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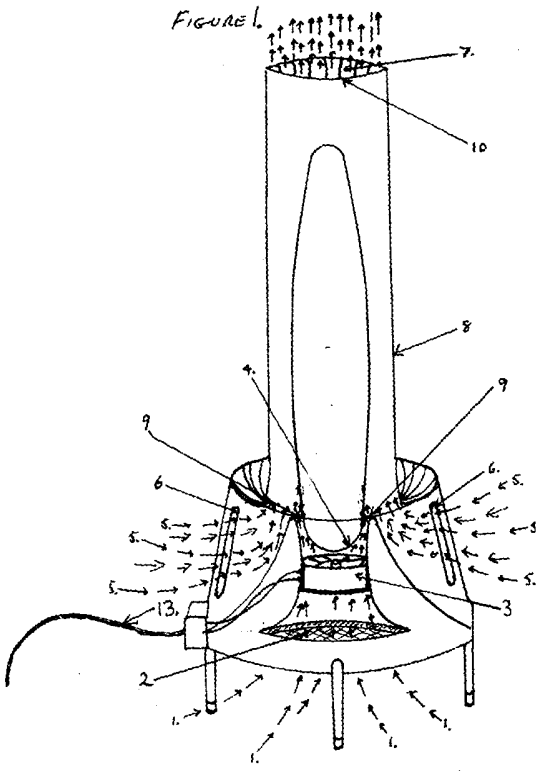
(51) INT CL:
F24F 7/007 (2006.01) ***F24F 13/26*** (2006.01)

(56) Documents Cited:
JP 2004060894 A **JP 2003042496 A**
US 20070202798 A1

(58) Field of Search:
INT CL **F04D, F24B**
Other: **Online: WPI, EPODOC, TXTE**

(54) Title of the Invention: **Vertical air mover**
Abstract Title: **Floor mounted mobile air circulator**

(57) A floor mounted mobile air circulator comprises an air driving mechanism 3 (i.e. fan, turbine, compressor etc...) that draws air 1 in from an inlet orifice 2 at or near a floor. The air is communicated from the air driving mechanism through an upright / vertical air flow directing duct 8 and through an outlet orifice 10 at a sufficient velocity utilising the Coanda effect towards a ceiling to displace heated air trapped adjacent the ceiling so as to reduce a differential temperature gradient of the air between the floor and ceiling. A main volume of air is entrained / drawn through lateral orifices 6 and does not pass through the air driving mechanism. The air circulator may be powered by mains electricity, an integral battery (fig 3) or separate battery (fig 4). Temperature sensors may record the air temperature at floor and ceiling levels and subsequently control the flow of air as a result of the recorded temperature gradient between the floor and ceiling (figs 5 & 6). The air circulator may comprise of a hose connection so that the air circulator may be connected to a pressurised air supply (fig 2).



GB 2468573 A

FIGURE 1.

