Docket No.: 713-2354 (22664) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
	:	
Soren Risgaard DAHL et al.	:	Confirmation No. (Not Yet Assigned)
	:	
U.S. Patent Application No. (Not Yet Assigned)	:	
	:	
Filed: September 20, 2011	:	

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Preliminary to examination of the above-referenced application, please amend the application as follows:

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (New) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
a plurality of refrigeration systems, each of which includes
at least one compressor,
at least one condenser,
at least one expansion valve,
at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the
at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of the at least one compressor, and
a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (New) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (New) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condensor fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

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16. (New) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (New) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (New) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (New) A preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (New) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (New) A preconditioned air unit according to claim 17, wherein the central controller is connected to at least one controller of the at least one voltage frequency driver.

22. (New) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of air unit power consumption.

23. (New) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit to at least one of: The selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

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24. (New) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (New) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (New) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (New) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (New) A preconditioned air unit according to claim 13, further comprising at least one of: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (New) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

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REMARKS

The specification of the referenced application has been amended to identify the corresponding International and Danish applications. The claims have been amended to cancel original claims 1 through 12 and to include new claims 13 through 29. No new matter has been introduced through the foregoing amendments. Entry is in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN HAM & BERNER, LLP

Benjamin J. Hauptman
Registration No. 29,310

1700 Diagonal Road, Suite 300
Alexandria, Virginia 22314
(703) 684-1111 BJH/csy
Facsimile: (703) 518-5499
Date: September 20, 2011

AMENDMENTS TO THE SPECIFICATION

On page 1 after the title, please insert the following:

-- RELATED APPLICATIONS

The present application is national phase of PCT/IB2010/051189 filed on March 18, 2010 and claims priority from Danish Application Number PA 2009 00392 filed March 20, 2009. –

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PTO/SB/14 (11-08)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	713-2354 (22664)
	Application Number	
Title of Invention	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applicant 1 Remove

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Soren	Risgaard	DAHL	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Odense SV	Country Of Residence[i]	DK
Citizenship under 37 CFR 1.41(b)[i]	DK		

Mailing Address of Applicant:

Address 1	Kielshusvej 16		
Address 2			
City	Odense SV	State/Province	
Postal Code	5250	Country[i]	DK

Applicant 2 Remove

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Bo	Vork	NIELSEN	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Morud	Country Of Residence[i]	DK
Citizenship under 37 CFR 1.41(b)[i]	DK		

Mailing Address of Applicant:

Address 1	Birkevej 6		
Address 2			
City	Morud	State/Province	
Postal Code	5462	Country[i]	DK

Applicant 3 Remove

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Henrik		OLSSON	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Odense SV	Country Of Residence[i]	DK

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	Application Number	
Title of Invention	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING	

Citizenship under 37 CFR 1.41(b) i	DK			
Mailing Address of Applicant:				
Address 1	Laerkedals Alle 30			
Address 2				
City	Odense SV	**State/Province**		
Postal Code	5250	**Country**i	DK	

Applicant 4 Remove

Applicant Authority (•) Inventor ( ) Legal Representative under 35 U.S.C. 117 ( ) Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Lars		SCHRODER	

Residence Information (Select One) ( ) US Residency (•) Non US Residency ( ) Active US Military Service

City	Assens	**Country Of Residence**i	DK
Citizenship under 37 CFR 1.41(b) i	DK		
Mailing Address of Applicant:			
Address 1	Kildensmindensvej 16		
Address 2			
City	Assens	**State/Province**	
Postal Code	5610	**Country**i	DK

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	33712		
Email Address	ITW@ipfirm.com	Add Email	Remove Email

Application Information:

Title of the Invention	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING		
Attorney Docket Number	713-2354 (22664)	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	9	**Suggested Figure for Publication (if any)**	4

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	713-2354 (22664)
	Application Number	
Title of Invention	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	33712		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	a 371 of international	PCT/IB2010/051189	2010-03-18

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country [i]	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
PA 2009 00392	DK	2009-03-20	◉ Yes ○ No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1 Remove

PTO/SB/14 (11-08)
Approved for use through 01/31/2014. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	713-2354 (22664)
	Application Number	
Title of Invention	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING	

If the Assignee is an Organization check here. ☒			
Organization Name	AXA POWER APS		
Mailing Address Information:			
Address 1	Smedebakken 31		
Address 2	Sohus		
City	Odense N	**State/Province**	
Country [i]	DK	Postal Code	5270
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the **Add** button.		Add	

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/			Date (YYYY-MM-DD)	2011-09-20
First Name	Benjamin J.	Last Name	Hauptman	Registration Number	29310

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371	ATTORNEY'S DOCKET NUMBER **713-2354 (22664)** U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/IB2010/051189	**March 18, 2010**	**March 20, 2009**

TITLE OF INVENTION

A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

APPLICANT(S) FOR DO/EO/US

Soren Risgaard DAHL; Bo Vork NIELSEN; Henrik OLSSON; Lars SCHRODER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) as indicated below.
4. ☒ The US has been elected (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   - a. ☐ is transmitted hereto (required only if not communicated by the International Bureau).
   - b. ☒ has been communicated by the International Bureau.
   - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   - a. ☒ is attached hereto.
   - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   - b. ☐ have been communicated by the International Bureau.
   - c. ☐ have not been made; however, the time limit for making such amendment has NOT expired.
   - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). **Declaration of Inventorship**
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A preliminary amendment.
14. ☒ An Application Data Sheet under CFR 1.76
15. ☐ A substitute specification.
16. ☐ A power of attorney and/or change of address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.2 and 37 CFR 1.821–1.825
18. ☒ A copy of the published international application w/ISR
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4)
20. ☐ Other items or information:

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
	PCT/IB2010/051189	**713-2354 (22664)**

The following fees are submitted:	CALCULATIONS	PTO USE ONLY
21. ☒ Basic national fee (37 CFR 1.492(a)) **$330.00**	$ 330.00	
22. ☒ Examination fee (37 CFR 1.492(c)) If the written opinion prepared by USI/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) ..... **$0** All other situations **$220.00**	$ 220.00	
23. ☒ Search fee (37 CFR 1.492(b)) If the written opinion of the ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) ..... **$0** Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Search Authority ..... **$100.00** International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB ..... **$430.00** All other situations **$540.00**	$ 430.00	
TOTAL OF 21, 22 and 23 =	$ 980.00	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) or computer program listing filed in an electronic medium) (37 CFR 1.492(j)). The fee is **$250** for each additional 50 sheets of paper or fraction thereof		

Total Sheets	Extra sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE		
- 100 =	/50 =		× $270.00	$	
Surcharge of **$130.00** for furnishing the oath or declaration later than 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$	

CLAIMS	NUMBER FILED		NUMBER EXTRA	RATE		
Total Claims	17	- 20 =	0	× $ 52.00	$	
Independent Claims	1	- 3 =	0	× $220.00	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ $390.00	$	
				TOTAL OF ABOVE CALCULATIONS =	$ 980.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.					$ 0.00	
				SUBTOTAL =	$ 980.00	
Processing fee of **$130.00** for furnishing the English translation later than the 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +					$ 0.00	
				TOTAL NATIONAL FEE =	$ 980.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +					$ 0.00	
				TOTAL FEES ENCLOSED =	$ 980.00	
					Amount to be refunded:	
					Amount to be charged	

a. ☐ A check in the amount of $ _____.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 07-1337 in the amount of $ ___ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1337. A duplicate copy of this sheet is enclosed.

d. ☒ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status. Kindly use the attorneys' address associated with the following Customer Number for future correspondence.

SEND ALL CORRESPONDENCE TO:

LOWE HAUPTMAN HAM & BERNER, LLP
1700 Diagonal Road, Suite 300
Alexandria, VA 22314
(703) 684-1111

Customer No. 33712
PATENT TRADEMARK OFFICE

/Benjamin J. Hauptman/
SIGNATURE
Benjamin J. Hauptman
NAME
29,310
REGISTRATION NUMBER

Claims

[Claim 1] A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

[Claim 2] A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

[Claim 3] A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condensor fan for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

[Claim 4] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

[Claim 5] A preconditioned air unit according to any of the preceding claims, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

[Claim 6] A preconditioned air unit according to claim 5, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

[Claim 7] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a central controller that is

configured for controlling the operation of the preconditioned air unit.

[Claim 8] A preconditioned air unit according to claim 7 as dependent on claim 5 or 6, wherein the central controller is connected to at least one controller of the at least one voltage frequency driver.

[Claim 9] A preconditioned air unit according to claim 7 or 8, wherein the central controller has a power sharing control input for control of air unit power consumption.

[Claim 10] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

[Claim 11] A preconditioned air unit according to claim 10, wherein the rectifier is a 12-pulse rectifier.

[Claim 12] A preconditioned air unit according to claim 10, wherein the rectifier is a 24-pulse rectifier.

