



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **94306183.8**

(51) Int. Cl.⁶ : **F24F 13/065, F04D 25/10**

(22) Date of filing : **22.08.94**

(30) Priority : **11.09.93 GB 9318871**

(43) Date of publication of application :
22.03.95 Bulletin 95/12

(84) Designated Contracting States :
AT CH DE DK ES FR GR IE IT LI NL SE

(71) Applicant : **Smiths Industries Public Limited Company**
765, Finchley Road
London, NW11 8DS (GB)

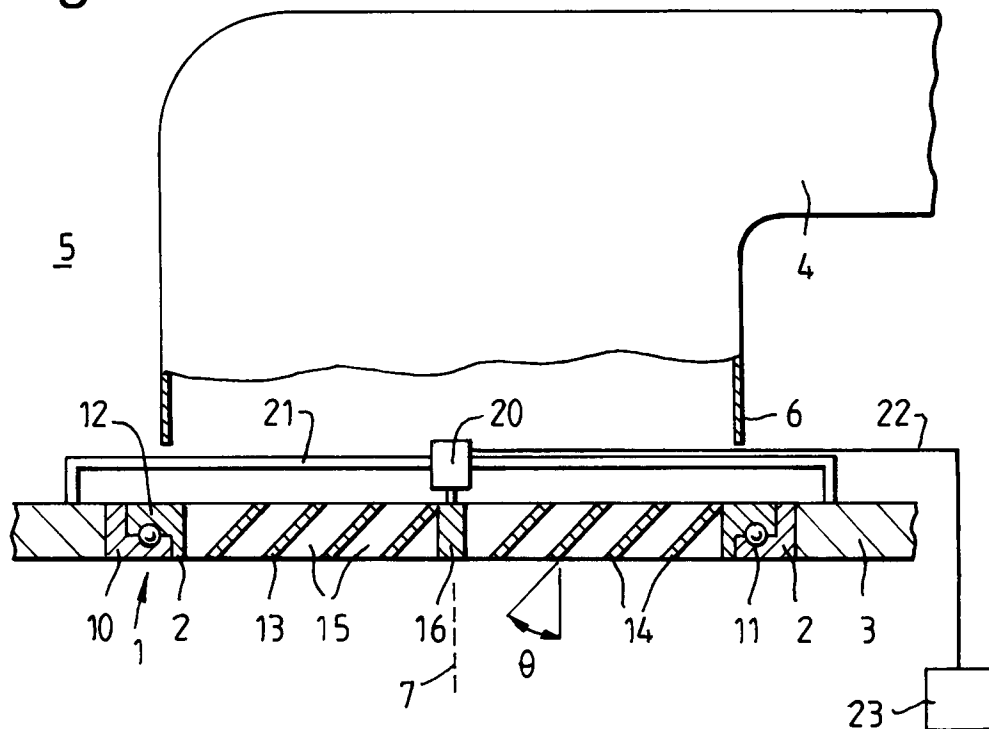
(72) Inventor : **Spearman, Robert Donald Aldo**
Greenacres,
High Broom Lane
Crowborough, East Sussex (GB)

(74) Representative : **Flint, Jonathan McNeill**
765 Finchley Road
London NW11 8DS (GB)

(54) **Ventilation apparatus.**

(57) Ventilation apparatus 1 installed in a ceiling structure 3 has a horizontal deflector plate 13 located below the outlet 6 of a duct 4. The plate 13 has vanes 14 inclined from the vertical at an angle of about 45° and spaced from one another by channels 15 through which air can flow. The deflector plate 13 is rotatably mounted by bearings 11 around its edge and is driven by an electric motor 20 or turbine 30 to rotate the deflector plate slowly about a vertical axis so that air is swept about the vertical axis 7.

Fig.1.



This invention relates to ventilation apparatus of the kind including a deflector mounted in a ceiling structure at the outlet of an air duct.

Ventilation in many buildings is carried out through ducts extending above the ceiling panels within the building. Air is expelled from the duct through grills mounted in the ceiling. This can result in poor overall ventilation because of the localised nature of the outlet grills. In particular, regions immediately below the grill may be draughty whereas regions remote from the grill may be inadequately ventilated. Although the grills can be provided with angled louvers to deflect airflow, this does not entirely overcome the problem.

