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D E C I S I O N
of 23 March 1994

Case Number: T 0285/92 - 3.2.3

Application Number: 85905239.1

Publication Number: 0199762

IPC: F24F 1/01

Language of the proceedings: EN

Title of invention:
Apparatus and method for ventilating rooms

Patentee:
Fläkt Aktiebolag

Opponent:
I Heinrich Nickel GmbH
II Gebrüder Trox Gesellschaft mit beschränkter Haftung

Headword:
-

Relevant legal norms:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Headnote/Catchword:

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Case Number: T 0285/92 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 23 March 1994

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office dated 24 February 1992 concerning maintenance of European patent No. 0 199 762 pursuant in amended form.**

Composition of the Board:

Chairman: C.T. Wilson
Members: J. du Pouget de Nadaillac
L.C. Mancini

Summary of Facts and Submissions

I. The appeal is directed against the interlocutary decision dated 4 February 1992 of the Opposition Division of the EPO with the written grounds being sent on 24 Februar 1992. According to this decision, the European patent No. 0 199 762, granted on the basis of European application No. 85 905 239.1 filed as an international application PCT/NO85/00069, is maintained in amended form.

II. Claim 1 of this European patent, in amended form, reads as follows:

"A method of producing an air flow for ventilating a room by displacement ventilation wherein ventilating air is introduced into the room in an essentially horizontally directed and uniformly diffused non-turbulent flow, by reducing the velocity of the ventilating air through expansion and by passing it through at least one screen-like opening, characterised by the steps of:
mixing fresh air and room air together by an induction effect caused by forming at least one jet of fresh air directed vertically downwards to form the ventilating air, and
introducing said mixed air into the room close to floor level, said room air being taken from a level higher than the level at which the mixed air is introduced into the room and along and adjacent to the upper restricting edge of the at least one screen-like opening."

The other independent claim, namely Claim 3, which remains as granted, reads:

"Apparatus for displacement ventilation, consisting of at least one device (1) for blowing ventilation air into a room, said device (1) having a single coherent screen-like opening for blowing the ventilation air into the room, the opening extending upwards from close to floor level and being designed for providing over essentially the entire surface of the opening an essentially horizontally directed and uniformly distributed flow of air into the room, said opening being covered by a perforated plate or two or more perforated plates (10) arranged in series one after the other and/or by a filter surface, characterised in that at least adjacent and along the upper restricting edge of the screen-like opening, at least one inlet opening (3) arranged for sucking secondary air from the room into a mixing chamber (4) is provided and that induction means (2a, 2b) adapted for blowing at least one jet of primary air downwards to the screen-like opening are arranged inwardly of said inlet opening (3) in order to suck in said secondary air from the room through the opening (3) by means of induction."

III. According to the contested decision, the method and apparatus according to Claims 1 and 3 respectively imply an inventive step even in the light of the most relevant documents (1) and (2), included in the following documents which were considered during the opposition proceedings:

1. DE-A-30 44 080
2. DE-A-27 54 699
3. GB-A-21 27 145
4. US-A-21 35 461
5. US-A-43 16 406

6. DE-A-33 04 151
7. DE-Zeitschrift "HLH"27, (1976), Nr. 10, pages 366 to 372
8. DE-Zeitschrift "Wärme-, Lüftungs- und Gesundheitstechnik, Oktober 1966, p. 245
9. Rox-Prospekt "Deckeninduktionsgerät mit Schlitzauslaß", Type KES 4251 A1, 1975.

IV. Appellant I (Opponent I) lodged the appeal on 13 April 1992 and paid simultaneously the appeal fee. In his statement of grounds received on 3 July 1992, a new document was cited, namely:

10. US-A-26 63 244

Appellant II (Opponent II) lodged the appeal on 31 March 1992 and paid the appeal fee at the same time. His Statement of Grounds was received on 11 June 1992.

V. During oral proceedings held before the Board on 23 March 1994, the Appellants objected essentially the lack of inventive step in the light of documents (1) and (2).