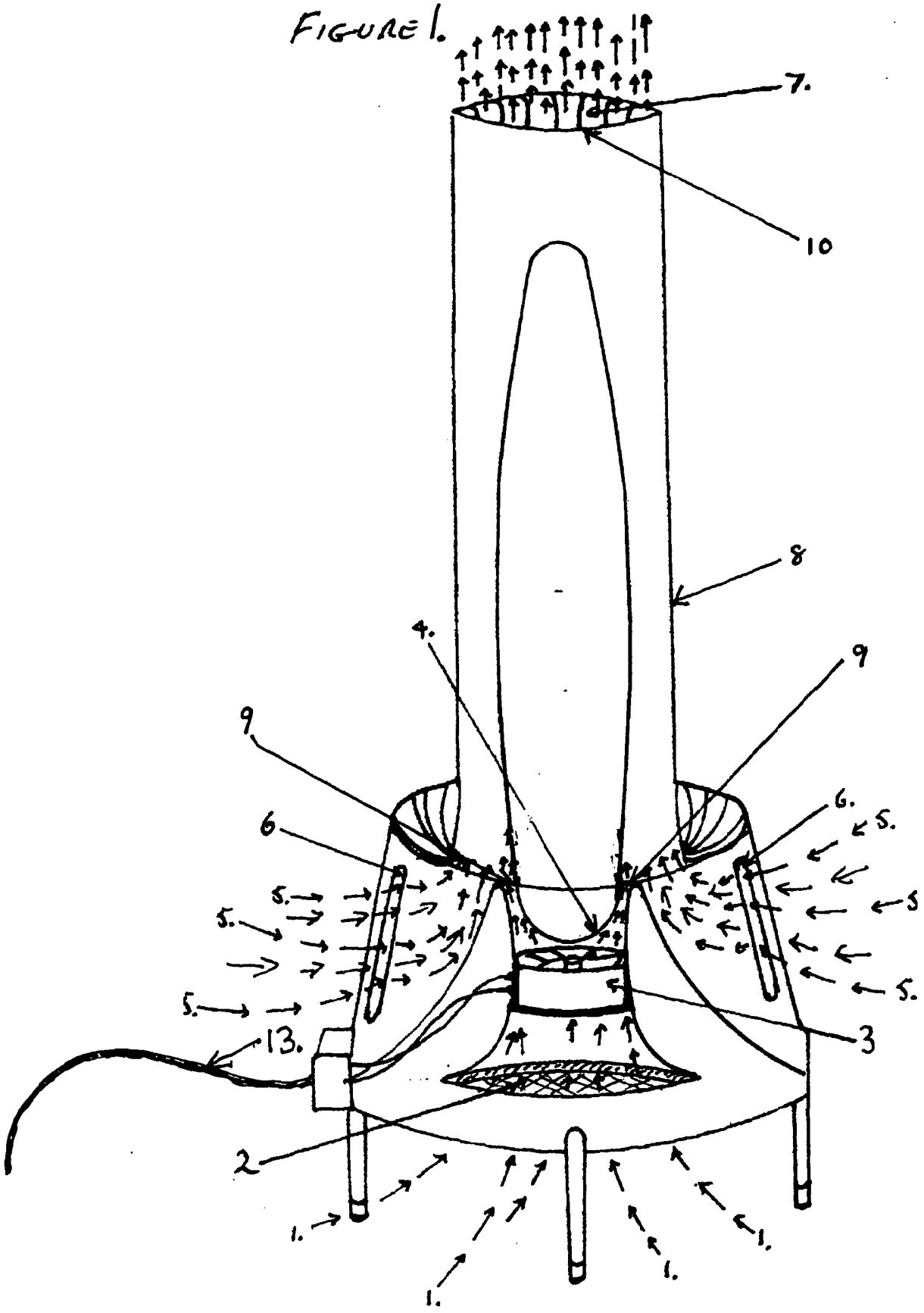