It is an object of the present invention to provide improved ventilation apparatus.

According to one aspect of the present invention there is provided ventilation apparatus of the above-specified kind characterised in that the deflector is mounted for rotation about a vertical axis such that air flowing through the deflector is deflected away from the vertical axis, and that the apparatus includes a drive for rotating the deflector about the vertical axis so that air emerging from the deflector is swept about the axis as it is rotated.

The drive may include an electrical motor, which may be mounted axially of the apparatus. Alternatively, the drive for rotating the deflector may include a turbine driven by air emerging from the duct. The apparatus preferably includes a plurality of bearings at the outer edge of the deflector. The deflector is preferably a plate with a plurality of vanes inclined from the vertical and separated from one another by channels through which air can flow. The vanes may be inclined at an angle of about 45° to the vertical and the deflector may be rotated at a rate of approximately 10 rpm. The apparatus may include a fan mounted between the deflector and the outlet of the duct and a heater arranged to heat air emerging from the apparatus.

Ventilation apparatus according to the present invention, will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a simplified sectional side elevation of the apparatus;

Figure 2 is a plan view of the apparatus from above;

Figure 3 is a simplified sectional side elevation of alternative apparatus; and

Figure 4 is a simplified sectional side elevation of a further modified form of the apparatus.

The ventilation apparatus 1 is mounted in a circular opening 2 in a horizontal ceiling panel 3. A duct 4 extends in a void 5 above the ceiling panel 3 and terminates in an air outlet 6 directed generally vertically downwards.

The ventilation apparatus 1 has an outer, annular frame 10 of circular shape and secured rigidly to the opening 2 in the ceiling panel 3, below the air outlet 6. The frame 10 includes several bearings 11 supporting the outer edge 12 of a horizontal deflector plate 13. The plate 13 is of a rigid plastics material and of circular shape, being between about 10cm and 100cm in diameter according to the application. A plurality of parallel louvers or vanes 14 extend across the width of the plate 13, the louvers being inclined from the vertical axis 7 by an angle ϕ of about 45°. In the example shown, all the louvers 14 are angled in the same direction but in alternative embodiments, the deflector could have two or more sets of louvers angled in different directions and of different angles. The louvers 14 are spaced from one another by channels 15 through which air is directed. At the central, vertical axis 7 of the deflector plate 13 a boss 16 is attached to the axle of a low-speed synchronous electric motor 20. Alternatively, a higher speed motor with a gearbox could be used. The motor 20 is mounted axially of the apparatus in a vertical orientation on a gantry 21, which extends above the deflector plate 13, and is connected via a cable 22 to a control unit 23. The control unit 23 may be wall-mounted in the same room as the ventilation apparatus 1 so that the apparatus can be controlled by the occupant of the room. Alternatively, the control unit 23 could be connected to the main ventilation system of the building and be controlled by other devices responsive to ambient conditions or to conditions in the duct 4.

In operation, the motor 20 is driven to rotate slowly at about 10 rpm so that the deflector plate 13 is also rotated about its axis at the same rate. Air emerging from the outlet 6 of the duct 4 flows along the channels 15 through the plate 13 and is directed downwardly by the louvers 14 at an angle of about 45° from the vertical. As the deflector plate 13 rotates, the air is swept around the vertical axis 7 to produce a large, swirling, gently ventilated region. In this way, a relatively large region receives the full airflow periodically. This can be preferable to a constant airflow of reduced force, as would be produced by a static deflector.

Instead of an electric motor 20, the ventilation apparatus could include a turbine 30 as shown in Figure 3. The turbine 30 is in the form of a fan mounted above the deflector plate 13' and coupled to its central boss 16' via a reduction gearbox 31. Airflow out of the duct 4' rotates the turbine 30 and hence the deflector plate. This arrangement avoids the need for electrical connection to the apparatus.