Abstract

A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard DAHL
Filer:	Benjamin J. Hauptman/Catherine Yao
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
National Stage Fee	1631	1	330	330
Natl Stage Search Fee - Report provided	1642	1	430	430
National Stage Exam - all other cases	1633	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**980**

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL et al.
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4272967	A1	1981-06-16	WHITE et al.	
	2	5107685	A	1992-04-28	KOBAYASHI et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100031676	A1	2010-02-11	URBAIN	
	2	20080250903	A1	2008-10-16	HSIEH	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	0431563	EP	A2	1991-06-12	KABUSHIKI KAISHA TOSHIBA	Corresponds to US Patent No. 5107685 A	☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-09-20
	First Named Inventor	Soren Risgaard DAHL et al.
	Art Unit	
	Examiner Name	
	Attorney Docket Number	713-2354 (22664)

	2	2150278	GB	A	1985-06-26	TELEDYNE INDUSTRIES INC.		☒
	3	10257796	JP	A	1998-09-25	MITSUBISHI ELECTRIC CORP		☒
	4	2007135103	WO	A2	2007-11-29	LEBRUN-NIMY EN ABREGE LEBRUN SA	Corresponds to US Publication No. 2010031676 A1	☒
	5	2007061622	WO	A1	2007-05-31	ILLINOIS TOOL WORKS INC.	Corresponds to US Publication No. 2008250803 A1	☒

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Search Report results for Danish Patent Application No. PA 2009 00392 dated November 3, 2009	☒
	2	ISR for PCT/IB2010/051189 dated January 11, 2011	☒

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2011-09-20
	First Named Inventor	Soren Risgaard DAHL et al.
	Art Unit	
	Examiner Name	
	Attorney Docket Number	713-2354 (22664)

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2011-09-20
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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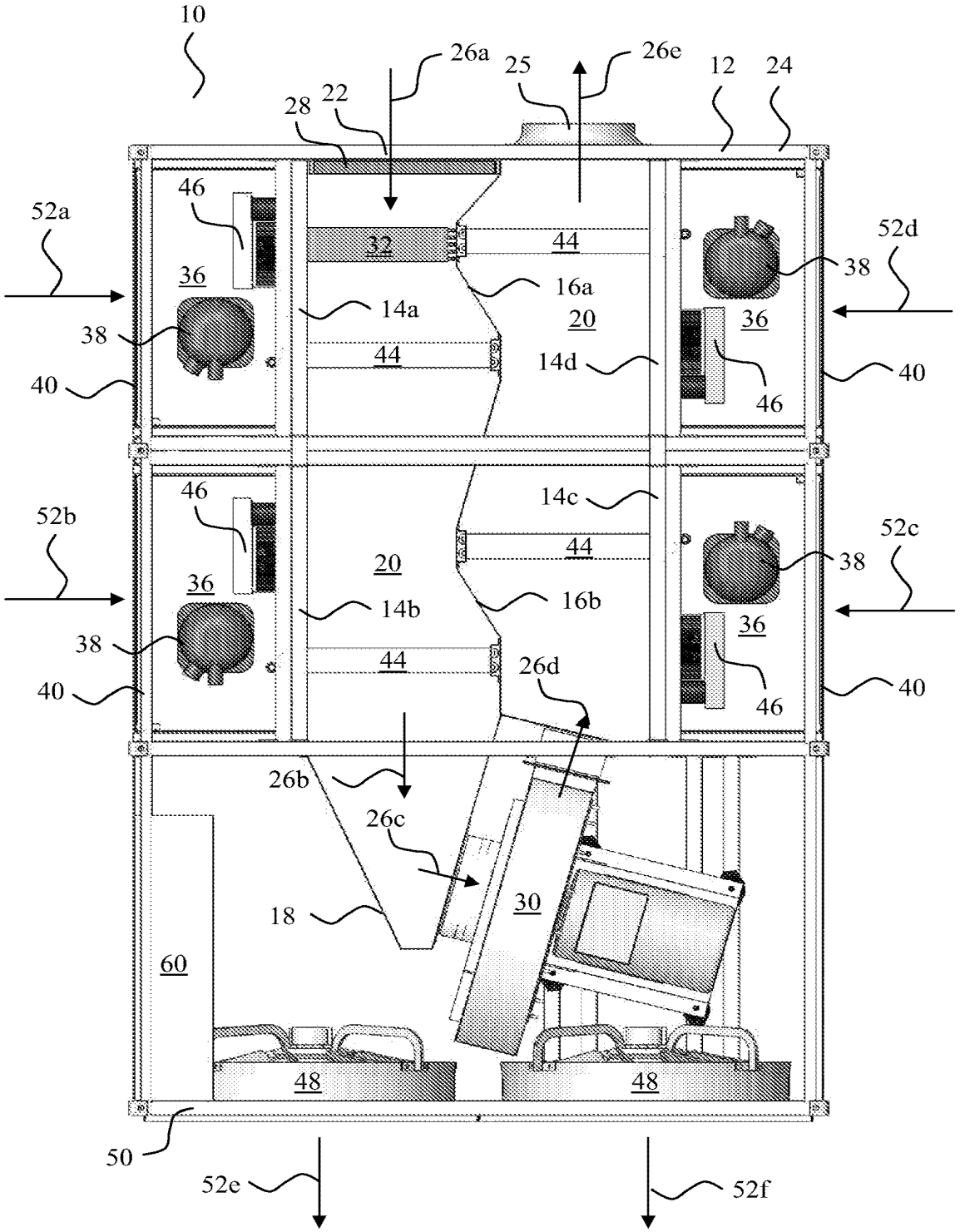
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Fig. 1

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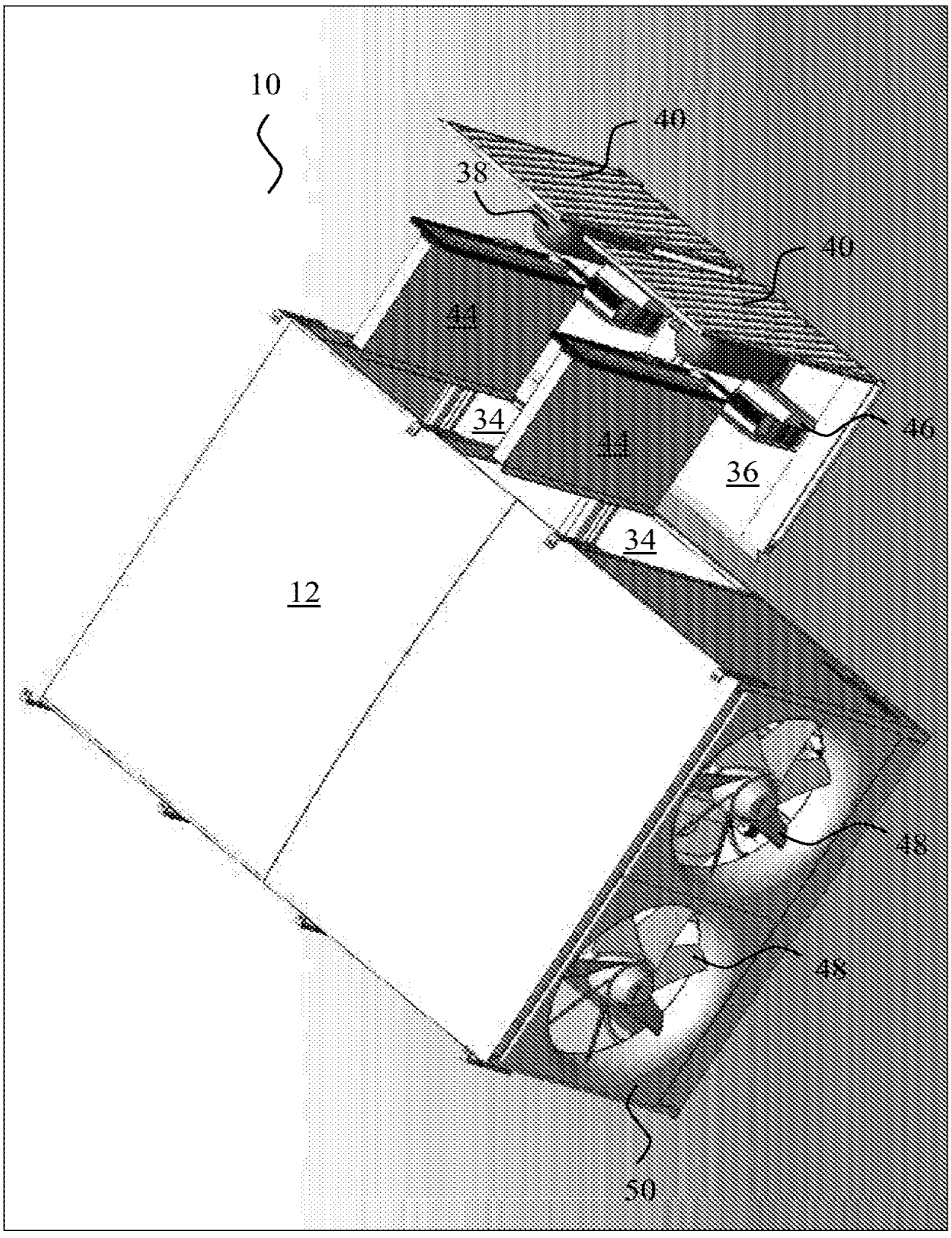

