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(54) Supply air terminal device.

(57) The present invention relates to a supply air terminal device comprising a casing (1) having a perforated front cover (2) through which air exits into a room, and a distribution chamber formed within the casing (1) and intended to receive air from a supply channel (4), the distribution chamber (3) comprising a wall (5) provided with openings (7) and functioning to release air from the distribution chamber (3) in a divergent flow pattern, wherein the wall (5) is disposed in a direction parallel with the air delivered from the channel (4) and has mutually parallel zones (6), which extend along the direction and which include first zones (6a) having openings (7) configured to release air obliquely rearwards in relation to the flow direction of the air supplied through the channel (4), and second zones (6b) having openings (7) configured to release air substantially perpendicular to the direction; and in that the first and the second zones (6a,6b) are disposed in a mutually recurring, consecutive pattern along the aforesaid direction.

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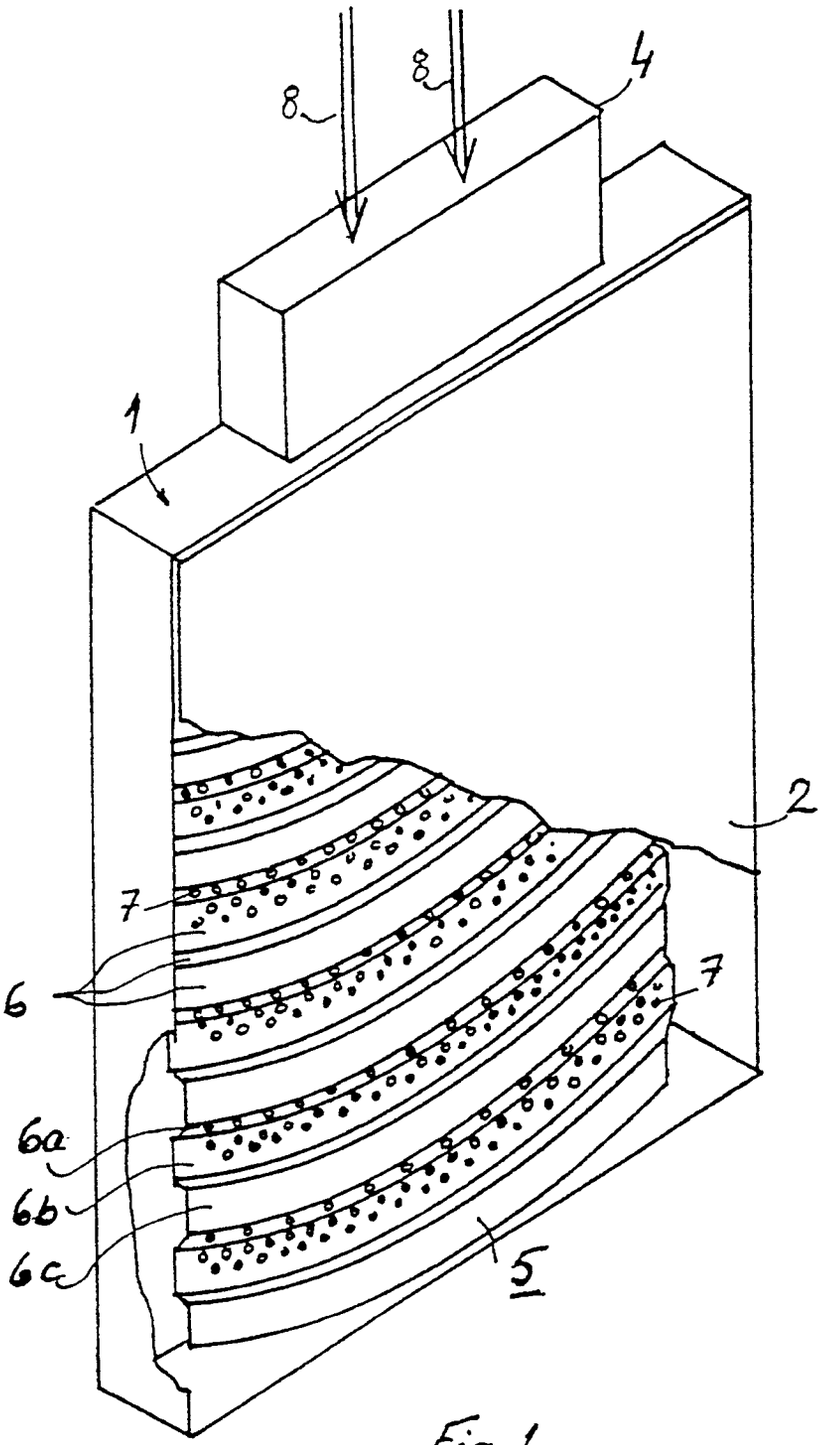