Various modifications are possible. For example, as shown in Figure 4, a greater ventilation effect can be achieved by including an electric fan or impeller 40 mounted between the deflector plate 13'' and the outlet of the duct 4''. A heater could also be included, such as an electrical heating element 41 or heat exchanger arranged to heat air emerging from the apparatus.

Claims

- 5 **1.** Ventilation apparatus including a deflector mounted in a ceiling structure at the outlet of an air duct, characterised in that the deflector (13, 13') is mounted for rotation about a vertical axis (7) such that air flowing through the deflector is deflected away from the vertical axis, and that the apparatus (1) includes a drive (20, 30, 31) for rotating the deflector about the vertical axis so that air emerging from the deflector is swept about the axis as it is rotated.
- 2.** Ventilation apparatus according to Claim 1, characterised in that the drive includes an electric motor (20).
- 10 **3.** Ventilation apparatus according to Claim 2, characterised in that the motor (20) is mounted axially of the apparatus (1).
- 4.** Ventilation apparatus according to Claim 1, characterised in that the drive for rotating the deflector (13) includes a turbine (30) driven by air emerging from the duct (4').
- 15 **5.** Ventilation apparatus according to any one of the preceding claims, characterised in that the apparatus (1) includes a plurality of bearings (11) at the outer edge of the deflector (13, 13').
- 6.** Ventilation apparatus according to any one of the preceding claims, characterised in that the deflector is a plate (13, 13') with a plurality of vanes (14) inclined from the vertical and separated from one another by channels (15) through which air can flow.
- 20 **7.** Ventilation apparatus according to Claim 6, characterised in that the vanes (14) are inclined at an angle of about 45° to the vertical (7).
- 8.** Ventilation apparatus according to any one of the preceding claims, characterised in that the deflector (13) is rotated at a rate of approximately 10 rpm.
- 9.** Ventilation apparatus according to any one of the preceding claims, characterised in that the apparatus (1) includes a fan (40) mounted between the deflector (13) and the outlet (6) of the duct (4).
- 25 **10.** Ventilation apparatus according to any one of the preceding claims, characterised in that the apparatus (1) includes a heater (41) arranged to heat air emerging from the apparatus (1).

30

35

40

45

50

55

Fig.1.

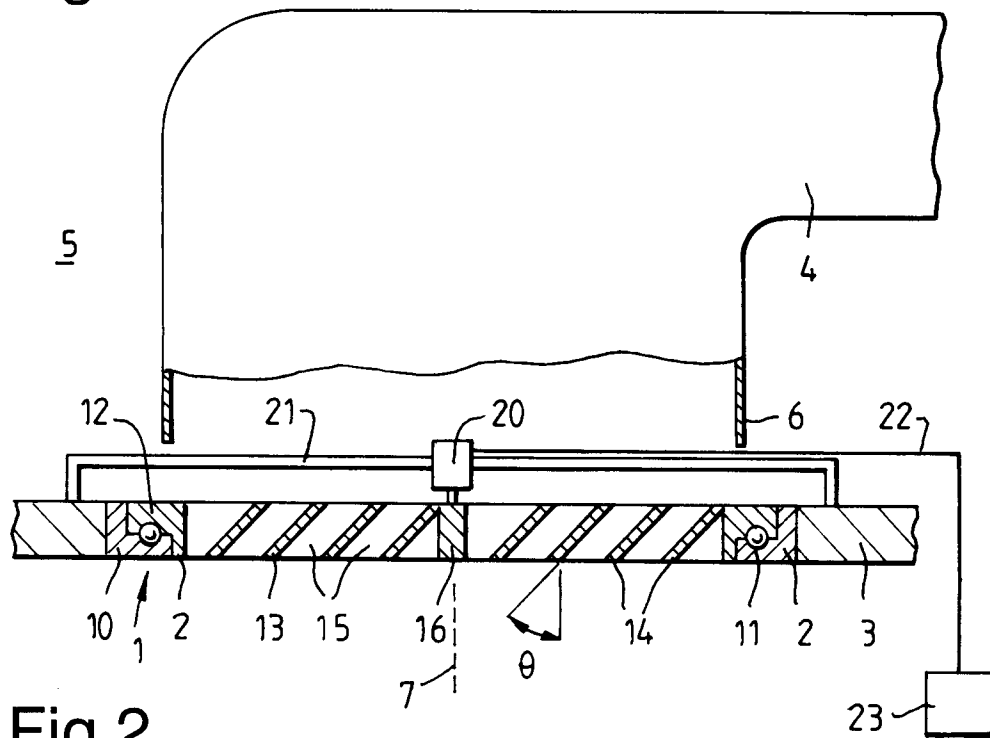


Fig.2.