Fig. 2

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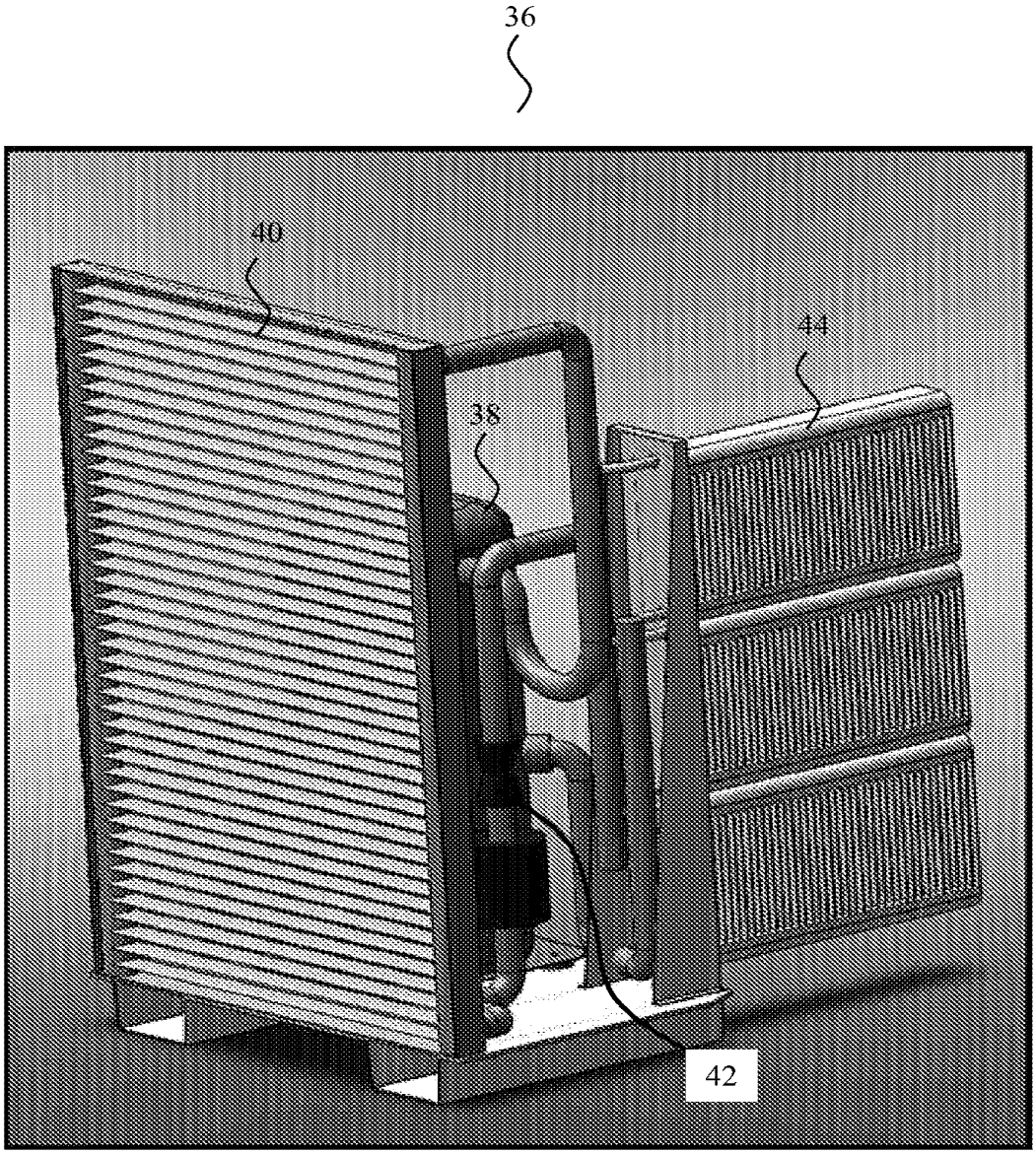

Fig. 3

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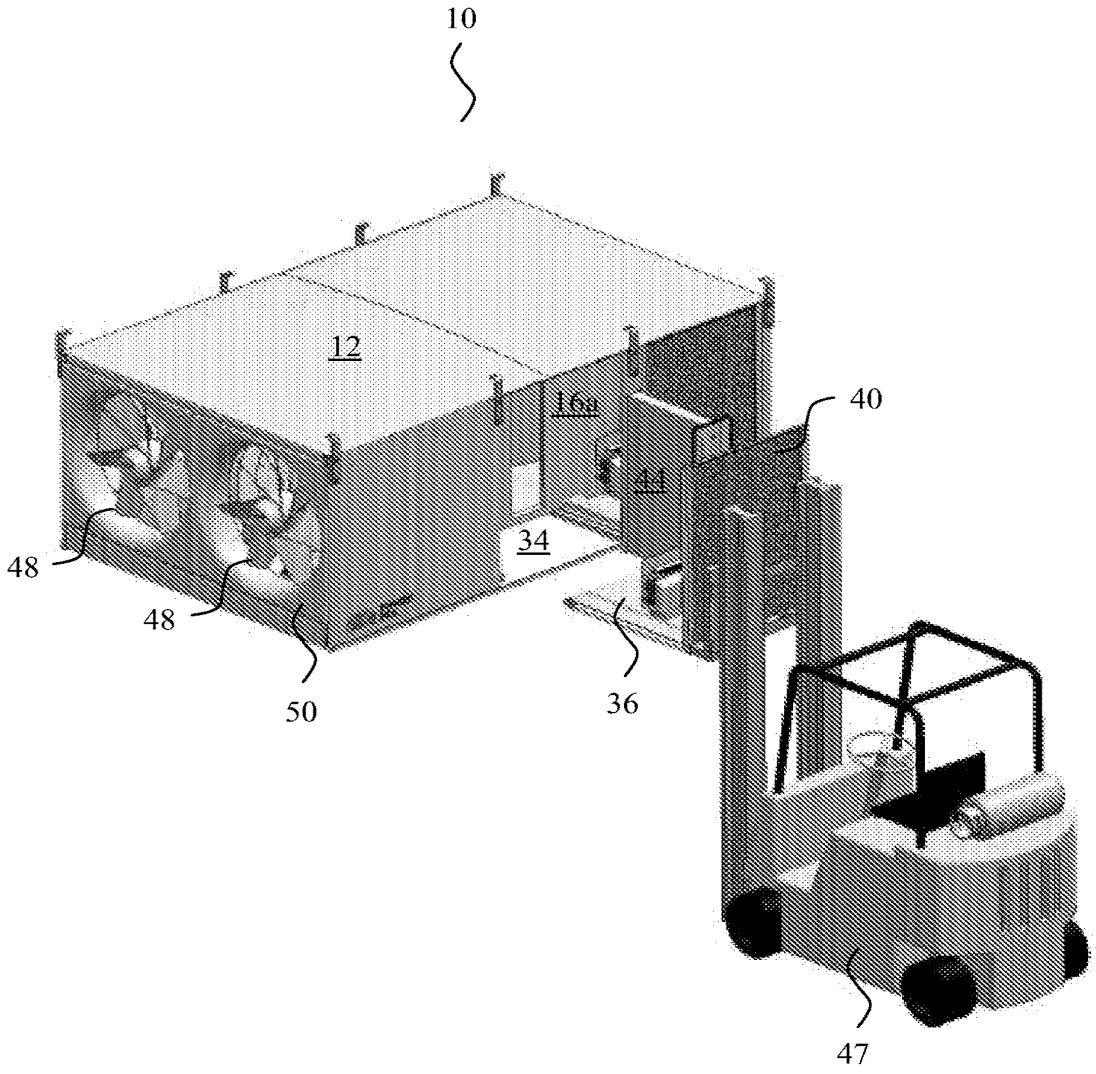