Fig 1

A SUPPLY AIR TERMINAL DEVICE

The present invention relates to a supply air terminal device comprising a casing having a perforated front cover through which air is released into a room, and a distribution chamber formed within the casing and functioning to receive air from an air supply channel, said distribution chamber having a perforated wall through which air exits from the distribution chamber in a divergent flow pattern.

A supply air terminal device of the kind described above is taught by Swedish Published Specification SE-B-8306695-1. The perforated wall of this device is curved so as to provide a divergent flow pattern, and is combined with a substantially flat front cover. This enables integrated wall structures and like structures to be constructed, without impairing the air supply properties of the device. In order to guide and direct the air flow through the openings in the wall in the manner desired, it is proposed that deflecting means, in the form of an insert, are mounted at each opening. The provision of such deflecting means in the case of the aforedescribed wall structure is necessary in order to obtain a desired flow pattern, seen in the vertical plane (the vertical extension plane), so that air is delivered to the room as effectively as possible without the risk of uncomfortable floor draughts or the like. Naturally, the provision of these deflecting means makes the supply air terminal device more expensive, both from the aspect of manufacture and from the aspect of installation. The two other proposals made in the published specification with respect to directing the air flow have not been found to fulfill those requirements placed thereon and consequently have never been used commercially.

DE-B-1 124 658 describes a wall configured with apertures or openings for releasing air in a desired pattern, in which those parts of the walls in which the openings are found are slightly inclined. In this way it is possible to compensate for air velocities which would otherwise give rise to an oblique component of the released air flow and therewith obtain an outgoing air flow at substantially right angles to the wall, which corresponds to the desired flow pattern according to said publication.

For a similar purpose, SE-B-8105785-3 proposes a main air flow distribution device in the form of a perforated wall which functions to deflect a flow into a plurality of part flows which pass through the perforations to the other side of the wall in a direction transversely to the direction of said main flow. In this case the wall comprises a profiled plate having profiled parts which extend transversely to the direction of the main flow adjacent to one or more perforations, and therewith forming said deflection means. The perforated wall obtains a sawtooth or stepped-like configuration. The essential features of this known device is that the deflecting means operative to deflect flow through the perforations are located downstream of respective perforations and immediately adjacent thereto at a distance which must at least be considerably smaller than the diameter of the perforations.

Intermediate walls of the profiled configuration proposed here have, however, been unable to replace the intermediate wall provided with loose deflecting means in the openings, in accordance with SE-B-8306695-1, since the intended and desired distribution of air to a room with the aid of a supply air terminal device has not been attainable in a satisfactory manner.

