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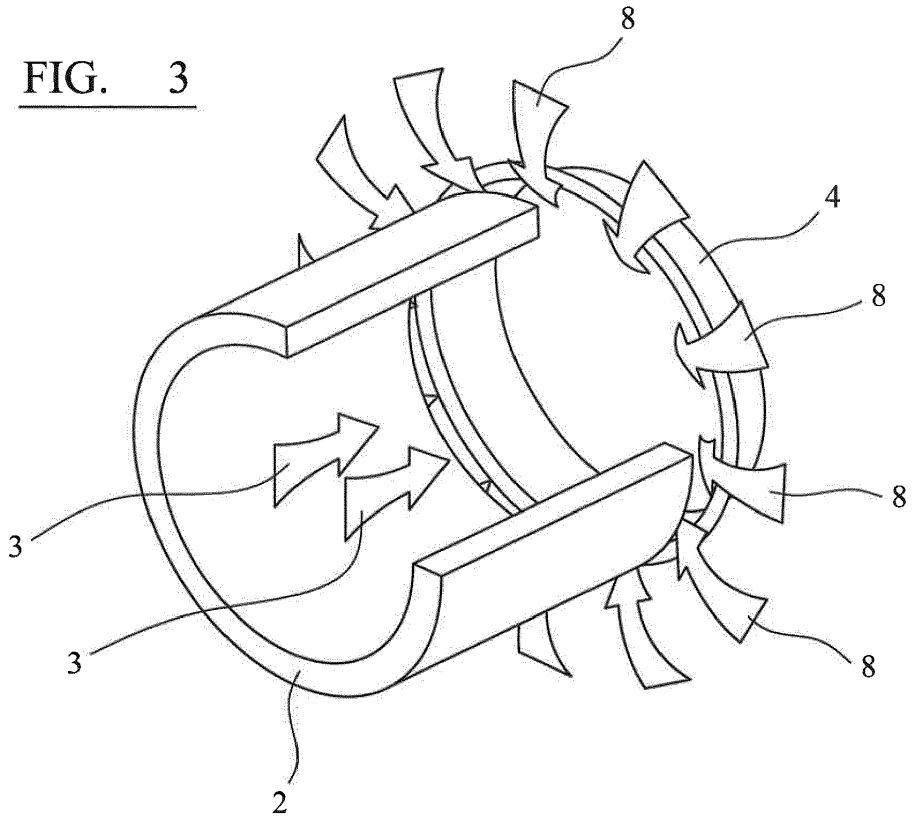
(54) DUCT SECTION FOR AN AIR MOVEMENT DUCT

(57) A duct section 1 for an air movement duct, has a duct inlet section 2 for a fan driven primary air flow 3, the duct section 1 further having a peripheral air inlet 5 through which a secondary air flow is drawn into the duct section 1 by entrainment by the passing primary air flow to form a combined air flow of both the primary and the secondary air flows. A nozzle 4 comprising a guide vane arrangement 6 is located downstream of the peripheral air inlet 5 so as to be impinged by and to direct the combined air flows.

FIG. 3



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Description

[0001] The present invention relates to a duct section for an air movement duct for apparatus for ventilating, heating, air-conditioning and/or cooling a space.

[0002] The invention seeks to provide improvements in the efficiency of the air movement, particularly, but not exclusively when it is required to deflect the path of the air movement.

[0003] According to the present invention there is provided a duct section for an air movement duct, comprising a duct inlet section for a fan driven primary air flow, the duct section further having a peripheral air inlet through which a secondary air flow is drawn into the duct section by entrainment by the passing primary air flow to form a combined air flow of both the primary and the secondary air flows, a nozzle comprising a guide vane arrangement being located downstream of the peripheral air inlet so as to be impinged by and to direct the combined air flows, wherein the guide vane arrangement of the nozzle comprises a plurality of guide vanes in spaced parallel relationship and extending transversely across the duct section.

[0004] Preferably, the nozzle comprises a further part of the duct section spaced from the duct inlet section to form the peripheral air inlet therebetween.

[0005] Alternatively, the peripheral air inlet comprises a slot or plurality of slots extending around substantially the entire periphery of the duct section in a plane normal to the direction of the primary air flow.

[0006] Preferably, in one particular embodiment, the guide vanes are arranged to be pivotable about their longitudinal dimension transverse to the direction of the air movement whilst remaining in the parallel relationship.

[0007] In an alternative construction, the nozzle is pivotable about an axis substantially aligned with the periphery of the duct section to incline the vanes at an angle to the flow direction of the combined air flows. In this arrangement the nozzle is pivotable by up to 20° from the axis of the duct section, and preferably up to 10°.