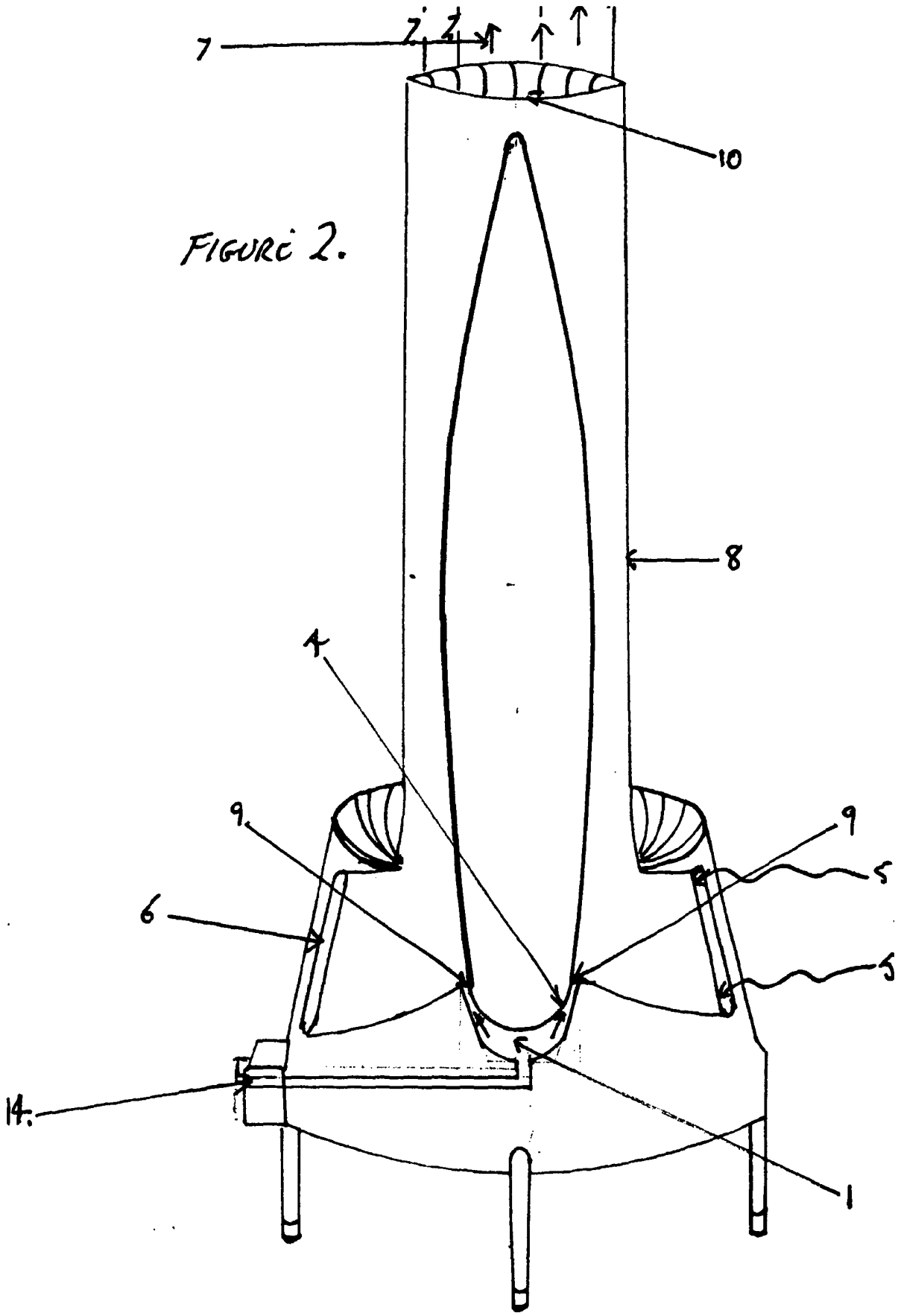