When supplying air to a room with the aid of a supply air terminal device problems occur, for instance, in the form of draught sensations (floor draughts etc.) when the distribution of air is unsuitable. This is contingent, among other things, on the configuration of the vertical flow pattern, in which the shortest so-called immediate zone is desired. By "immediate zone" is meant the zone nearest the terminal device within which the sensation of draughts is manifested and, more technically, is the zone defined by the distance from the terminal device where the air supplied has a velocity of 0.2 m/s. Even the horizontal flow pattern has significance in the context of obtaining the shortest possible immediate zone in all air directions. The air distribution also influences temperature distribution within the occupied zone, and hence temperature measurements in occupied zones can be of interest in this context. For instance, according to one ISO-standard, the temperature is measured outside the so-called immediate zone, partly at floor level (0.1 m above the floor surface) and partly at a height of 1.1 m. The difference between the measured temperatures should be as small as possible, and should be less than 3°C for comfort purposes. It has been found that the results concerned with short immediate zones and small temperature differences are primarily influenced by the behaviour of the air as it exits from the terminal device. Optimal results are obtained when the air is first given an upwardly extending direction and is thereafter allowed to fall straight down as close as possible to the terminal device, and preferably in the absence of a horizontal velocity component, and then allowed to disperse quietly and gently over the floor surface with an air-displacing purpose, subsequent to the impact losses experienced by contact with the floor surface. The air should not mix with the impure air which shall be evacuated upwards in the room. Air supply terminal devices known hitherto have been unable to satisfy all of these requirements simultaneously, which also applies to the use of loose deflecting means in accordance with SE-B-8306695-1.

The present invention relates to an air supply terminal device which obviates the need of loose deflecting means and which, at the same time, provides an air distribution pattern of the aforesaid kind which provides a satisfactory result. The invention is characterized by the features set forth in the following claims.

The inventive air supply terminal device thus includes a wall which has a plurality of mutually parallel zones comprising a first array of zones provided with openings which are intended to enable air to exit obliquely rearwards in relation to the direction of air flow supplied through the air supply channel of said device, and a second array of zones having openings which are intended to enable air to exit substantially at right angles to the direction of the supplied air.

The wall may be configured in accordance with one of two preferred, different embodiments. The principle difference between these embodiments is that according to one embodiment the wall is profiled or bent at the various zones such that the air will exit in the required flow directions, principally at right angles to the wall surfaces surrounding said openings, whereas in the case of the second preferred embodiment, the wall is not bent or profiled, but that the openings are instead formed in the wall in a manner such as to obtain the same air outflow effect through said openings.

Thus, according to the first preferred embodiment, the wall surfaces located within the zones in which the air exits obliquely rearwards from the device are inclined in relation to the direction of the supplied air flow, whereas the wall in the other perforated zones is located closer to the front cover than the wall surfaces in those zones which lack openings, wherein the wall surface located in the two last mentioned arrays of zones extends substantially parallel with the direction of the supplied air flow.

According to the second preferred embodiment, the wall surface located within those zones in which air exits obliquely rearwards from the device extends substantially parallel with the supplied air flow and the openings in said surface are configured so that the air will exit obliquely in relation to the wall. The openings are preferably punched in the wall in a manner to provide inverse eyelid-like configurations exhibiting a substantially upwardly directed oval or narrow slot.

The perforated profiled wall is preferably made from rolled metal sheet which is capable of being given the desired profile and also of being manufactured with the aid of standard methods and which can be bent or curved transversely, i.e. perpendicularly to the zones. In order to stiffen the wall, the wall is preferably bent at its imperforate zones. Preferably, the zones are arranged consecutively with an imperforate zone at the very bottom of the wall.

The perforated non-profiled wall is preferably manufactured from thin metal sheet, by punching from the sheet openings of suitable configuration, for instance the eyelid-configuration described above. The parallel zones will normally extend horizontally, but in the case of walls provided with separate side pieces arranged at angles to the centre piece, the parallel zones may be obliquely inclined to the horizontal plane.

The openings in the wall will preferably have a diameter or width of at least 6 mm and may advantageously be positioned so as to form a so-called triangular dividing pattern with a pitch of at least twice the diameter or width, preferably at least three times this measurement.

The perforated wall surface is preferably given a cross-section configuration which will provide the desired flow pattern. In this connection, the wall is normally curved towards the front cover when said cover is straight or convex. In the case of geometrically complicated supply air terminal devices, an advantage is afforded when deflecting means are mounted between the wall and the front cover for the purpose of directing air laterally in the manner desired.

The invention will now be described in more detail with reference to an exemplifying embodiment thereof and also with reference to the accompanying drawings.