The Appellants argued as follows:

Document (2), which represents the closest prior art, discloses a displacement ventilation method. Thus, the feature of the characterising part of Claim 1, that air is introduced into the room close to floor level, is already known from this prior art, which, further, teaches at page 8 that the introduction of fresh air creates a stratification of the air. The nature of the air introduced is however not mentioned in this prior art, so that an open problem thereupon lies for the person skilled in the art. As indicated by the description of the patent in suit, the introduction of

air can produce the so called "cold slide effect" and one problem underlying the present invention is, therefore, to avoid this effect.

The man skilled in the art faced with the problem of avoiding this effect and determining the air to be introduced will immediately take into account the teaching of document (1), which solves both problems by supplying into the room to be ventilated a mixture of fresh air and room air obtained by an induction effect, as is the case with the present invention according to Claim 1. It is accepted that, when a ventilation of the room is wished, the teaching of this document (1) differs from the teaching of document (2), since the ventilation air is directed to a hollow space under the floor and delivered into the room trough openings of the floor, but this is clearly given only as an example. Another opening located close to the floor level is provided for the mixed air in case of heating, and it is obvious to use it for a displacement ventilation without the heating means. Moreover, a displacement ventilation is, in fact, suggested in this prior art, since the mixed air is given as turbulent only in the hollow space under the floor and is, then, supplied into the room at a very low flow rate, see page 4, lines 10 to 15. Therefore, a combination of documents (1) and (2) is obvious and leads to the subject-matter of Claims 1 and 3 of the contested patent.

The second and last feature of Claim 1 is vague with regard to the exact level at which room air is taken, in particular since Figure 1 of the contested patent shows a wall between the said level and the upper edge of the screen-like opening. Moreover, this feature is suggested by document (1), since, in this prior art, the room air is taken from a level under the window bench, so in the lower part of the room, as indicated on page 3, line 23.

The choice for such a level is, moreover, very limited: The curves A and B shown in Figures 2 and 3 of the contested patent are well known in the art and the skilled person knows that room air cannot be taken from either a too high level, since the air is contaminated, or a too low level, since, in this case, it is not warm enough. This specialist has also a basic knowledge of the flow laws and, therefore, knows that the flow of air, which is removed through an opening (flow into a sink, "Senkenströmung"), does not influence a jet air flow ("Strahlströmung") issuing from another opening, even when the two openings are very close to each other. In view of these considerations, he is forced to choose the removal position of the room air according to the contested Claim 1.

For all these reasons, the subject-matter of Claims 1 and 3 is obvious in the light of the combination of documents (1) and (2).

In their written submissions, the Appellants have additionnally mentioned document (6), because it discloses a displacement ventilation method, in which room air is mixed by induction effect with fresh air and the mixed air is introduced into the room through a screen. Document (4) also is relevant, since it discloses room and fresh airs which are mixed by induction and horizontally introduced into the room through venetian blind elements.

VI. The Respondent (Patentee) disputed that document (1) concerns displacement ventilation and held that already the combination of this document with document (2) is not obvious. One of the main problems with displacement ventilation is a disturbance of the stratification and document (1) gives no hint that the removal of room air does not disturb the stratification.

Moreover, this document, as well as all other cited documents, does not suggest locating the removal of room air at a position very close to the output screen of the device.

VII. The Appellants requested that the decision under appeal be set aside and that Europen patent No. 0 199 762 be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained as amended in the opposition proceedings or on the basis of an auxiliary request presented at the oral proceedings and combining Claims 1 and 2.

Reasons for the Decision

1. The appeal is admissible.

2. The valid Claim 1, amended during the opposition proceedings, contains all the features of granted Claim 1, with additionally a reference to "displacement ventilation" and a more limited definition of the room air intake position, which was a feature of the originally filed Claim 3. Thus, the wording of Claim 1 does not give rise to any objections under Article 123 EPC.