[0008] In a preferred embodiment, the periphery of the inlet side of the nozzle is profiled, in cross-section, to provide a curved inlet edge to provide a smooth transition of the internal surface of the duct section for the air flow from the primary duct section through the guide vanes irrespective of the angular displacement of the nozzle.

[0009] A preferred embodiment of the present invention is shown in the accompanying drawings in which:-

Figure 1 shows a schematic cross-sectional view of a duct section with a guide nozzle inclined at an angle to the axis of a primary part of the duct section and hence the air flow passing through, to deflect the air flow,

Figure 2 illustrates the duct section of figure 1 in which the nozzle axis is correctional with that of the primary duct section,

Figure 3 shows a schematic part sectional perspective view of the duct section in which the guide vanes of the nozzle have been omitted in the interests of clarity, and

Figure 4 is a schematic illustration using bubbles indicative of the air flow to indicate the air flow through the duct section and the nozzle.

[0010] Referring now to Figure 1 there is shown a schematic cross-sectional view of a duct section 1 which consists of an duct inlet section 2 for a fan driven primary air flow moving in the direction indicated by the arrow 3 and, downstream of the duct inlet section 2 a nozzle 4 which is spaced from the inlet duct section 2 to provide a peripheral air inlet 5 through which, in operation, the primary air flowing past the peripheral air inlet 5 entrains air from outside the duct section 1 to provide a secondary flow 8 into the nozzle so that a combination of the primary air flow and the secondary air flow passes through the nozzle 4. In another embodiment, the peripheral air inlet 5 comprises a slot or plurality of slots extending around substantially the entire periphery of the duct inlet section 2 in a plane normal to the direction of the primary air flow.

[0011] The greater flow of air formed by the combination of the two flows generates a venturi effect through the nozzle 4 which speeds up the flow of air through the nozzle.

[0012] As shown in cross-section in Figures 1 and 2 the nozzle 4 has three guide vanes 6 arranged in spaced parallel relationship and extending transversely across the duct section 1 to guide the air flow. In cross-section, the vanes 6 have an aerodynamic profile to minimise turbulence as the air passes through the nozzle 4. In the embodiment of the invention shown in Figure 1, the nozzle 4 is arranged to pivot about a point 7 adjacent the periphery of the duct inlet section 2 to deflect the flow of air at an angle to the inlet flow of primary air as indicated by the arrows 3 in the duct inlet section. This arrangement has the effect that secondary air entering adjacent the pivot point 7 travels at a different speed than the secondary air drawn in at other points on the periphery, particularly at a point 180° spaced from this pivot point 7, where the peripheral gap is wider. This speed difference can be used to bring about change in the flow direction. This has advantages in directing the flow leaving the nozzle 4.

[0013] The periphery of the nozzle 4 has a profile in cross section which has the same or slightly smaller internal diameter than that of the duct inlet section 2 and on the upstream edge 9 of the nozzle the profile is curved outwardly radially as shown to provide a smooth transition for both the primary and the secondary air flows into the nozzle 4.

[0014] The referring now also to Figure 3, there is shown a part sectional view of the duct section in which the vanes in the nozzle have been removed from the nozzle in the interests of clarity. The arrows 8 indicate the secondary air flow passing into the interior of the duct section 1 to combine with the primary air flow as both the air flows pass through the nozzle 4.

[0015] Figure 4 illustrates schematically, by means of bubbles, the general disposition of the air flows. The primary air flow 3 enters the duct section 1 in the direction of the arrow 3and the secondary air flow 8 passes through the secondary air gap 5 to combine with the primary air flow so a much greater volume of air passes through the nozzle 4 as indicated by the density of the bubbles. Thus, a venturi effect through the nozzle is generated.

[0016] It will be understood that different embodiments of the nozzle 4 may arrange for the guide vanes to be pivoted in a different manner. For example, the nozzle could be pivoted about a transverse axis located on the axial axis of the duct section 1 so that the peripheral air inlet 5 has a reduced gap at one edge and an increased gap at the edges located 180° apart when it is tilted. It is also possible for the vanes to be connected via a linkage arrangement movable to tilt the vanes simultaneously whilst retaining them in spaced parallel relationship. Although three vanes are shown it will be understood that the number of vanes provided would depend upon the requirements of the particular installation and could therefore be one or more. Although shown as circular in cross-section, it will be understood that the duct could have a square, rectangular or other cross section.