Fig. 4

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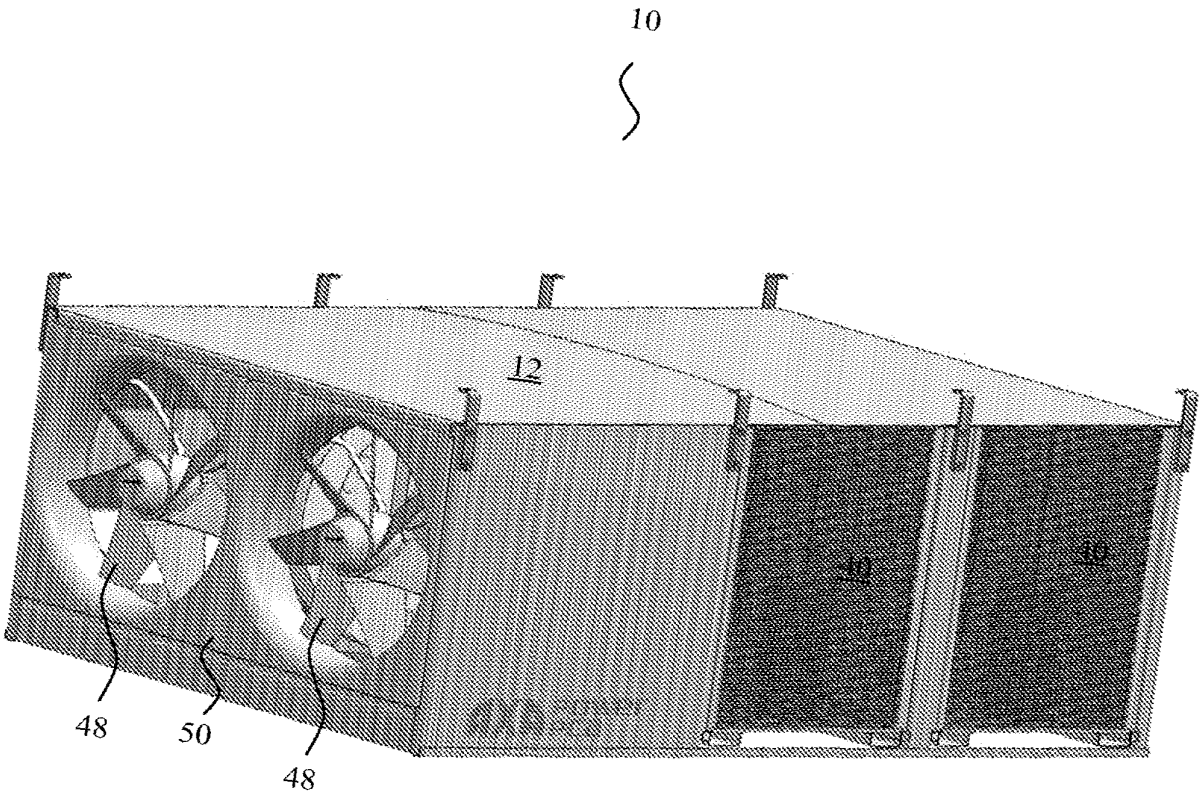

Fig. 5

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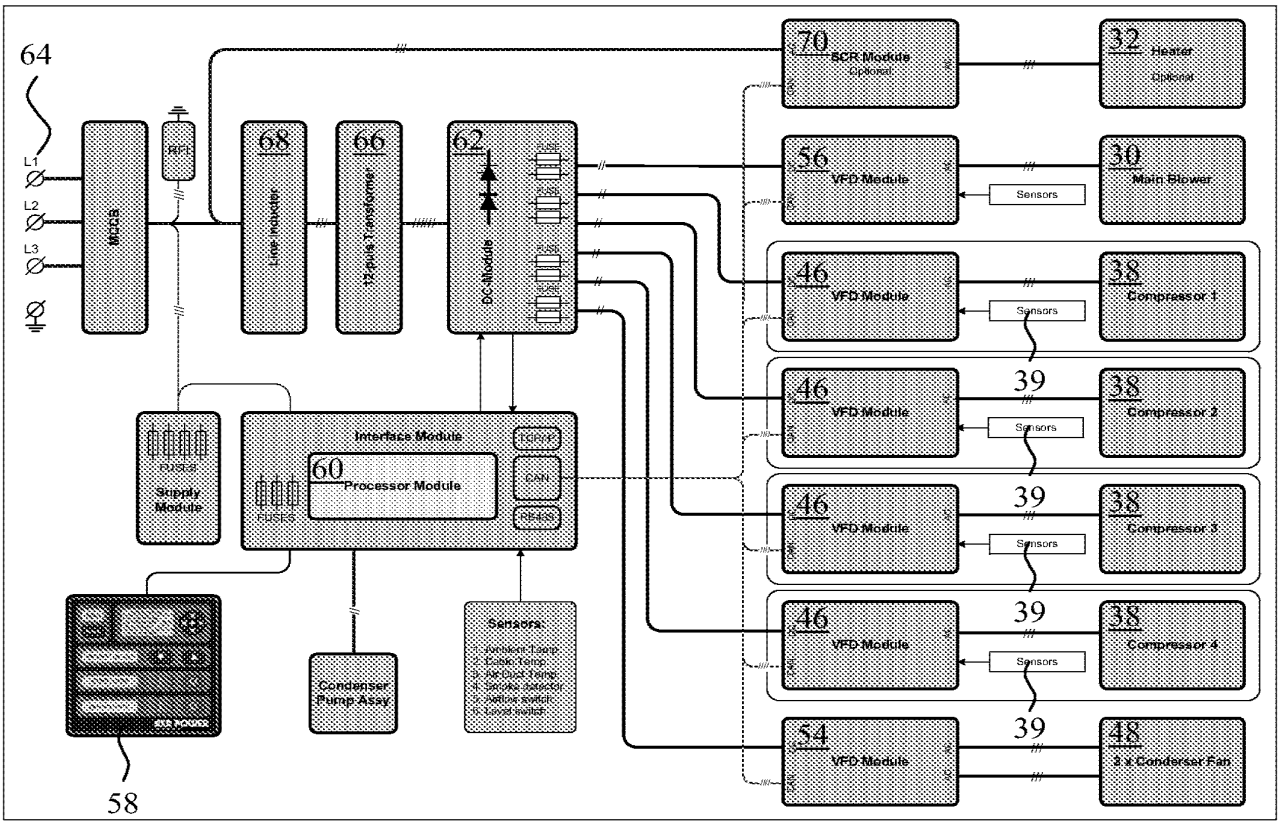
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Compressor 4
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VFD Module
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Condenser Pump Assay
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Fig. 6

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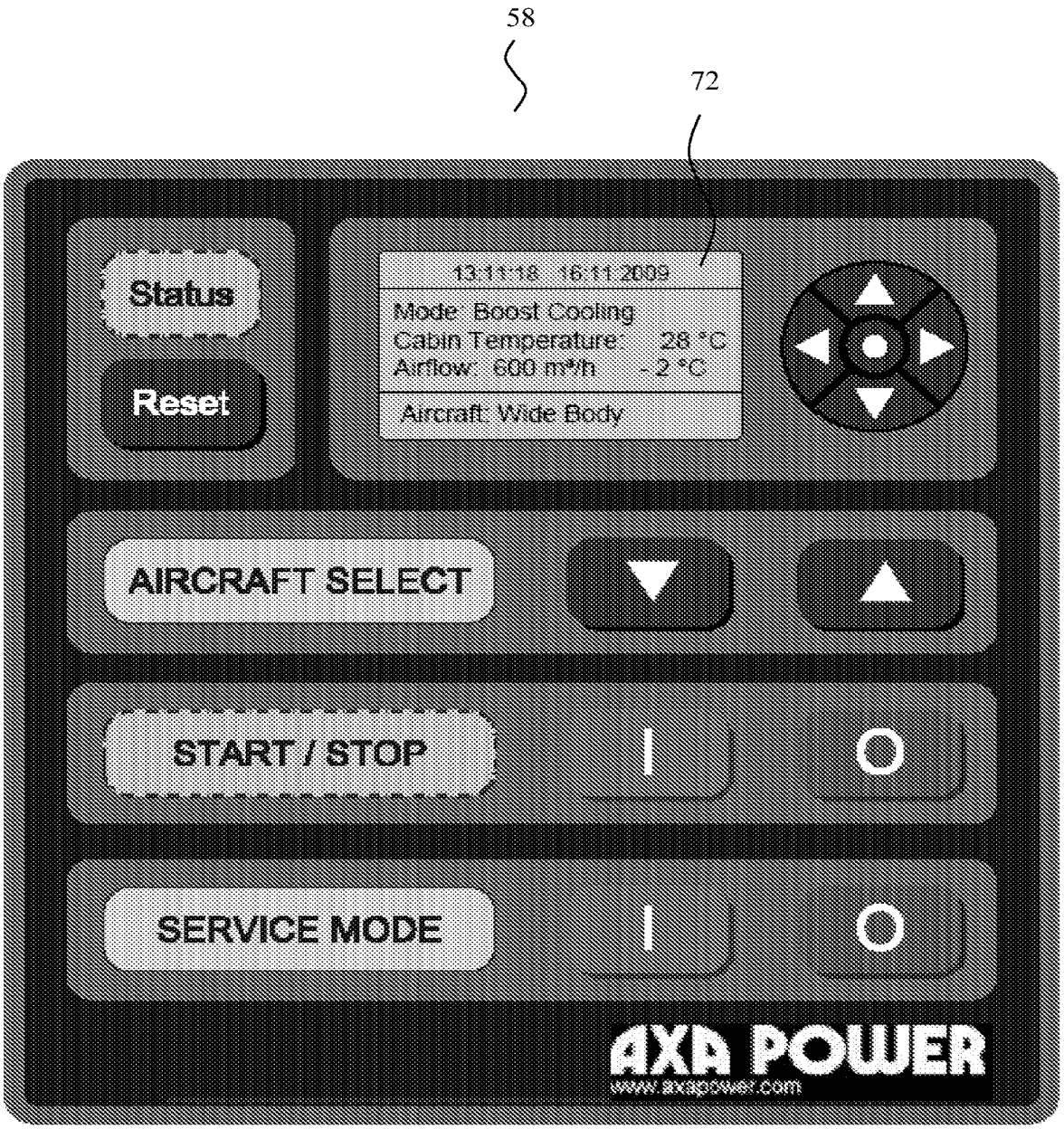
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AXA POWER
www.axapower.com