3. Novelty of the subject-matter of the claims is no longer disputed and the Board agrees that none of the cited documents discloses a method or an apparatus according to either Claim 1 or Claim 3.

4. In the opinion of the Board, the ventilating apparatus disclosed in document (2) represents the closest prior art, preferably to the device described in document (1),

which was considered in the opposition procedure to represent the closest prior art. The main reason, which is dealt with in more detail below, is that, in the Board's opinion, document (1) does not deal with displacement ventilation.

Document (2) mentions the problem of introducing fresh air without mixing it with contaminated air and without subjecting persons to draughts, that is to say to the cold slide effect. According to the citation, one solution consists in arranging at floor level a ventilation diffuser comprising a distribution pipe having a plurality of nozzles and incorporated within a vertical screen. This screen is provided with a large number of perforations, such that, even if a turbulent air flow is supplied by the pipe within the screen area, it is equalized by passing through the perforated surface of the screen. The rate of flow in front of the screen is very low and a flow of fresh air perpendicular to the perforated surface is obtained, causing a layering of the air.

The way in which the ventilation air is introduced into a room is consistent with the principle of so called "displacement ventilation": Air having a lower temperature than the air within the room to be ventilated is introduced horizontally at floor level, in a laminar manner and with a low velocity, so that, in the room, a lower layer of fresh air with a low relative concentration of contaminants is obtained. Heat sources, such as seated persons, computer terminals, etc., generate convection flows in the room, which draw the supply air from the lower part of the room up towards the ceiling. The air, similarly to a piston, pushes the contaminants ahead of itself, without destroying the zones of stratifications formed in the room, i.e. a lower zone of fresh air and an upper contaminated zone.

5. The problem to be solved according to the description of the patent in suit is to provide an improved method of ventilation using displacement ventilation with increased field of use due to:

(a) reduced risk of draft along the floor
(b) reduced temperature differences feet-head
(c) improved cost of operation
(d) reduced investment costs.

According to Claims 1 and 3, this problem is solved by the introduction into the room to be ventilated of a mixture of fresh air and room air, said room air being taken from a lower zone of the room, which contains relatively pure air. Due to this mixture, the introduced air mixture has a higher temperature than the supplied fresh air, hence a temperature close to the room temperature. Therefore, the cold slide effect is avoided and the temperature differences feet-head is reduced. Moreover, a lower supply of fresh air is needed, so that less energy is consummed by the fan, and less cumbersome devices can be employed, solving thereby the part objects (c) and (d).

6. Document (1), indeed, mentions the problem of room drafts caused by the ventilation air and solves this problem by mixing fresh air with room air by means of induction, as is the case with the present invention. This solution, based on the principle of induction, is in fact well-known in the general field of ventilation, as shown by several other documents, but not in the field of displacement ventilation. In particular, the apparatus known from document (1), is not intended for use in a displacement ventilation method and, contrary to the Appellants's assertion, does not suggest such a method:

The apparatus disclosed by this document (1) requires for the room to be air-conditioned a false floor provided with outlet openings through which a mixture of fresh air and room air can be vertically discharged into the room. The apparatus itself is located under a window ledge and comprises an induction chamber associated with heating means. The room air inlet of the induction chamber is located just under the window ledge and through this inlet the room air is sucked into the induction chamber by means of a jet of fresh air directed vertically downwards. Reaching the floor level, the resulting air mixture is selectively directed by a pivotable flap either to an inlet opening of the false floor or to a vertical outlet opening of the induction chamber located at floor level. Depending on whether heating or ventilating of the room is wanted, the apparatus according to this document (1) works differently: When heating is required, the flap is positioned so that the vertical outlet opening of the induction chamber is open and the air mixture, exiting from this opening, abuts against the parallely disposed heating means and, being upwards deflected, is heated by sweeping along the heating means. In the ventilating mode, the air mixture is directed through the inlet opening of the false floor into the intermediate space of the floors and, then, discharged into the room by the openings of the false floor, which are each covered by a screen.