Figure 1 of the drawings is a partially sectioned, perspective view of an inventive supply air terminal device. Figures 2-6 are principle drawings which illustrate the positioning and various configurations of the perforated wall. Thus, Figure 2 is a horizontal view of the device illustrated in Figure 1, Figures 3-4 are vertical sectional views of mutually different configurations of an inventive perforated wall, whereas Figures 5 and 6 illustrate different possibilities of forming the wall in relation to the front cover.

Figure 1 illustrates an air supply terminal device comprising a casing 1 having a substantially flat front cover 2 for releasing air into a room, and a connector 4 by means of which the casing 1 can be connected to an air supply channel, not shown. Arranged within the casing 1 is a distribution chamber 3 (this chamber cannot be seen in the Figure 1 illustration) which is intended to receive air flowing from the supply channel and which is partially defined by a perforated wall 5 which is convex towards the front cover 2 and which is configured in accordance with one of the preferred inventive embodiments (Claim 3). The wall 5 presents substantially horizontal and mutually parallel zones 6, of which the openings 7 of one array of zones 6a are directed obliquely upwards, since the wall 5 in the region of these zones 6a is inclined obliquely downwards and outwards from an imperforate array of zones 6c, and which have a substantially vertical direction and therewith extend parallel with the main direction of the incoming air flow 8. The zones 6c are also located closer to the distribution chamber 3 than the remaining zones. A further array of zones 6b is also arranged vertically and below the zones 6a but closer to the

front cover 2 than the remaining zones. The zones 6b present horizontally directed openings 7 in the region nearest the zones 6a. The openings 7 are arranged in the wall 5 for releasing the air in a direction towards the front cover 2 in a divergent flow pattern. The dimensions and configuration of the substantially flat front cover 2 in other respects are chosen so as not to influence negatively the divergent character of the flow pattern.

The curved wall 5 is attached to and sealed against the rear wall of the casing 1 in a manner to define the distribution chamber 3 between the rear wall of the casing 1 and the wall 5.

In the case of the illustrated embodiment, the perforated wall 5 is convexly curved, although the wall 5 can be given other configurations, as shown below.

Figure 2 is a principle drawing which illustrates a horizontal section of the supply air terminal device described with reference to Figure 1. Figure 2 illustrates the distribution chamber 3 located within the casing 1 and partially defined by the wall 5, said chamber functioning to distribute air through the wall 5 and out towards and through the front cover 2 in the arrowed flow directions. The drawings also indicates the provision of deflecting means 9 for distributing air in a lateral direction.

Figure 3 illustrates schematically one embodiment of the wall 5 in which those openings which are intended to direct exiting air obliquely rearwards in relation to the direction of the incoming air flow, here indicated by a downwardly directed arrow, are formed in a zone of the wall which is oblique in relation to the direction of said air flow. Remaining openings are formed in zones where the wall 5 is parallel with the air flow direction. Figure 4 illustrates in a similar manner an embodiment of the wall 5 in which the openings intended to direct the exiting air obliquely rearwards are formed by bending the wall under the actual opening itself, which in this case preferably has the form of a narrow slot in a plane substantially perpendicular to the air flow.

Figure 5 illustrates schematically different shapes of the wall 5 in relation to a flat front cover 2 and indicates the air flow directions. As illustrated in Figure 6, the wall 5 can, in principle, completely surround the distribution chamber 3 and may itself be surrounded completely by the front cover 2, therewith imparting to the device a cylindrical shape, when such a shape is required or desired in special circumstances.

Example

Various types of air supply terminal devices, including the inventive device, were tested at Stifab laboratories and the air distribution patterns obtained with these devices were compared.

The air distribution pattern was determined by measuring the size of the immediate zone and also by measuring temperature differences in accordance with ISO-standards. All of the terminal devices used when carrying out these measurements had a semi-circular shape, since devices of this shape are those generally used.