Fig. 7

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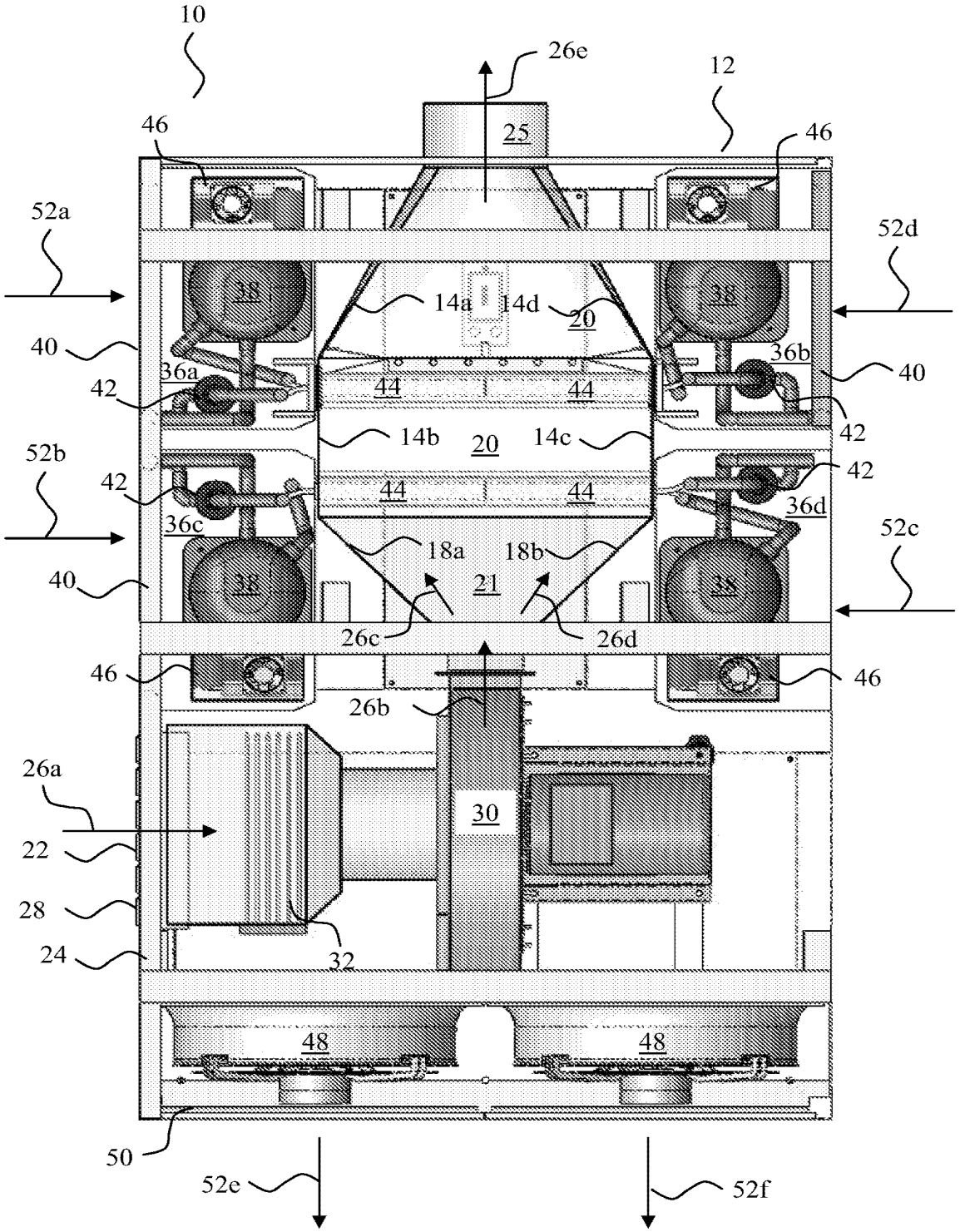
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Fig. 8

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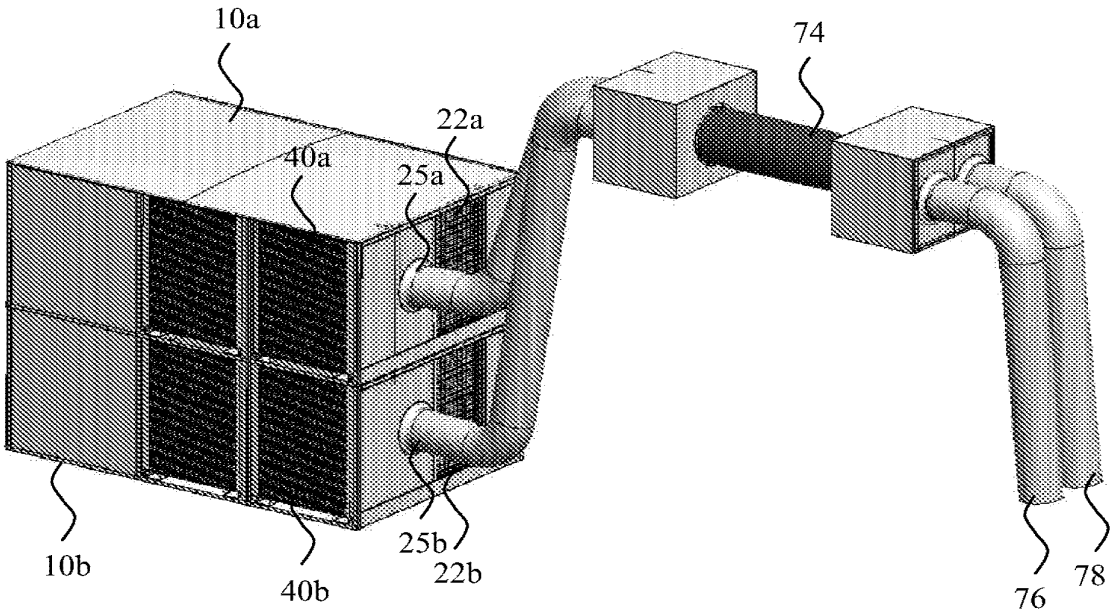

Fig. 9

PCT REQUEST

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0	**For receiving Office use only**	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	

0-4	**Form PCT/RO/101 PCT Request**	
0-4-1	Prepared Using	PCT-SAFE Version 3.51.044.220 MT/FOP 20100101/0.20.5.18
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	International Bureau of the World Intellectual Property Organization (RO/IB)
0-7	**Applicant's or agent's file reference**	ITW 22664
I	**Title of Invention**	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
II	**Applicant**	
II-1	This person is	Applicant only
II-2	Applicant for	All designated States except US
II-4	Name	AXA Power ApS
II-5	Address	Smedebakken 31 Søhus 5270 Odense N Denmark
II-6	State of nationality	DK
II-7	State of residence	DK
III-1	**Applicant and/or inventor**	
III-1-1	This person is	Applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	DAHL, Søren Risgaard
III-1-5	Address	Kielshusvej 16 5250 Odense SV Denmark
III-1-6	State of nationality	DK
III-1-7	State of residence	DK

III-2	**Applicant and/or inventor**	
III-2-1	This person is	Applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	NIELSEN, Bo Vork
III-2-5	Address	Birkevej 6 5462 Morud Denmark
III-2-6	State of nationality	DK
III-2-7	State of residence	DK
III-3	**Applicant and/or inventor**	
III-3-1	This person is	Applicant and inventor
III-3-2	Applicant for	US only
III-3-4	Name (LAST, First)	OLSSON, Henrik
III-3-5	Address	Lærkedals Allé 30 5250 Odense SV Denmark
III-3-6	State of nationality	DK
III-3-7	State of residence	DK
III-4	**Applicant and/or inventor**	
III-4-1	This person is	Applicant and inventor
III-4-2	Applicant for	US only
III-4-4	Name (LAST, First)	SCHRØDER, Lars
III-4-5	Address	Kildensmindensvej 16 5610 Assens Denmark
III-4-6	State of nationality	DK
III-4-7	State of residence	DK

PCT REQUEST

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IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/ has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Common representative
IV-1-1	Name	AXA Power ApS
IV-1-2	Address	c/o HAUPTMAN, Benjamin J. LOWE HAUPTMAN HAM & BERNER, LLP 1700 Diagonal Road, Suite 300 Alexandria, Virginia 22314 United States of America
IV-1-3	Telephone No.	(+1)703-684-1111
IV-1-4	Facsimile No.	(+1) 703-518-5499
IV-1-5	e-mail	ITW@ipfirm.com
IV-1-5(a)	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address to send, if the Office or Authority so wishes, advance copies of notifications in respect of this international application.	Yes
V	**DESIGNATIONS**	
V-1	**The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.**	
VI-1	**Priority claim of earlier national application**	
VI-1-1	Filing date	20 March 2009 (20.03.2009)
VI-1-2	Number	PA 2009 00392
VI-1-3	Country	DK
VI-2	**Incorporation by reference :** where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.	
VII-1	**International Searching Authority Chosen**	European Patent Office (EPO) (ISA/EP)