Claims

1. A duct section for an air movement duct, comprising a duct inlet section (2) having a primary air inlet for a fan driven primary air flow, the duct section (1) further having a peripheral air inlet (5) downstream of the primary air inlet through which a secondary air flow (8) is drawn into the duct section (1) by entrainment by the passing primary air flow (3) to form a combined air flow of both the primary and the secondary air flows, a nozzle (4) comprising a guide vane arrangement being located downstream of the peripheral air inlet (5) so as to be impinged by and to direct the combined air flows, wherein the guide vane arrangement of the nozzle (4) comprises a plurality of guide vanes (6) in spaced parallel relationship and extending transversely across the duct section (1).

2. A duct section for an air movement duct according to claim 1, wherein the nozzle (4) comprises a further part of the duct section (1) spaced from the duct inlet section (2) to form the peripheral air inlet (5) therebetween.

3. A duct section for an air movement duct according to claim 1 wherein the peripheral air inlet (5) comprises a slot or plurality of slots extending around substantially the entire periphery of the duct inlet section (2) in a plane normal to the direction of the primary air flow.

4. A duct section for an air movement duct according to claims 1, 2 or 3, wherein the guide vanes (6) are elongate and arranged to be pivotable about their longitudinal dimension transverse to the direction of the air movement whilst remaining in the parallel relationship.

5. A duct section for an air movement duct according to claim 4, wherein the nozzle (4) is pivotable about an axis (7) substantially aligned with the periphery of the duct section (2) to incline the vanes at an angle to the flow direction of the combined air flows to deflect and guide the airflows.

6. A duct section for an air movement duct according to claim 5, wherein the nozzle (4) is pivotable by up to 20° from the axis of the primary airflow duct inlet section (2).

7. A duct section for an air movement duct according to any one of the preceding claims, wherein the periphery of the inlet side of the nozzle (4) is profiled, in cross-section, to provide a curved inlet edge forming a smooth transition of the internal surface of the duct section (2) for the air flow from the primary duct section through the guide vanes (6) irrespective of the angular displacement of the nozzle.