FIGURE 2.



FIGUAÕ 3

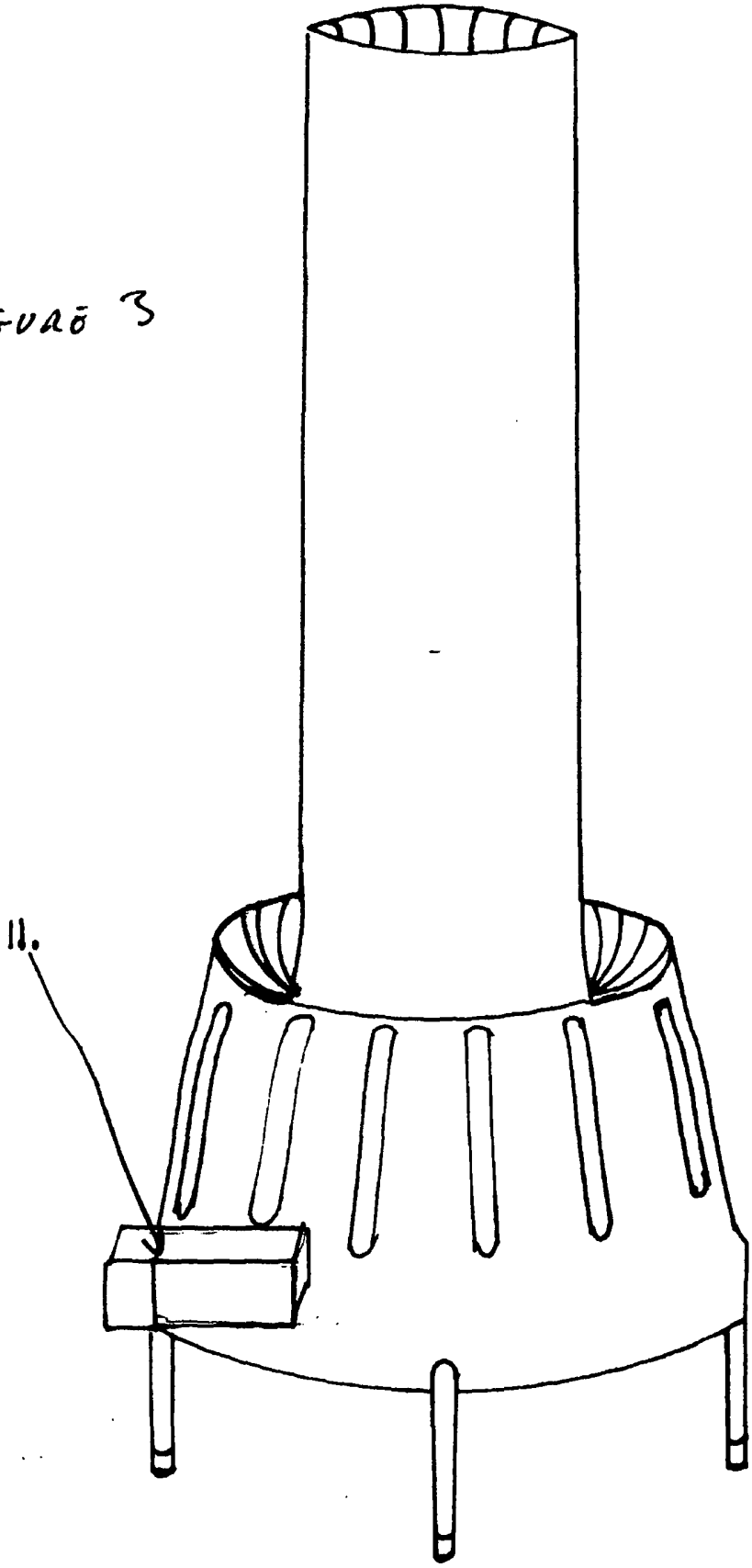
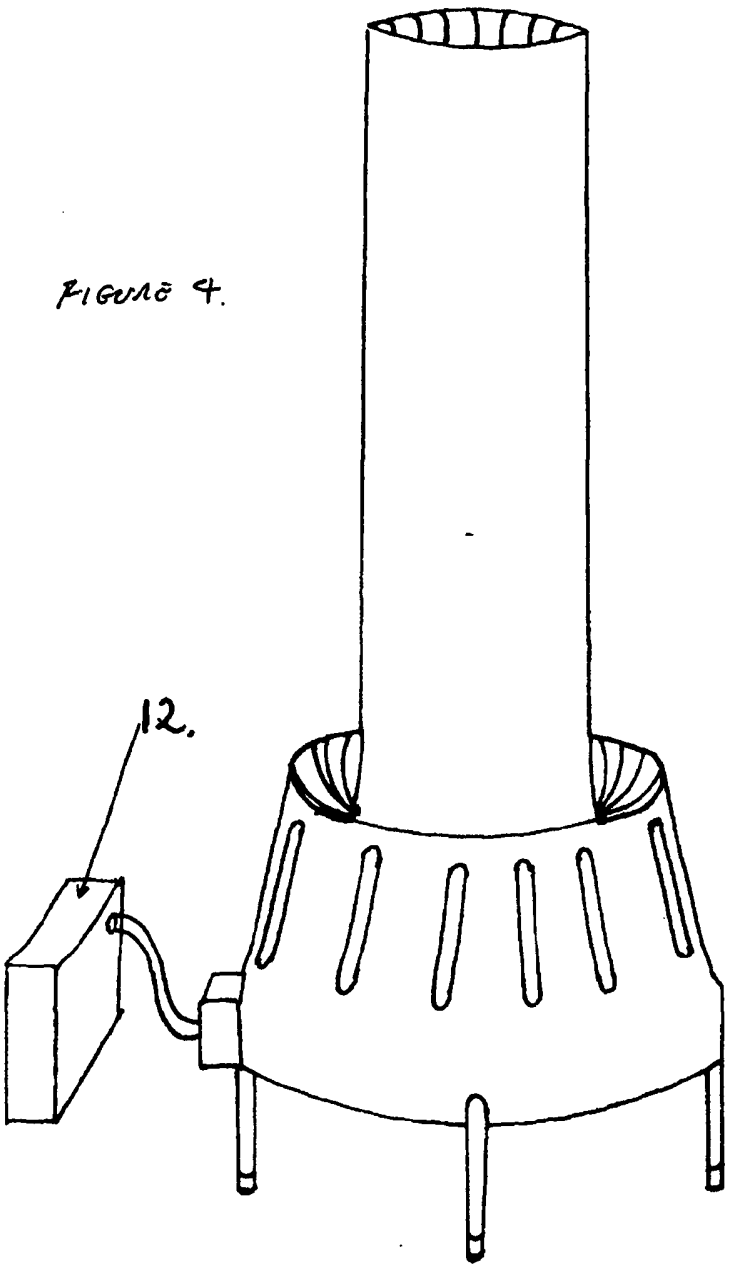