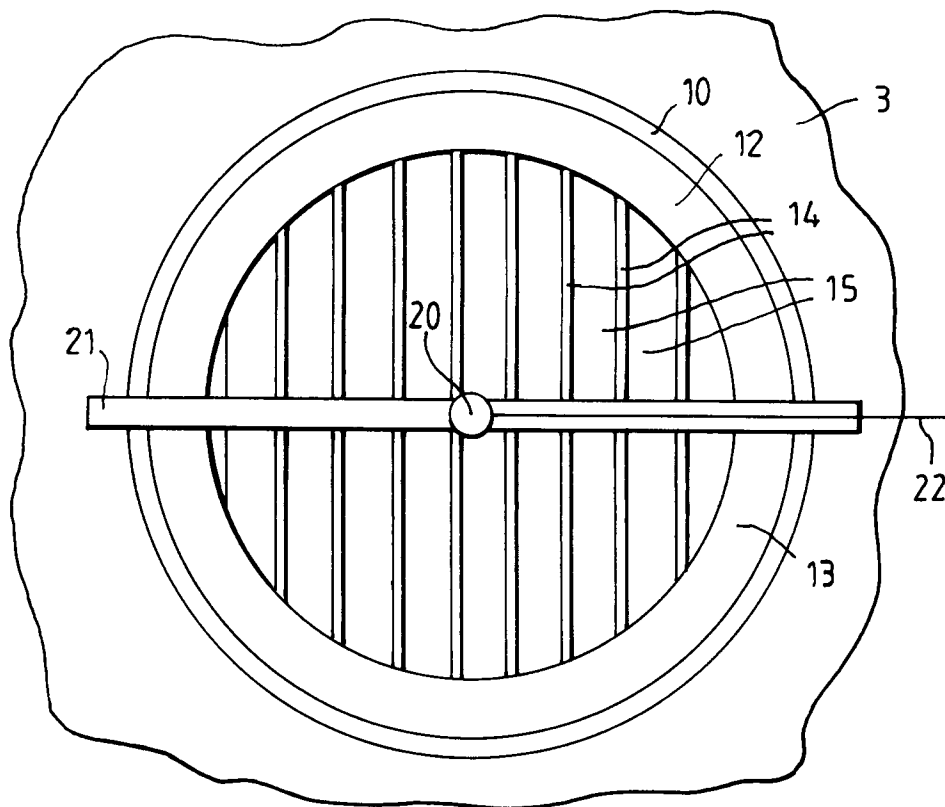


Fig.3.

