 with the first and second panel members partially detached from one another.

According to an embodiment of the invention an air extraction unit 100 is provided having a first panel member 10 and a second panel member 50. The first and second panel members 10, 50 are releasably connectable to one another using a quick-release device. In the present embodiment the quick-release device is a screw with a corresponding threaded portion provided as part of the extraction unit 100. Thus, a screwdriver is required in order to disconnect the first and second panel members. In alternative embodiments other quick-release devices may be employed. A screw of similar device requiring a tool (in this case a screwdriver) has the advantage that tampering with the unit 100 by an unqualified or unauthorised user is discouraged.

The first panel member 10 is of substantially L-shaped profile and provides an upper face 12 and a side face 11 of the air extraction unit. The second panel member 50 is of a corresponding shape to provide a substantially box-shaped unit when the first and second panel members 10, 50 are connected together.

An upper face 12 of the unit 100 provided by first panel member 10 is provided with air inlet apertures 15 that may be attached to air inlet ducts that are in fluid communication with areas of the building from which it is desired to extract air.

An air outlet aperture 20 is provided on a side face 11 of the first panel member 10. The air outlet aperture 20 may be attached to an air outlet duct of a building. It will be appreciated that in some embodiments of the invention the air outlet aperture 20 may be connected directly to an air outlet in an outer wall of a building.

In the case of installations where multiple air outlets are required, blind outlets 25 provided in the first panel member 10 may also be opened as required, by cutting of the first panel member 10. A further blind outlet aperture 25A is provided on the upper face 12, of a shape corresponding to that of an air duct of rectangular cross-section.
It will also be appreciated that an air extraction unit according to embodiments of the invention may be used in any suitable orientation as dictated by an installation environment.

A first baffle wall portion 17 is provided on an inner side of the first panel member 10, between the air inlet apertures 15 of the first panel member 10 and the air outlet aperture 20 of the first panel member 10.

Figure 5 shows an interior view of the second panel member 50. The second panel member 50 is provided with a lateral fan module support panel 55 having fan module outlet apertures 60, each outlet aperture 60 being shaped to connect to the air outlet of a fan module to be installed over each outlet aperture 60. The positions of the fan module outlet apertures 60 correspond to the positions of the air inlet apertures 15 formed in the first panel member 10.

The fan module is installed in the second panel member 50 with the air outlet of the fan module forming a substantially airtight seal with the fan module outlet apertures 60 of the support panel 55.

A second baffle wall portion 57 is provided on an inner side of the second panel member 50 at a location corresponding to the location of the first baffle wall portion 17 of the first panel member 10. When the first and second panel members 10, 50 are connected to one another, the first and second baffle wall portions 17, 57 assume complementary positions thereby to form a single and substantially continuous baffle wall. The baffle wall prevents recirculation back to the air inlet aperture 15 of air that has been pumped through a fan module installed on the second panel member 50.

Figure 6 shows a front view of the second panel member 50 without anti-backdraft devices installed, and Figure 7 shows a front view of the second panel member 50 with two anti-backdraft devices 70 installed, each device corresponding to one of the two fan module outlet apertures 60.

The embodiment of the invention shown in the Figures is designed for connection to two air inlet ducts, and for the installation of two fan modules in the unit. It will be appreciated however that in some embodiments of the invention the extraction unit is
designed for use with a single fan module, and in other embodiments the extraction unit is designed for use with more than two fan modules.

Figure 8 shows the first and second panel members 10, 50 during a process of mounting the second panel member to the first panel member. Peripheral edges of the second panel member fit into corresponding peripheral recesses of the first panel member in order to effect an essentially airtight seal between the first and second panel members.

According to embodiments of the present invention the first and second panel members 10, 50 are secured together using a quick-release screw mechanism. In alternative embodiments the first and second panel members 10, 50 are secured together using a quick-release latch mechanism, or any other suitable quick-release mechanism.

The air extraction unit may be used with fan modules having independent humidity control systems. Thus, when a fan module detects an increase in humidity of air being drawn through the fan module, the fan module may increase a pumping speed of the fan.

In the embodiment shown in the figures, the air inlets 15 of the first panel member 10 form an airtight seal with respective fan modules; thus no intermixing of air being drawn through respective air inlet apertures 15 from respective air inlet ducts occurs until the air has been pumped downstream of the anti-backdraft devices 70. The air inlet ducts may correspond respectively to air from potentially high humidity areas of a building (e.g. a kitchen and/or a bathroom), and air from generally low humidity areas of a building (e.g. a lounge and/or a hallway).

The first panel member 10 may be installed in a building above a false ceiling in a corridor or room, in a utility room, or any other suitable place. It may be suspended from a bracket, or attached directly to a wall or ceiling.