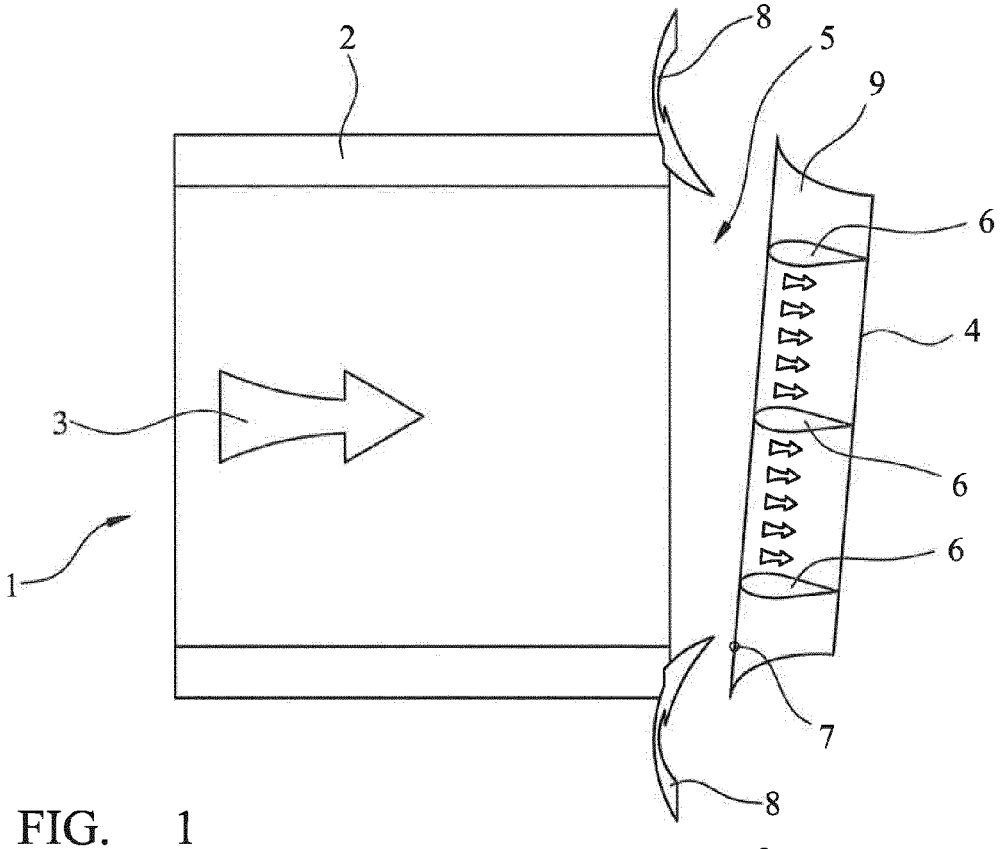


FIG. 1

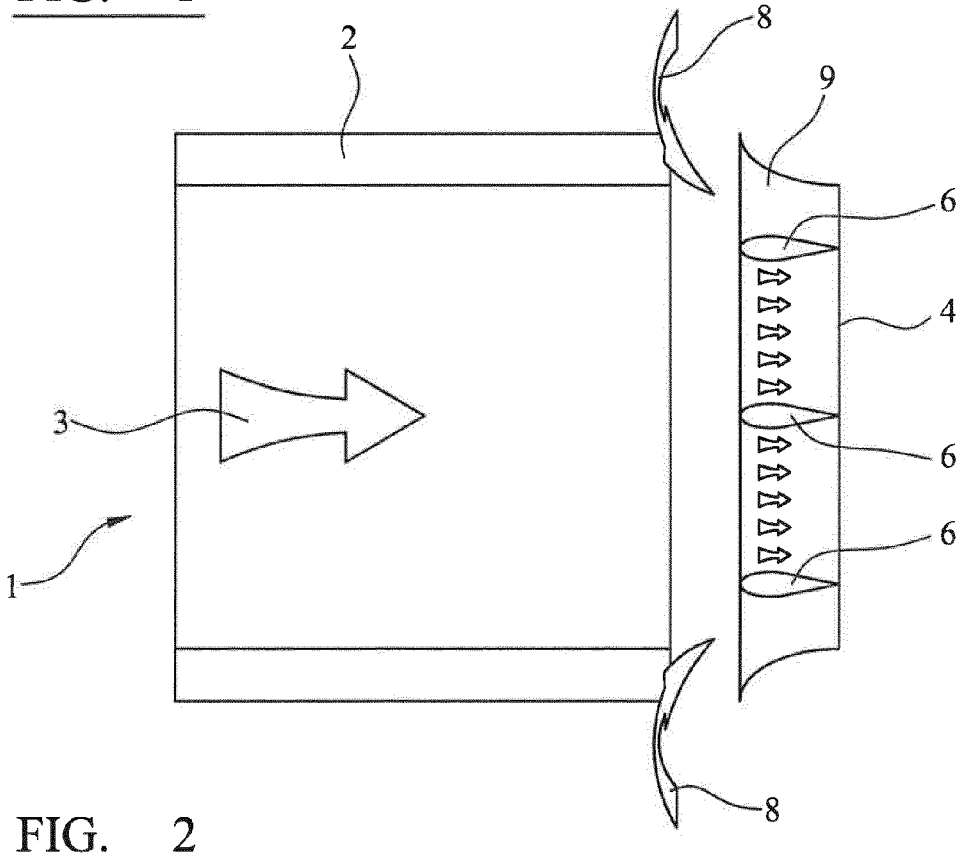
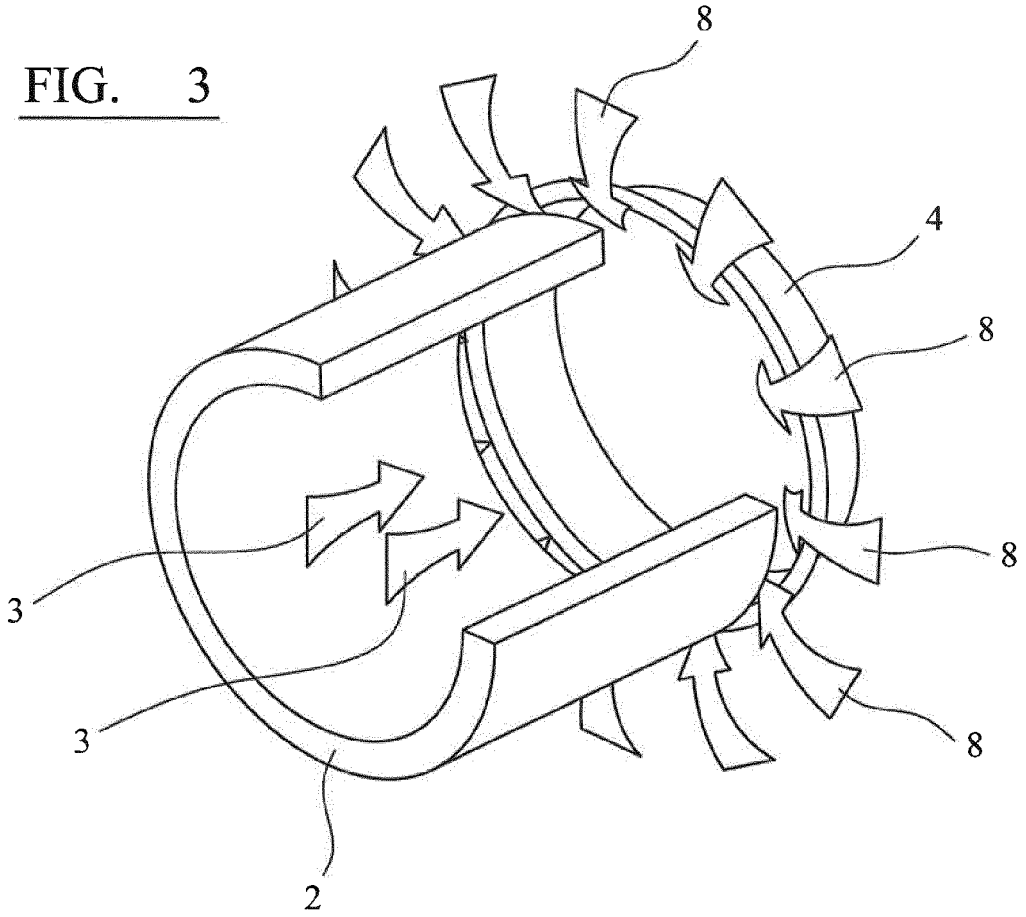