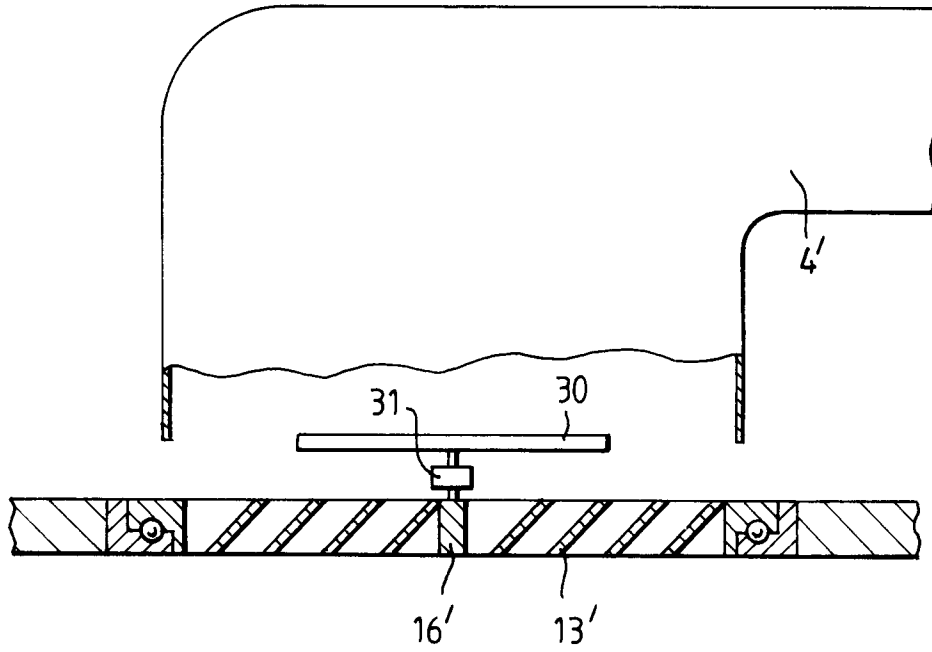
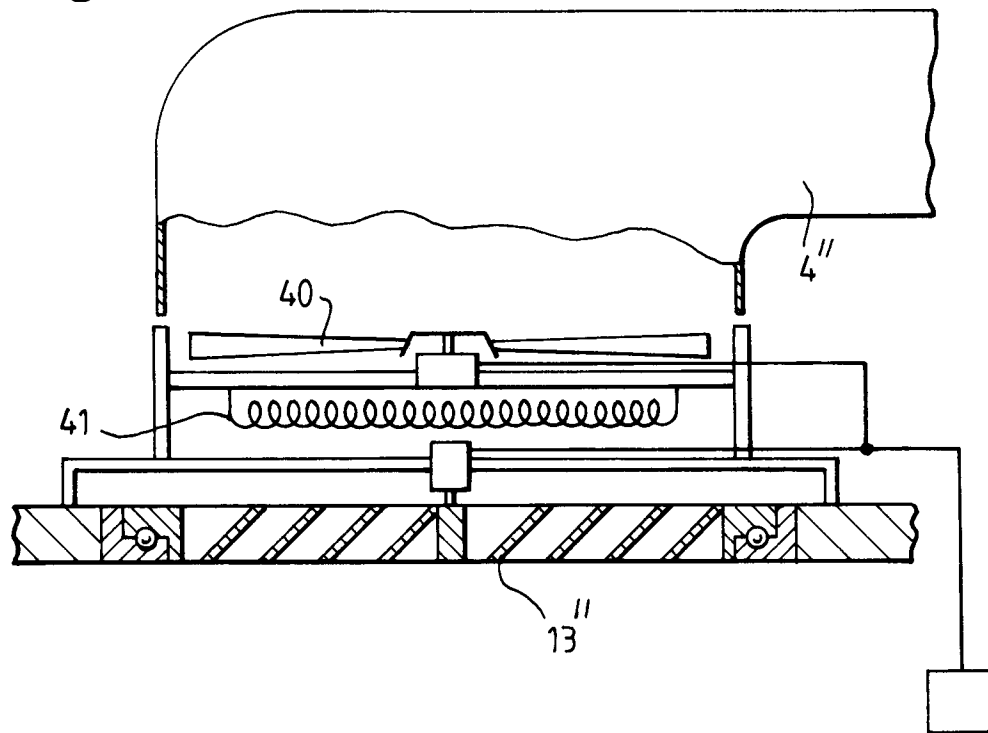


Fig.4.





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 6183

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.6)
X	PATENT ABSTRACTS OF JAPAN vol. 14, no. 97 (M-0940) 22 February 1990 & JP-A-01 305 247 (MATSUSHITA ELECTRIC) 8 December 1989 * abstract *	1-3, 7-10	F24F13/065 F04D25/10
Y	-----	4-6	
Y	GB-A-2 073 818 (HITACHI) * abstract; figure 1 *	5, 6	
Y	----- GB-A-2 088 953 (SANYO ELECTRIC) * abstract; figure 1 * -----	4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F24F F04D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 December 1994	Examiner Peschel, G
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 03.92 (P04C01)