FIGURE 4.



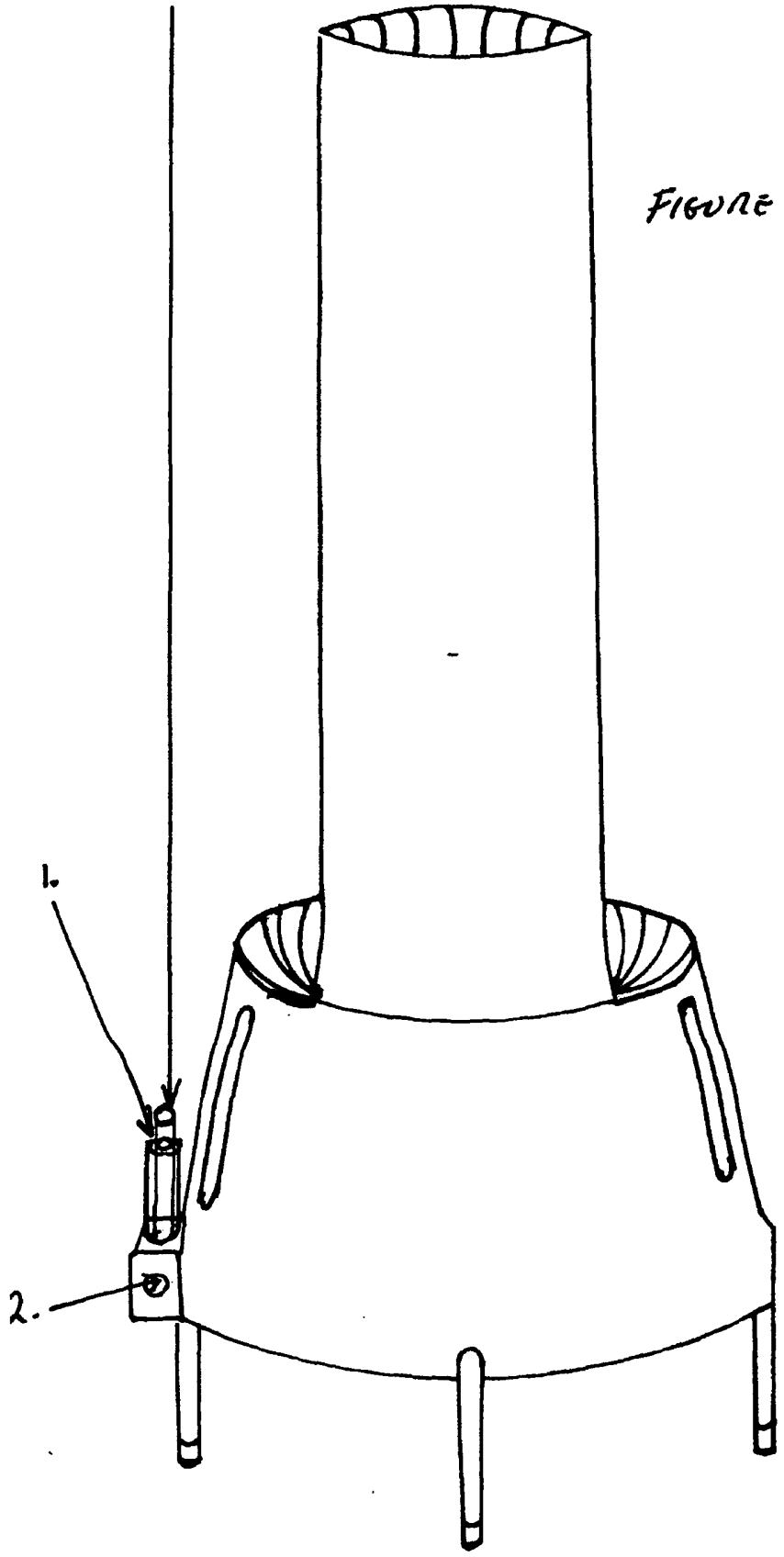


FIGURE 5

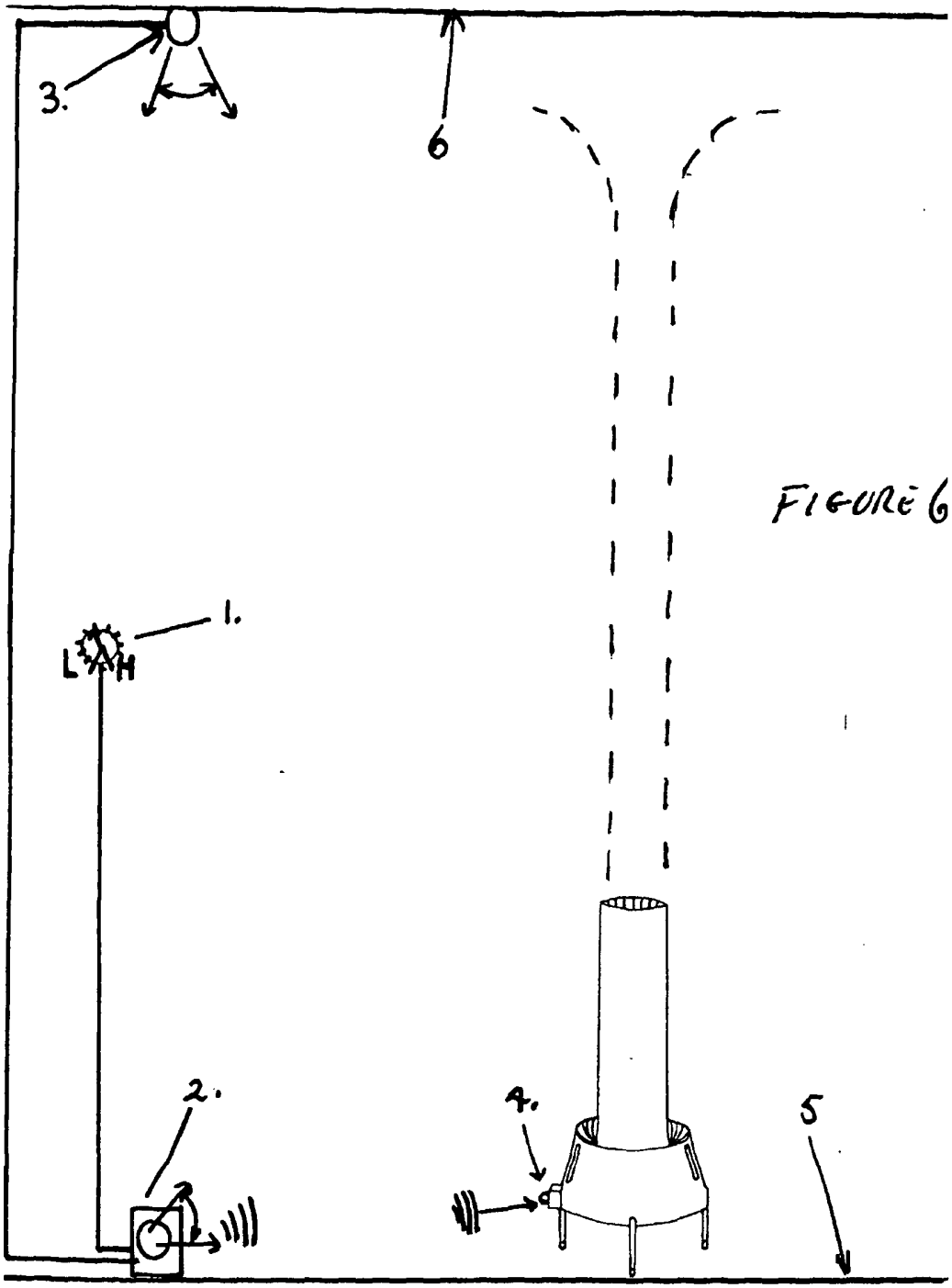


FIGURE 6

TITLE Vertical Air Mover

BACKGROUND

When a room is heated a considerable temperature gradient can exist between floor and ceiling. Because of this, energy consumption is greater than it would be if the temperature was more equally distributed between floor and ceiling. There would also be a reduction in heat loss through the ceiling fabric as result of the lower temperature at the ceiling. A lower thermostat setting to reach a required warmth in the comfort zone for the occupants would again contribute to an energy saving.

The novel aspect to this invention is the method of generating a vertically moving air column for room de-stratification and it differs from other room de-stratifier designs in that only a small percentage of this air column passes through a fan, blower ,or other rotating blade or vane mechanism. The primary air mover in this invention which can be a turbine, fan blower with a plurality of rotating blades or an external compressed air supply, drives air through one or more narrow gaps or interstices thereby creating a suction effect at the intake vents . This entrained air that is drawn through the intake vents or orifices comprises the bulk of the air column. By manipulating the air stream and utilising this Coanda effect to cause an amplification of the air volume , only a small quantity of primary air is required to generate a