It was found that the inventive supply air terminal device had an immediate zone which was approximately 10% shorter than the immediate zone of the next best alternative, according to the measurements taken, namely a device provided with inserts in accordance with the teachings of SE-B-8306695-1.

The temperature measurements revealed that the temperature differences measured in accordance with the above were smallest with the device constructed in accordance with the invention. The temperature difference measured with the inventive device was also found to be an approximately 10% improvement on the temperature differences measured with the remaining devices.

Claims

1. A supply air terminal device comprising a casing (1) having a perforated front cover (2) through which air exits into a room, and a distribution chamber (3) formed within the casing (1) and intended to receive air from a supply channel (4), said distribution chamber (3) comprising a wall (5) provided with openings (7) and functioning to release air from the distribution chamber (3) in a divergent flow pattern, **characterized** in that the wall (5) is disposed in a direction parallel with the air delivered from the channel (4) and has mutually parallel zones (6), which extend along said direction and which include first zones (6a) having openings (7) configured to release air obliquely rearwards in relation to the flow direction of the air supplied through the channel (4), and second zones (6b) having openings (7) configured to release air substantially perpendicular to said direction ; and in that said first and said second zones (6a,6b) are disposed in a mutually recurring, consecutive pattern along said direction.

2. A device according to Claim 1, **characterized** in that the zones (6) also include third zones (6c) which lack openings.

3. A device according to Claim 2, **characterized** in that the wall (5) in the first zones (6a) is inclined relative to said direction of the supplied air ; in that the wall (5) in the second zones (6b) is located closer to the front cover (2) than the wall (5) in the third zones (6b) ; and in that the wall (5) in both of the lastmentioned zones (6b, 6c) is substantially parallel with the direction of the supplied air.

4. A device according to Claim 1 or 2, **characterized** in that the wall (5) in the first zones (6a) is substantially parallel with said direction of the supplied air ; and in that the openings (7) in the first zones (6a) are configured such that the air will exit obliquely in relation to the wall (5).

5. A device according to any one of Claims 1-4, **characterized** in that the openings (7) in the wall (5) form a triangular distribution pattern having a pitch which is at least twice the diameter or width of the opening, preferably at least three times said measurement.

6. A device according to any one of Claims 1-5, **characterized** in that the wall (5) has a horizontal cross-section configured to produce the desired flow pattern.

7. A device according to any one of Claims 1-6, **characterized** in that deflecting means (9) for directing air laterally in the manner desired are mounted between the wall (5) and the front cover (2).

