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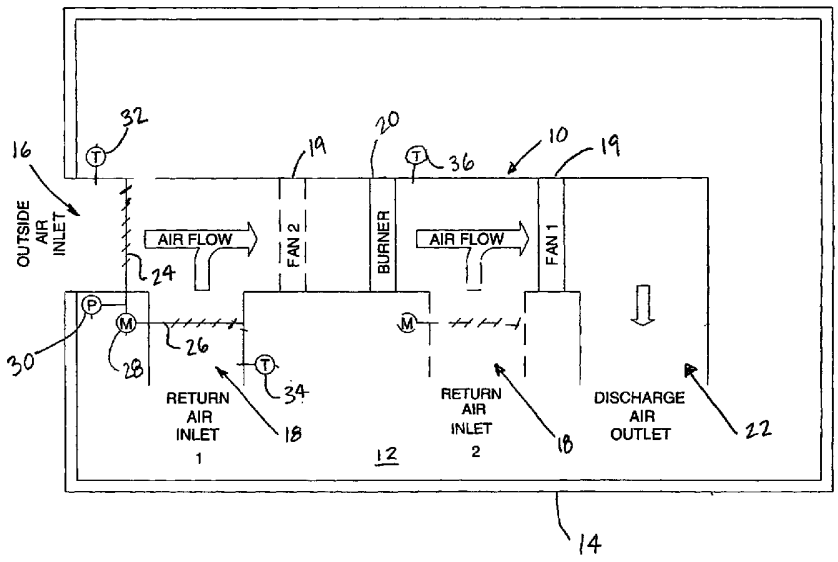
[Continued on next page]

(54) Title: A METHOD AND CONTROLLER FOR DETERMINING CARBON DIOXIDE EMISSIONS



(57) Abstract: A method of determining the amount of air flowing through an outside air damper (24) of a recirculating air heater (10) includes the steps of sensing an amount of airflow flowing through the damper, recording the amount of airflow and a damper position value at a plurality of damper positions, and interpolating a curve relating the amount of airflow to the damper position for all damper positions between a minimum damper position and a maximum damper position. Once the amount of air flowing through the outside air damper is determined from a position on the curve, the concentration of carbon dioxide (CO_2) within a building space can be calculated and/or determined to be within acceptable limits.

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INTERNATIONAL SEARCH REPORT

International Application No
US2004/024757

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F24F11/04 G01F1/26 G01F25/00 F24F11/00 G01N33/00
G01N25/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F24F G01F G01N F23N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 335 040 A (GINN LEROY D ; GINN LEROYCE S (US)) 4 October 1989 (1989-10-04) column 4, line 33 - line 37; figures 1,9	1,3
A	EP 0 498 554 A (HITACHI LTD) 12 August 1992 (1992-08-12) column 6, line 4 - line 21; claim 9; figure 7	1,3
A	US 2003/135335 A1 (ADAMS PAUL ROBERT ET AL) 17 July 2003 (2003-07-17) abstract	1,3
A	NL 1 011 306 C (ITHO B V) 17 August 2000 (2000-08-17) abstract	1,3

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 April 2005	22 APR 2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Gonzalez-Granda, C

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/024757

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 431 457 B1 (DIRKES, II JAMES V) 13 August 2002 (2002-08-13) cited in the application the whole document	2,4
A	US 5 165 883 A (VAN BEMMEL ET AL) 24 November 1992 (1992-11-24) abstract	2,4
A	FR 2 470 371 A (NEOTRONICS LTD) 29 May 1981 (1981-05-29) abstract	2,4

INTERNATIONAL SEARCH REPORT

ernational application No.
PCT/US2004/024757

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1,3

Determining the amount of air flowing through a damper

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2. claims: 2,4

Determining a concentration C of carbon dioxide (CO2) in an air flow

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir tional Application No
PCT/US2004/024757

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0335040	A	04-10-1989	US	4796651 A	10-01-1989
			AT	113372 T	15-11-1994
			CA	1324508 C	23-11-1993
			DE	3851949 D1	01-12-1994
			DE	3851949 T2	18-05-1995
			EP	0335040 A2	04-10-1989
			JP	1292213 A	24-11-1989
EP 0498554	A	12-08-1992	DE	69201137 D1	23-02-1995
			DE	69201137 T2	11-05-1995
			EP	0498554 A1	12-08-1992
			JP	2082278 C	23-08-1996
			JP	5058286 A	09-03-1993
			JP	8000533 B	10-01-1996
			JP	8080850 A	26-03-1996
			US	5263894 A	23-11-1993
US 2003135335	A1	17-07-2003	BR	0214507 A	03-11-2004
			CA	2466932 A1	31-07-2003
			EP	1466221 A1	13-10-2004
			WO	03062938 A1	31-07-2003
NL 1011306	C	17-08-2000	NL	1011306 C2	17-08-2000
US 6431457	B1	13-08-2002	NONE		
US 5165883	A	24-11-1992	WO	9106808 A1	16-05-1991
			AT	124526 T	15-07-1995
			AU	634183 B2	18-02-1993
			AU	4484589 A	31-05-1991
			DE	59009328 D1	03-08-1995
			DK	90791 A	16-05-1991
			EP	0424597 A1	02-05-1991
			ES	2078248 T3	16-12-1995
			FI	100678 B1	30-01-1998
			GR	3017594 T3	31-12-1995
			KR	152092 B1	01-10-1998
			NO	911865 A ,B,	16-05-1991
			RU	2067728 C1	10-10-1996
FR 2470371	A	29-05-1981	CA	1159560 A1	27-12-1983
			DE	3042670 A1	01-10-1981
			FR	2470371 A1	29-05-1981
			GB	2064780 A ,B	17-06-1981
			IN	154609 A1	17-11-1984
			JP	1602014 C	27-02-1991
			JP	2022341 B	18-05-1990
			JP	56085637 A	11-07-1981
			US	4423487 A	27-12-1983