PCT REQUEST

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VII-2	**Request to use results of earlier search; reference to that search**		
VII-2-1	Filing date	20 March 2009 (20.03.2009)	
VII-2-2	Application Number	PA 2009 00392	
VII-2-3	Country (or regional Office)	DK	
VIII	**Declarations**	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	1	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	1	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	

PCT REQUEST

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VIII-2-1	**Declaration: Entitlement to apply for and be granted a patent** Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name (LAST, First)	In relation to this international application AXA Power ApS is entitled to apply for and be granted a patent by virtue of the following:
VIII-2-1(iv)		an assignment from DAHL, Søren Risgaard, NIELSEN, Bo Vork, OLSSON, Henrik, and SCHRØDER, Lars to AXA Power ApS, dated 09 March 2010 (09.03.2010)

Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)

The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

Declaration of inventorship (Rules 4.17(iv) and 51*bis*.1(a)(iv))
for the purposes of the designation of the United States of America:

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/IB2010/ (if furnishing declaration pursuant to Rule 26*ter*).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications:

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name: DAHL, Søren Risgaard

Residence: Odense SV, Denmark
(city and either US state, if applicable, or country)

Mailing Address: Kielshusvej 16, 5250 Odense SV, Denmark

Citizenship: DK

Inventor's Signature: Søren R. Dahl Date: 09-03-2010
(The signature must be that of the inventor, not that of the agent)

Name: NIELSEN, Bo Vork

Residence: Morud, Denmark
(city and either US state, if applicable, or country)

Mailing Address: Birkevej 6, 5462 Morud, Denmark

Citizenship: DK

Inventor's Signature: Date: 9.3.2010
(The signature must be that of the inventor, not that of the agent)

☒ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".

Continuation of Box No. VIII (i) to (v) DECLARATION

If the space is insufficient in any of Boxes Nos. VIII (i) to (v) to furnish all the information, including in the case where more than two inventors are to be named in Box No. VIII (iv), in such case, write "Continuation of Box No. VIII ..." indicate the item number of the Box) and furnish the information in the same manner as required for the purposes of the Box in which the space was insufficient. If additional space is needed in respect of two or more declarations, a separate continuation box must be used for each such declaration. If this Box is not used, this sheet should not be included in the request.

Name: OLSSON, Henrik . . . . . .

Residence: Odense SV, Denmark. . . . . .
(city and either US state, if applicable, or country)

Mailing Address: Lærkedals Allé 30, 5250 Odense SV, Denmark. . . . . .

Citizenship: DK. . . . . .

Inventor's Signature: . . . . . Date: 9/3/2010 . . . . .
(The signature must be that of the inventor, not that of the agent)

Name: SCHRØDER, Lars . . . . . .

Residence: Assens, Denmark. . . . . .
(city and either US state, if applicable, or country)

Mailing Address: Kildensmindensvej 16, 5610 Assens, Denmark. . . . . .

Citizenship: DK. . . . . .

Inventor's Signature: . . . . . Date: 09/03-2010 . . . . .
(The signature must be that of the inventor, not that of the agent)

PCT REQUEST

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IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	10	✓
IX-2	Description	14	✓
IX-3	Claims	2	✓
IX-4	Abstract	1	✓
IX-5	Drawings	9	✓
IX-7	TOTAL	36	
	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	–	✓
IX-17	Copy of the results of earlier search(es)	–	✓
IX-18	PCT-SAFE physical media	–	–
IX-19	Other	Cited Reference in Exam Report of DK PA-2009-000392	✓
IX-19	Other	Cited Reference in Exam Report of DK PA-2009-000392	✓
IX-19	Other	Cited Reference in Exam Report of DK PA-2009-000392	✓
IX-19	Other	Cited Reference in Exam Report of DK PA-2009-000392	✓
IX-19	Other	Cited Reference in Exam Report of DK PA-2009-000392	✓
IX-19	Other	Declaration of Inventorship	✓
IX-19	Other	PCT-RO-101 Last Page with Applicant's Signature	✓
IX-20	**Figure of the drawings which should accompany the abstract**	4	
IX-21	**Language of filing of the international application**	English	
X-1	**Signature of applicant, agent or common representative**	/henrik olsson/	
X-1-1	Name	AXA Power ApS	
X-1-2	Name of signatory	OLSSON, Henrik	
X-1-3	Capacity	General Manager	

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10-1	**Date of actual receipt of the purported international application**	
10-2	**Drawings:**	
10-2-1	Received	
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/EP
10-6	**Transmittal of search copy delayed until search fee is paid**	

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Box No. IX CHECK LIST for PAPER filings – this sheet is only to be used when filing an international application on PAPER

This international application contains the following:	Number of sheets
(a) request form PCT/RO/101 (including any declarations and supplemental sheets)	10
(b) description (excluding any sequence listing part of the description, see (f), below)	14
(c) claims	2
(d) abstract	1
(e) drawings (if any)	9
(f) sequence listing part of the description (if any)	0
Total number of sheets	36

This international application is accompanied by the following item(s) *(mark the applicable check-boxes below and indicate in right column the number of each item)*:	Number of items
1. ☒ fee calculation sheet	1
2. ☐ original separate power of attorney	
3. ☐ original general power of attorney	
4. ☐ copy of general power of attorney; reference number:	
5. ☐ statement explaining lack of signature	
6. ☒ priority document(s) identified in Box No. VI as item(s) DK PA 2009 00392	1
7. ☐ Translation of international application into *(language)*:	
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12. ☐ other *(specify)*:	

Figure of the drawings which should accompany the abstract:	Language of filing of the international application:
4	ENGLISH

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request)

Name: HENRIK OLSSON
Title: GENERAL MANAGER

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Exhibit 1002
Page 041

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/051189

A. CLASSIFICATION OF SUBJECT MATTER
INV. B64F1/36
ADD.

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)
B64F

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 Y	WO 2007/135103 A2 (LEBRUN NIMY EN ABREGE LEBRUN S [BE]; URBAIN CLAUDY CHRISTIAN [BE]) 29 November 2007 (2007-11-29) * abstract; figures 1/4-4/4 pages 10-14 pages 17-21	1-9 10-12
Y A	WO 2007/061622 A1 (ILLINOIS TOOL WORKS [US]; LEADINGHAM DAVID W [US]; BIVENS STEVE [US];) 31 May 2007 (2007-05-31) the whole document	10-12 1-9
A	EP 0 431 563 A2 (TOSHIBA KK [JP]; TOSHIBA AUDIO VIDEO ENG [JP] TOSHIBA KK [JP]; TOSHIBA) 12 June 1991 (1991-06-12) * abstract; figures 1-4,6 column 1, lines 1-48	1-7

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

[X] See patent family annex.

* Special categories of cited documents :

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

"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

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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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 December 2010	11/01/2011

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, Fax: (+31-70) 340-3016	Larrañeta Reclusa, I

Form PCT/ISA/210 (second sheet) (April 2005)

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Page 042

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/051189

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 10 257796 A (MITSUBISHI ELECTRIC CORP) 25 September 1998 (1998-09-25) * abstract -----	1-7

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

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Exhibit 1002
Page 043

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2010/051189

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007135103 A2	29-11-2007	AT 461109 T	15-04-2010
		CN 101448702 A	03-06-2009
		EP 1857363 A1	21-11-2007
		EP 2021247 A2	11-02-2009
		JP 2009537779 T	29-10-2009
		US 2010031676 A1	11-02-2010
WO 2007061622 A1	31-05-2007	AT 423063 T	15-03-2009
		CN 101331059 A	24-12-2008
		EP 1951573 A1	06-08-2008
		JP 2009516622 T	23-04-2009
		US 2008250803 A1	16-10-2008
EP 0431563 A2	12-06-1991	JP 3177736 A	01-08-1991
		US 5107685 A	28-04-1992
JP 10257796 A	25-09-1998	JP 3414612 B2	09-06-2003

Description

Title of Invention: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

[1] The present invention related to a preconditioned air unit supplying preconditioned air, i.e. heated air or cooled air, to an aircraft parked on the ground.

[2] On the ground, an aircraft typically uses the auxiliary power unit engine (APU) to drive air-conditioning equipment to cool or heat the aircraft cabin to a temperature that is comfortable for passengers. However, operation of the APU has a high cost in terms of jet fuel consumption, generated acoustic noise, CO_2 emissions, etc. For example, the APU of an A320 aircraft consumes app. 160 I fuel per hour. In addition to the general air pollution, the consumption of one litre of jet fuel leads to emission of 2.5 kg CO_2 into the atmosphere and thus, the APU emits app. 400 kg CO_2 per operational hour.

[3] In order to avoid running the APU on the ground, preconditioned air units have been provided for supplying the required preconditioned air to the parked aircraft. The preconditioned air units are powered from the mains supply made available at the airport in question.