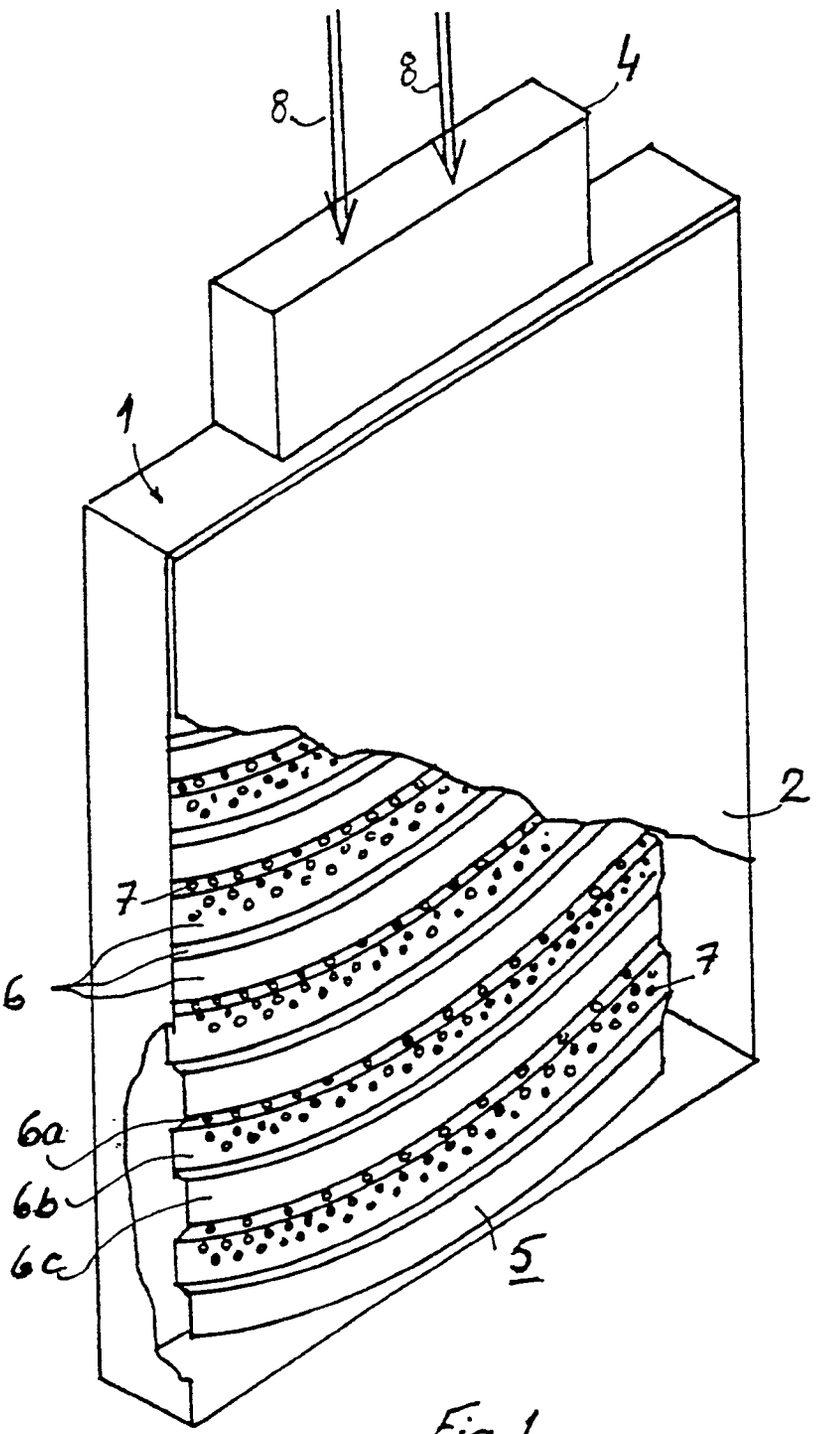

Fig 1

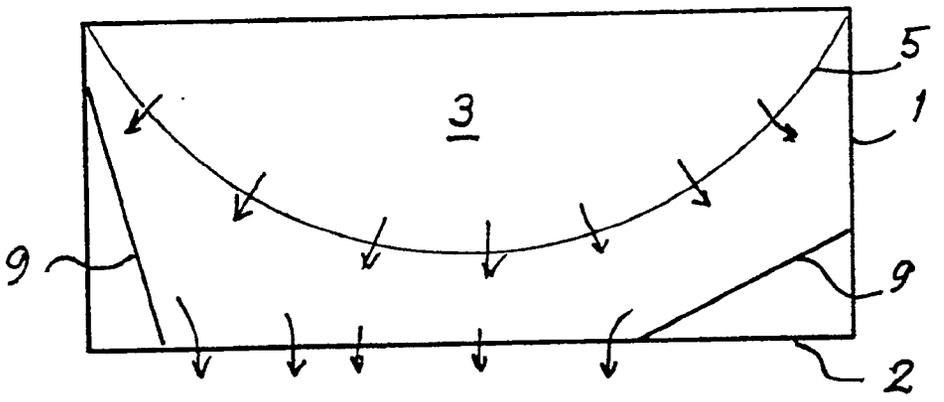

Fig 2

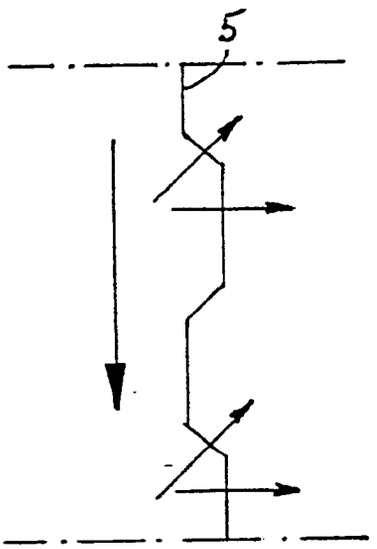

Fig 3

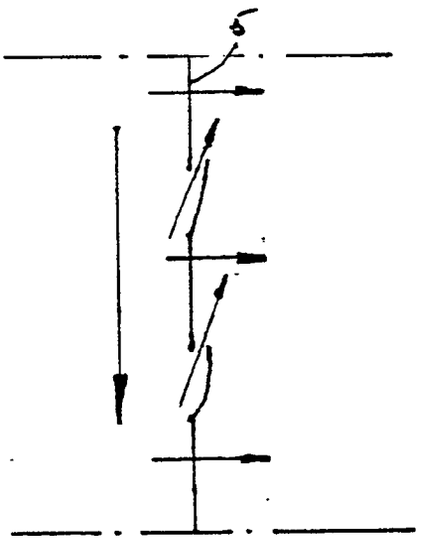

Fig 4

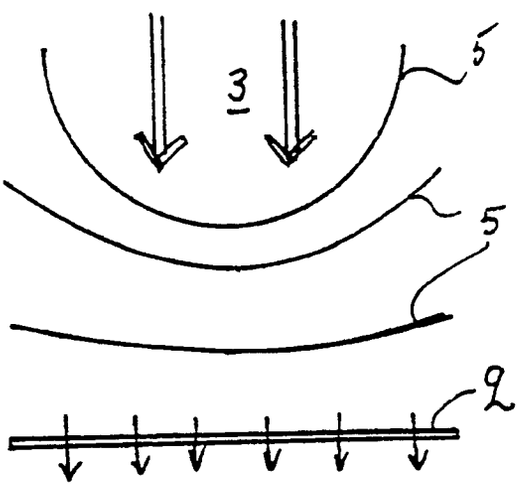

Fig 5

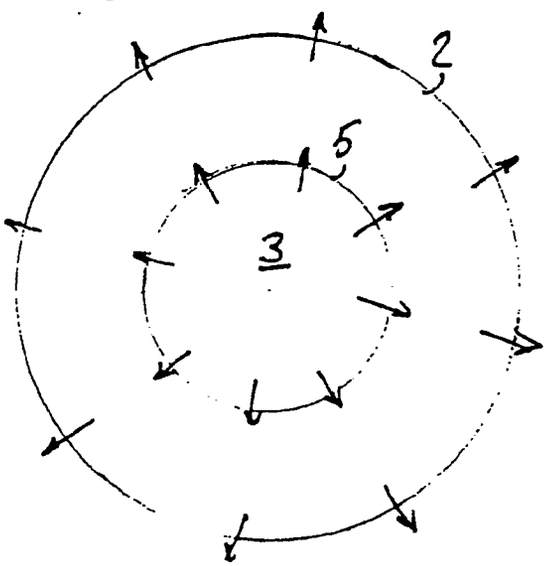

Fig 6

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 91850014.1

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.)
A	SE-B-445 069 (ANDERS ODELROS) *claims 1-10, figures 1-5 and examples according to the figures, see esp. p. 6*	1,3,6,7	F 24 F 13/06
A	WO-A1-83/01290 (LEIF LIND)	1-7	
A	DE-A-662 838 (PAUL H. MÜLLER)	1-7	
A	DE-A1-2 941 276 (LEIF LIND)	1-7	
A	DE-A-1 124 658 (H. KRANTZ)	1-7	
A	FI-A-71 417 (LEITZINGER OY) *clamis 1-2, fig 1-5*	1-7	

TECHNICAL FIELDS SEARCHED (Int. Cl.)

F 24 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	17-04-1991	ELIASSON H.

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

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E : earlier patent document, but published on, or after the filing date
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