much larger volume of entrained air which is drawn into the air column. This entrained air which can be as much as twenty times the volume of the primary air has the advantage that it is smooth and is a consistent laminar flow unlike other systems where air is forced through a fan or blower device and comprises the entire air column. The entrained air column is then directed over a curved surface causing it to increase in velocity towards its centre. The outer part of the column having less velocity will be at higher pressure than the inner and will have an inward force keeping the column intact. The contained column is separated for some distance from the room air by an outer shroud . The air that is ejected from the shroud upper orifice in contact with the room air has less energy to be dissipated from the surrounding air as the outer part of the air column has a lower velocity than if the column were annular or turbulent in nature. The higher velocity centre has the effect of sucking the column in on itself due to the lower internal pressure and so will travel a greater distance before dissipating and so require less energy. De-stratifier systems that use high speed fan blowers to produce turbulent or annular air movements can be less efficient and produce more operating noise which is a disadvantage in domestic settings.

STATEMENT OF INVENTION

This invention relates to a mobile floor standing and self supporting device which creates a column of air that is made to move vertically upward without the need for continuous ducting or physical containment of the vertical path between floor and ceiling for the air column. By drawing air in at a low level and expelling the column of air some distance higher with sufficient velocity and integrity to travel to the ceiling level unaided thereby displacing the warmer air trapped at the ceiling level .

ADVANTAGES

Other devices which address this problem either require to be supported from the ceiling and drive warm air down to lower levels and may require a level of skilled installation or would be fixed in a permanent position or have ducting to guide and enclose the air column which would require a support from walls or floor and ceiling and would not be stable otherwise and not be mobile or where the entire air column is made to pass through the fan or blower device.

The advantages of this invention are

1 Floor Standing
2 Self Supporting
3 Mobile(can be positioned to suit the situation)
4 No Installation Costs
5 No skilled Installation Requirement
6 Short Cost Recovery Time
7 Lower Room Thermostat Settings
8 Can significantly reduce heating costs.
9 Lower heat loss through the ceiling.
10 Uses a small amount of energy compared to energy saved.
11 Can lower the carbon footprint in both domestic and commercial installations.
12 Reduces the risk of uncomfortable draughts by having a smooth laminar flow.
13 Lower operating noise by reducing the need for a large flow air mover mechanism.