[4] Cost, efficiency, flexibility, and serviceability remain an issue in known preconditioned air units.

[5] A new preconditioned air unit is provided for supplying preconditioned air to an aircraft parked on the ground. The new preconditioned air unit has a housing with walls defining a flow duct with an air inlet for intake of ambient air to be conditioned to a low temperature, typically a temperature in the range from - 5°C to + 5 °C, and an air outlet for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. To prevent cooling losses, the outer walls of the flow duct may be provided with a layer of heat insulation material.

[6] The preconditioned air unit further comprises a blower accommodated in the housing and connected with the flow duct for generation of an air flow from the air inlet toward the air outlet. The blower is preferably a highly efficient centrifugal fan. The blower is preferably mounted with vibration dampers and attached with flexible connections to the flow duct.

[7] The new preconditioned air unit further comprises at least one refrigeration system, each of which comprises at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a refrigerant flow circuit containing a refrigerant.

[8] At least one compressor of the at least one refrigeration system may be powered from a variable frequency driver. In a conventional preconditioned air unit, the compressor

is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the maximum capacity of the compressor is determined by the frequency of the mains supply. Advantageously, the output voltage and frequency of the variable frequency driver in the new preconditioned air unit are varied to control the at least one compressor in accordance with the current cooling requirement. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. In this way, each of the at least one refrigeration systems may operate continuously, i.e. the output voltage and frequency of the variable frequency driver may be adjusted to levels required by the at least one compressor in order for it to cool the airflow interacting with the respective at least one evaporator in accordance with a control setting. This increases the life time and decreases power consumption of the at least one refrigeration system as compared to conventional on/ off control.

[9] Further, the maximum capacity of a compressor driven by a variable frequency driver may be increased as compared to the same compressor supplied directly from the mains supply. For example, supplying a compressor with a supply voltage with a 75 Hz output frequency increases the cooling capacity of the compressor by 50% over the same compressor supplied directly from the mains supply in Europe.

[10] Preferably, the controller of the variable frequency driver (in the following denoted "VFD-controller") is capable of controlling the variable frequency driver to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rating of the compressor whereby the one or more compressors supplied from the variable frequency driver may be controlled for provision of variable cooling capacity, e.g. in response to the temperature and flow rate of the air flow in the flow duct.

[11] A plurality of variable frequency drivers may be provided for power supply of respective compressors, e.g. each of the compressors may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective compressor.

[12] Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more compressors.

[13] The preconditioned air unit may further comprise at least one condenser fan for generation of a condenser airflow interacting with the at least one condenser of the at least one refrigeration system thereby increasing the heat removal capacity of the at least one condenser.

[14] Each of the at least one condenser fan may be located in any suitable position in the housing for provision of a condenser air flow within the housing. Each of the at least one condenser fan may be located adjacent an air outlet in the housing for generation

of a condenser air flow out through the outlet, and each of the at least one condenser may be located adjacent an air inlet for interaction with the generated condenser airflow at ambient temperature. Obviously, the direction of the condenser air flow may be reversed although in this case the condenser air flow may be heated by internal components within the housing before interacting with the at least one condenser.

[15] At least one of the at least one condenser fan may be powered from a variable frequency driver. In a conventional preconditioned air unit, the condenser fan is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA, and thus, the condenser fan performance is locked to the frequency of the mains supply. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the at least one condenser fan in accordance with the current operational requirements, such as current pressure within the at least one condenser, efficiency, etc. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the at least one condenser fan. A plurality of variable frequency drivers may be provided for power supply of respective condenser fans, e.g. each of the condenser fans may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective condenser fan by control of the condenser air flow rate generated by the condenser fan.

[16] Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more condenser fans.

[17] The preconditioned air unit may further comprise a variable frequency driver connected for electrical power supply of the blower. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the blower.

[18] The new preconditioned air unit may comprise a main unit and one or more self-contained cooling modules mounted in the main unit. The main unit includes the housing having a plurality of compartments for receiving and holding the self-contained cooling modules. Each of the self-contained cooling modules comprises at least one of the at least one refrigeration systems.

[19] Each of the at least one refrigeration system operates in accordance with well-known refrigerator principles and with a well-known refrigerant, such as R134a with low global warming potential.

[20] The at least one evaporator of the at least one refrigeration system is mounted in the housing of the preconditioned air unit for interaction with the airflow in the flow duct for cooling of the air flow. For example, a cooling surface of the at least one evaporator may be positioned inside the flow duct for direct contact across a large surface area with the airflow in the flow duct.

[21] One or more VFD-controllers of the at least one refrigeration system may further perform data collection of parameter values sensed by sensors of the at least one refrigeration system, e.g. temperature sensors sensing temperatures in the airflow upstream and downstream of the at least one evaporator and of the at least one condenser, pressure sensors sensing the pressure of the refrigerant in the at least one refrigeration system, etc.

[22] Preferably, the preconditioned air unit has a central controller that is configured for controlling the operation of the preconditioned air unit. The central controller may be connected to a user interface for reception of user commands from a user and for outputting messages to the user. The preconditioned air unit may comprise at least one of the following: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, a loudspeaker, etc. For example, one of the primary user entries specifies the type of aircraft to be supplied by the preconditioned air unit. This information may be entered using entry keys of the user panel, or, using a remote control from the passenger boarding bridge, or, may be transmitted from the building management system of the airport, etc.

[23] The central controller may further be connected with some or all of the VFD-controllers of the preconditioned air unit for individual control of the VFD-controllers. For example, if the preconditioned air unit comprises a plurality of refrigeration systems, the central controller may output an individual temperature setting to the VFD-controllers of each of the refrigeration systems, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective at least one compressor to adjust the temperature of the airflow having interacted with the corresponding at least one evaporator as required.

[24] Further, each of the refrigeration systems may be configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing cooling refrigeration system may transmit a failure signal to the central controller and may shut down if required. In response to the failure signal, the central controller may operate to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the preconditioned air unit.

[25] The central controller may be interfaced with some or all of the VFD-controllers and possibly other controlled devices, such as an SCR module controlling a heater in the flow duct, with a data and control bus, such as the CAN bus.

[26] The preconditioned air unit may further have a rectifier connected to the mains supply input of the preconditioned air unit for generation of a power DC voltage supply for supplying the variable frequency drivers.

[27] In order to suppress distortion and pollution of the mains supply, the rectifier circuit may comprise a 12-pulse rectifier, or a 18-pulse rectifier, or a 24-pulse rectifier, etc.

[28] The preconditioned air unit may share a mains power outlet with other equipment at the parked aircraft, such as, a ground power unit, a cable coil, vehicle chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit may comprise a power sharing control input for control of preconditioned air unit power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit when the ground power unit draws a high supply current. The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, again, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit.

[29] The preconditioned air unit may be mounted underneath or on top of a passenger boarding bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit may be provided with pedestal legs for flexibility in preconditioned air unit location at an apron or in a hangar.

[30] A plurality of the new preconditioned air units may be interconnected for supplying preconditioned air to a parked aircraft in cooperation. Two of the new preconditioned air units may for example be coupled in parallel in a master-slave configuration wherein the outputs of each of the preconditioned air units supply a common hose that is connected to the parked aircraft and possibly split at the aircraft into two or more hoses for supplying possible individual inputs of the aircraft for preconditioned air. The master may control the slave in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft. Other control principles may also be applied. For example, the CAN-bus of the cooperating preconditioned air units may be inter-

connected for flexibility of control sharing between cooperating units.

[31] The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

[32] Fig. 1 shows a preconditioned air unit from above with the top removed,

[33] Fig. 2 shows a preconditioned air unit in perspective with two self-contained cooling modules withdrawn from their respective compartments,

[34] Fig. 3 shows a self-contained cooling module in perspective,

[35] Fig. 4 illustrates handling of a self-contained cooling module with a fork lift truck,

[36] Fig. 5 shows a preconditioned air unit in perspective ready for mounting,

[37] Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit,

[38] Fig. 7 shows the user interface panel of the preconditioned air unit,

[39] Fig. 8 shows another preconditioned air unit from above with the top removed, and

[40] Fig. 9 shows two preconditioned air units coupled in parallel in a master-slave configuration.

[41] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[42] Fig. 1 shows a top view of an exemplified embodiment of the new preconditioned air unit 10 for supplying preconditioned air to an aircraft parked on the ground. The preconditioned air unit 10 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 16a, 16b, 18, besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters the flow duct 20 through an air inlet 22 in a side wall 24 of the housing 12. The flow duct 20 is folded inside the housing 12 so that walls 16a, 16b separate the flow duct into two parts with air flowing in opposite directions during operation of the preconditioned air unit 10. The side wall also has an air outlet 25 for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, and the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

[43] A blower 30 is connected with the flow duct 20 for generation of the required air

flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

[44] An optional heater 32 is mounted in the flow duct 20 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

[45] As most clearly shown in Fig. 2, the illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective, identical self-contained cooling modules 36.