FIG. 2

FIG. 3



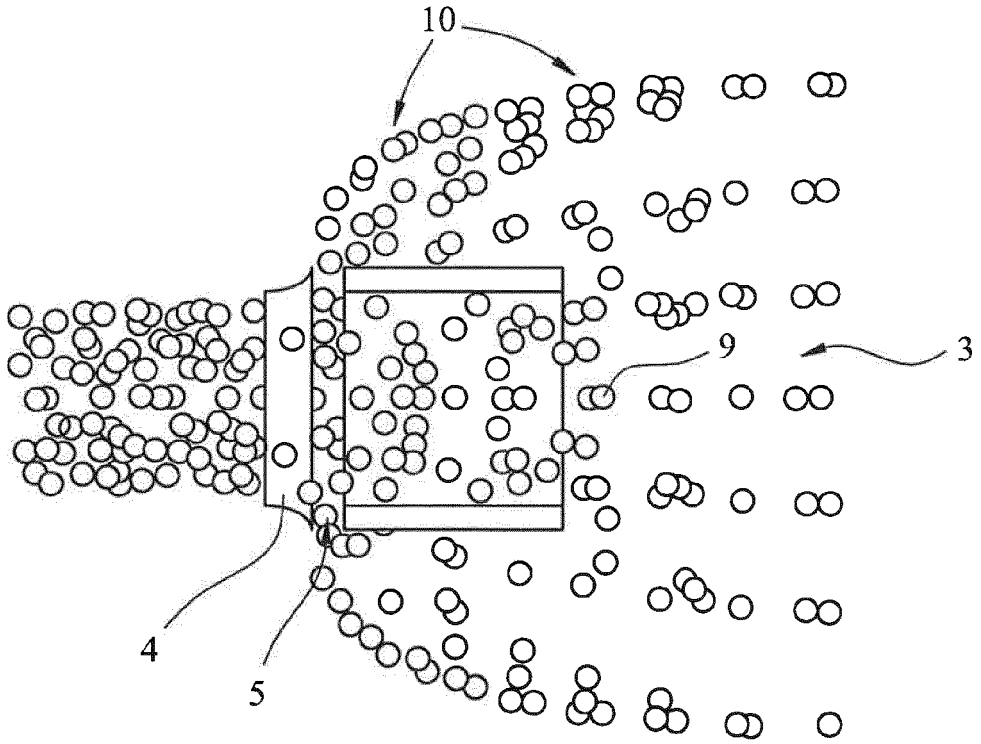


FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 7554

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 255 176 A (MACROW LAWRENCE) 10 March 1981 (1981-03-10) * column 2, line 31 - column 3, line 41; figures 1,2 *	1-7	INV. F24F13/26 F24F7/06 F24F13/06 F24F13/02
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X	US 3 981 326 A (GORCHEV DIMITER) 21 September 1976 (1976-09-21) * column 3, line 17 - column 5, line 36; figure 1 *	1	
X	DE 10 2006 030662 A1 (FUCHS PETER [DE]) 17 January 2008 (2008-01-17) * abstract *	1	
A	US 2012/292407 A1 (MORNAN BRIAN J [US] ET AL) 22 November 2012 (2012-11-22) * paragraphs [0055] - [0064]; figures 2A-2D *	1	TECHNICAL FIELDS SEARCHED (IPC) F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 February 2017	Lienhard, Dominique

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 18 7554

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82