DETAILED DESCRIPTION

This invention is described by the following drawings figures 1 to 6.

Referring to FIGURE (1). This invention describes a Vertical Air Mover which draws cooler air (5) from the lower level of a room into one or more intake orifices (6) The air mover is floor standing and consists of a housing for the air drive mechanism (3) and a shroud (8) to improve the suction effect at the intake orifice and direct the column of air vertically upwards. The primary air mover which can be a turbine or fan blower with a plurality of electrically driven rotating blades or an external compressed air supply, drives air through one or more narrow gaps or interstices (9) thereby creating a suction effect at the intake orifices . This entrained air (5) comprises the bulk of the air column and has the advantage that it is a smooth and a consistent laminar flow unlike air which is forced through a fan or blower device and comprises the entire air column. The inner part of the column is then directed over a curved surface the aim of which is to increase the velocity of the air column as its distance from its centre decreases . In one design example this can be a torpedo shaped structure (4) causing the air flow to increase in velocity towards the centre of the column. The outer part of the column having less velocity will be at higher pressure than the inner and will have an inward force keeping the column intact. By manipulating the air stream and utilising this Coanda effect to cause an amplification of the air volume, only a small quantity of primary air(1) entering through orifice (2) is required to generate a much larger volume of entrained air (5) which is drawn into the air column. The column of air (7) is directed vertically upward towards the ceiling by the shroud (8) exiting at the upper orifice (10). and maintaining sufficient concentration and velocity to enable a displacement of the air near the ceiling of a room. The Vertical Air Mover can be electrically powered by a battery pack (11) housed in the device as in example FIGURE (3) or in a separate power bank (12) as in FIGURE (4) or by an electrical connection chord (13) from the main electrical supply as in FIGURE (1). Another proposed design would be to supply primary air to the Vertical Air Mover from the supply of a high pressure air line to a pneumatic connection (14) as in FIGURE (2) .

Method of control can be through internal sensors (1&2) that monitor the ceiling and floor temperature gradient as in example FIGURE (5) and control the amount of air being moved by the Vertical Air Mover . Alternatively external monitoring can control the amount of air being moved as in example FIGURE (6) where data from ceiling temperature sensor (3) and room thermostat (1) and sender (2) collate temperature information from the ceiling and area (6) and floor area (5) and remotely control the air flow and thermal effect via receiver (4).

CLAIMS.

(1)

This invention relates to a floor standing and self supporting mobile device which creates a column of air from the air which is drawn in at a lower orifice near the floor level using a method of suction that does not require the main volume of an air column to be in direct contact with the air moving drive mechanism .The column of air then exits an orifice at a higher level with sufficient velocity to travel to the ceiling level unaided by a continuous duct thereby displacing the warmer air trapped at the ceiling level so causing a reduction in the temperature gradient of the air between floor and ceiling allowing for a reduction in the heating requirement.

DEPENDANT CLAIMS

(2) The Vertical Air Mover creates a column of air the main volume of which is not passed through a rotating blade device such as a fan or blower.
(3) The Vertical Air Mover is mobile.
(4) The Vertical Air Mover is electrically powered.
(5) The Vertical Air Mover is battery or mains powered.
(6) The Vertical Air Mover can be pneumatically powered via an external air supply.
(7) The Vertical Air Mover causes a reduction in the temperature gradient between floor and ceiling of a room.
(8) The Vertical Air Mover will cause a beneficial decrease in heat energy consumed per perceived comfort for a room.

Application No:	GB1003415.5	**Examiner:**	Stephen Hart
Claims searched:	1	**Date of search:**	14 May 2010

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
A		US 2007/202798 A1 (BILLIOTTE) see figs 14a & 14b and paragraph [0190].
A		JP 2004060894 A (NAKAMOTO) see figs 1 - 3.
A		JP 2003042496 A (NAKAMOTO) see figs 1 - 5.

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} :

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

F04D; F24B

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

Online: WPI, EPODOC, TXTE

International Classification:

Subclass	Subgroup	Valid From
F24F	0007/007	01/01/2006
F24F	0013/26	01/01/2006