The first and second panel members are made from a plastics material. The panel members may be formed by a vacuum-forming technique or a moulding technique. The panel members may also have metallic components fabricated for example by forming or casting.
The air extraction unit according to the embodiment shown in the Figures simplifies the
process of installation of air extraction apparatus. The first panel member 10 is installed
as a first fix in the early stages of building construction when air ducting is being
installed. At this stage, air inlet apertures 15 are connected to air ducts in
communication with areas of the building that require air extraction. The air outlet
aperture 20 is also connected to an air outlet duct of the building.

It will be appreciated that air inlet apertures and air outlet apertures may be provided of
any suitable shape corresponding to air inlet or outlet ducts to which the first panel
member 10 is to be connected.

The second panel member 50 is installed at a later stage, together with associated fan
modules and electrical wiring, when the building is secure. Articles within the building
are less vulnerable to theft or damage at this stage, and embodiments of the invention
therefore provide a method of reducing theft or damage of high value items from
buildings during the construction stage of a building.

In alternative embodiments of the invention, a single fan module may be provided in the
air extraction unit. In some embodiments, a single fan module is provided that is in fluid
communication with each air inlet aperture 15 of the first panel member 10.

It will be appreciated that an air extraction unit may be used with other gases and is not
necessarily limited to air. For example, fan modules configured to pump corrosive
and/or toxic gases may be employed. Fan modules of the type herein described and
claimed may be employed in chemical plant or laboratory environments in addition to
domestic, office and other building environments.

Throughout the description and claims of this specification, the words "comprise" and
"contain" and variations of the words, for example "comprising" and "comprises", means
"including but not limited to", and is not intended to (and does not) exclude other
moieties, additives, components, integers or steps.

Throughout the description and claims of this specification, the singular encompasses
the plural unless the context otherwise requires. In particular, where the indefinite article
is used, the specification is to be understood as contemplating plurality as well as
singularity, unless the context requires otherwise.
Features, integers, characteristics, compounds, chemical moieties or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith.
CLAIMS

1. An extraction unit suitable for use with gaseous fluids comprising:
   a first panel member comprising means for connection to a plurality of fluid ducts,
   said means for connection to a plurality of fluid ducts comprising at least one extraction
   unit fluid inlet and at least one extraction unit fluid outlet;
   a second panel member comprising means for mounting at least one fan module
   thereto, the second panel member further comprising means for connection to the first
   panel member,
   the unit being configured such that with the first and second panel members
   connected to one another and at least one fan module mounted to the second panel
   member, a fluid flowpath is provided through the fan module between at least one
   extraction unit fluid inlet and at least one extraction unit fluid outlet.

2. A unit as claimed in claim 1 wherein the means for connection to the first panel
   member comprises quick-release connection means.

3. A unit as claimed in claim 1 or claim 2 wherein the second panel member is
   provided with at least one anti-backdraft device.

4. A unit as claimed in claim 3 wherein the at least one anti-backdraft device is
   provided at a location downstream of the fan module mounting means.

5. An extraction unit as claimed in any preceding claim comprising means for
   mounting a plurality of fan modules therein.

6. An extraction unit as claimed in claim 5 wherein each of said plurality of fan
   modules is arranged to draw fluid from a respective extraction unit fluid inlet.

7. An extraction unit as claimed in claim 6 as dependent on claim 4, wherein the at
   least one anti-backdraft device is provided between an air outlet of each fan module and
   the at least one air outlet of the extraction unit, such that when an anti-backdraft device
   corresponding to a particular fan module is closed, the air outlet of said fan module is
   isolated from both the at least one air outlet of the extraction unit and the air outlet of
   another fan module mounted to the second panel member.
8. An extraction unit as claimed in any preceding claim, wherein the at least one fan module is provided with a humidity sensor.

9. An extraction unit as claimed in claim 8 wherein the at least one fan module is configured to increase and decrease a pumping speed of the fan module in response to an increase or decrease in humidity, respectively, of air being pumped through the fan module.

10. An extraction unit as claimed in any preceding claim wherein the first and second panel members are formed to have corners of a curved profile thereby to allow contaminants including grease to be readily washed away.

11. An extraction unit as claimed in any preceding claim further comprising at least one fan module.

12. An extraction unit as claimed in any preceding claim installed in a building.

13. An extraction unit substantially as hereinbefore described with reference to the accompanying drawings.
A. CLASSIFICATION OF SUBJECT MATTER

INV. F04D25/16 F04D27/02 F04D29/42 F04D29/52 F04D29/62

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C

See patent family annex

Special categories of cited documents

*A* document defining the general state of the art which is not considered to be of particular relevance

*E* earlier document but published on or after the international filing date

*L* documents which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

*O* document referring to an oral disclosure use, exhibition or other means

*P* document published prior to the international filing date but later than the priority date claimed

Date of the actual completion of the international search

1 February 2008

Date of mailing of the international search report

11/02/2008

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Authorized officer

Ingelbrecht, Peter
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