7. Contrary to the Appellants' opinion, document (1) does not disclose or suggest displacement ventilation. Air in the ventilation mode of the apparatus according to that citation is supplied vertically into the room through openings of the floor and it is clearly emphasised in the whole document (see, in particular, page 3, lines 22 to 31) that a turbulent air flow is obtained in the zone for occupation by persons. Although mention is made in

lines 10 to 15 of page 4 to a low velocity for the air supplied through the openings, it is only stated to be low enough not to reach the ceiling. Therefore, air movements are not excluded, on the contrary they are wished as long as they do not come into contact with the warm air layers of the upper part of the room. However, in the absence of any special separating means, it is not clear to what extent it is possible to have a circulating turbulent lower layer and an upper still layer of air. The main teaching of this prior art is to obtained a permanent mixture of fresh air and room air, and therefore turbulent flows in the lower part of the room in order to avoid the cold slide effect and, for this reason, vertical air mixture streams are provided, the effect of which is quite opposite to the building of an air stratification. Thus, at least in the occupation zone of the room, air is discharged in a non-laminar manner.

Moreover, the outlet openings for this air mixture in the floor are each provided with a mere screen, and no idea is given to provide such a screen so that an "uniformly diffused non-turbulent air flow" is obtained, as required by the preambles of Claims 1 and 3 of the patent in suit.

Thus, since the principle underlying the displacement ventilation technique is based on the creation of the least possible movement in the room air, a person skilled in the art, who wishes to improve this technique, would not have considered document (1), the teaching of which goes in an opposite direction, since it is based on the dilution technique.

8. Moreover, the argument of the Appellants, that the skilled person would realise that he could use the vertical opening, close to the floor, of the heating

mode, can only be considered as the result of a hindsight view, since no suggestion appears in document (1) to do so. Such a use would require the suppression of the heating means and, further, the mounting on the vertical opening of an appropriate screen for displacement ventilation.

9. Document (1), additionally, does not suggests the last feature of Claim 1 in suit. In page 4 of this prior art, it is recommended to locate the inlet opening for the room air to be mixed and the outlet openings for the ventilation air distant from each other, so that both short-circuit flows between these two kinds of openings and zones with too low temperatures and too great turbulences are avoided. Thus, this document leads away from a removal of room air at a position above and adjacent the output screen for the ventilation air, as claimed by the present invention.

It may be that, once a person skilled in the art has decided to apply the induction principle in a displacement ventilation technique, the choice for the location of the intake opening for the room air is limited. However, the idea itself of removing air from a room, in which a displacement ventilation is wanted, is not obvious in the absence of any suggestion, since the person skilled in the art would have thought that such a removal would disturbe the stratified air condition within the room, which is typical of displacement ventilation. Document (1) with the above mentioned recommendation confirms this prejudice and, in fact, dissuades the person skilled in the art from applying the induction effect in a displacement ventilation. The explanation of the flow laws made by the Appellants does not help in this respect, since it only concerns the influence between inlet and outlet flows, and not the whole air stratification of the room.

10. Document (6) teaches the application of the induction principle in theatres. According to this prior art, a cold slide effect is avoided by blowing a mixture of fresh air and room air through the perforations of a vertical screen placed under the seats of the spectators. However, no idea is given to discharge the air streams through this screen in such a way that a displacement ventilation occurs. In document (4), a mixture of fresh and room air is projected by means of a fan, hence with a great velocity, through louvre elements located at an intermediate level of the room, quite above the floor level. It follows that, also from these documents, no incentive is given to combine the induction principle with a displacement ventilation.

11. Hence, in the light of all these documents, it would not have been obvious for a person skilled in the art to arrive at the claimed solution of the existing problem. The subject-matter of Claims 1 and 3 involves, therefore, an inventive step. The dependent Claims 2, 4 and 5, describes further embodiments of the claimed method or apparatus, and therefore are also patentable.

Under these circumstances, it is unnecessary to examine the auxiliary request.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Maslin C.T. Wilson