[46] As shown in Fig. 3, each of the self-contained cooling modules 36 comprises a refrigeration system including a compressor 38, a condenser 40, an expansion valve 42, and an evaporator 44 connected in series in a refrigerant flow circuit containing a refrigerant selected in accordance with the expected high end ambient temperature of the airport in question, e.g. R134a selected for operation at high end ambient temperatures around 40 °C The refrigerant flow circuit forms a closed and sealed loop. Each of the self-contained cooling modules 36 operates in accordance with well-known refrigerator principles.

[47] Each of the self-contained cooling modules 36 can be installed in the housing 12 of the main unit without interfering with the refrigeration system of the module 36 so that assembly and possible disassembly of self-contained cooling modules 36 in the preconditioned air unit housing 12 can be performed by persons without specific skills in the field of refrigeration systems. The self-contained cooling modules 36 may be manufactured at one site particularly suitable for manufacturing of refrigeration systems for subsequent integration with housings 12 of the main unit at a separate site particularly suitable for manufacturing of airport ground equipment in general thereby increasing manufacturing flexibility and decreasing manufacturing cost of the preconditioned air unit 10. Further, the self-contained cooling module 36 may be stored as a spare part including the refrigerant, whereby repair of a preconditioned air unit without having to perform the cumbersome task of emptying the preconditioned air unit for refrigerant is made possible.

[48] The power supply, control circuitry, and user interface of the preconditioned air unit 10 allows the preconditioned air unit 10 to operate with any number of self-contained cooling modules 36 installed, i.e. the illustrated preconditioned air unit 10 may operate with a single self-contained cooling module 36 installed in an arbitrarily selected compartment 34; or, with two self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or, with three self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or with four self-contained cooling modules 36 installed in respective compartments 34. In this way, a product line

of preconditioned air units 10 is provided making four different preconditioned air units 10 available with different cooling capacities based on the same components. This lowers manufacturing cost by lowering purchase cost per component, and storage and handling cost both per component and per finished preconditioned air unit 10. Further, a preconditioned air unit 10 already in use in an airport with less than four self-contained cooling modules 36 installed may be upgraded on site by installing one or more self-contained cooling modules 36 in empty compartments 34.

[49] Preferably, the self-contained cooling modules 36 are removably installed in the housing 12 of the main unit facilitating separation of an installed self-contained cooling module from the housing 12, e.g. utilizing screws, nuts and bolts for fastening each of the self-contained cooling modules 36 to the housing 12 and utilizing electrical connectors (not shown) to establish the required electrical interconnections between the cooling module and the housing 12 when the cooling module 36 is inserted in the housing 12 of the main unit 10.

[50] Fig. 2 shows in perspective the preconditioned air unit of Fig. 1 with two self-contained cooling modules 36 withdrawn from the housing 12 of the main unit 10. Fig. 5 shows in perspective the preconditioned air unit of Figs. 1 and 2 with the two self-contained cooling modules 36 inserted and installed in the housing 12 of the main unit 10.

[51] The removability of the modules 36 enhances the serviceability of the preconditioned air unit 10 since a possible malfunctioning self-contained cooling module can be separated from the housing 12 of the main unit 10 and replaced with a functioning module 36 with a minimum of down time of the preconditioned air unit 10. One cooling module 36 can be replaced in approximately 20 minutes. In the event that a functioning cooling module 36 is not available for substitution of the malfunctioning cooling module 36, the preconditioned air unit 10 will continue operation with the remaining cooling modules 36, i.e. the preconditioned air unit 10 remains fully operational, however with a lowered cooling capacity. Further, the malfunctioning module 36 can be moved for repair at a separate site particularly suitable for repair of refrigeration systems. Also, the possible requirement of dismounting and moving the entire preconditioned air unit for repair of a cooling circuit is hereby reduced. Preferably, the self-contained cooling module 36 has physical dimensions suitable for movement by a fork lift truck 47 as illustrated in Fig. 4 facilitating transportation of the module 36, e.g. for storage, assembly into a preconditioned air unit 10, and service. For example, a malfunctioning module 36 can be removed from the housing 12 with a fork lift truck 47 and a properly functioning module 36 can be installed in the housing 12 with a fork lift truck 47.

[52] In the illustrated preconditioned air unit 10, the evaporator 44 of each self-contained

cooling module 36 is positioned inside the flow duct 20 through a slot in the wall 14a, 14b, 14c, 14d when installed in the housing 12 of the main unit for optimum heat exchange with the air flow in the duct 20. The evaporator 44 has a large number of channels for passage of the air flow in the duct 20 providing a large surface of heat exchange between the air flow and the refrigerant flowing inside the evaporator 44 as is well-known in the art of refrigeration systems. The slots in the walls 14a, 14b, 14c, 14d are sealed when the respective self-contained cooling modules 36 are mounted in their operational positions in the compartments 34. In absence of a self-contained cooling module 36, the slot is sealed with a cover plate.

[53] Cooling in multiple steps as provided by a plurality of self-contained cooling modules 36 efficiently condenses the air humidity and protects the last downstream evaporator 44 from freezing over. A stainless steel condensate pan (not shown) and integrated condensate pump (not shown) ensure that the condensation moisture is removed in a controlled way.

[54] The cooling air leaves the illustrated preconditioned air unit through one or two 14" hoses.

[55] Each of the compressors 38 of the self-contained cooling modules 36 may be powered from a variable frequency driver 46 also located in the respective self-contained cooling module 36. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the capacity of the compressor is limited by the frequency of the mains supply. This limitation does not exist in the new preconditioned air unit 10. Advantageously, the variable frequency driver the VFD-controller is capable of varying the output voltage and frequency of the variable frequency driver 46 in order to control the compressor 38 in accordance with the current cooling requirement. In the illustrated preconditioned air unit, the variable frequency driver 46 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

[56] The output voltage and frequency supplied by the variable frequency driver 46 is controlled by the VFD-controller in a way well-known in the art of variable frequency drivers. Preferably, the VFD-controller is capable of controlling the variable frequency driver 46 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the compressor 38 whereby each of the compressors 38 supplied from a respective variable frequency driver 46 may be controlled for provision of variable cooling capacity.

[57] Each of the self-contained cooling modules has temperature sensors (39 in Fig. 6) in electrical connection with the VFD-controller of the module 36 and mounted for sensing temperatures in the air flow up-stream and down-stream of the evaporator 44

and transmitting the sensed temperature values to the VFD-controller, and the VFD-controller controls the cooling capacity of the compressor 38 in response to the sensed temperatures.

[58] Each of the self-contained cooling modules 36 operates continuously, i.e. the output voltage and frequency of the variable frequency driver 46 are adjusted to levels required by the compressor 38 in order for it to cool the airflow having interacted with the evaporator 44 substantially to the temperature setting. This increases the life time and decreases power consumption of the cooling modules 36 as compared to on/off control of the compressors 38.

[59] The preconditioned air unit 10 further comprises two condenser fans 48 mounted across apertures in the side wall 50 for generation of condenser airflow causing ambient air to enter the housing 12 through apertures in the self-contained cooling modules 36 covered by the condensers 40 as indicated by arrows 52a - 52f for heat removal from the heat exchanging surfaces of the condensers 40.

[60] The condenser fans 48 are powered from one variable frequency driver 54. Advantageously, the VFD controller of the variable frequency driver 54 is capable of varying the output voltage and frequency of the variable frequency driver 54 in order to control the condenser fans 48 in accordance with the current operational requirements, such as current pressure within the condenser(s), efficiency, etc. Preferably, the variable frequency driver 54 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the condenser fans. The preconditioned air unit 10 further comprises a variable frequency driver 56 connected for electrical power supply of the blower 30. Advantageously, the VFD controller of the variable frequency driver 56 is capable of varying the output voltage and frequency of the variable frequency driver 56 in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver 56 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. Preferably, the controller of the variable frequency driver 56 is capable of controlling the variable frequency driver 56 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the blower whereby the blower 30 supplied from the variable frequency driver 56 may be controlled for provision of variable flow rate of the air flow in the flow duct 20, e.g. in response to a user control command, e.g. the type of aircraft.

[61] The preconditioned air unit 10 has a central controller 60 that is configured for con-

trolling the operation of the preconditioned air unit 10. The central controller 60 is connected with the user interface panel 58 for reception of user commands and for outputting messages to the user, e.g. on a display of the user interface panel 58, by a loudspeaker of the user interface, etc.

[62] The central controller 60 is connected with all of the VFD-controllers of the preconditioned air unit 10 for individual control of the VFD-controllers. For example, the central controller outputs an individual temperature setting to each of the VFD-controllers of the preconditioned air unit 10, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective compressor 38 to adjust the temperature of the airflow having interacted with the corresponding evaporator 44 as required. Further, in the event that one of the installed self-contained cooling modules 36 fails, the failing cooling module transmits a failure signal to the central controller 60 and shuts down if required. In response to the failure signal, the central controller 60 operates to automatically adjust the required amount of cooling among the remaining properly operating self-contained cooling modules 36 of the preconditioned air unit 10.

[63] Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit 10.

[64] The illustrated preconditioned air unit 10 has a 12-pulse rectifier 62 connected to a mains supply input 64 of the preconditioned air unit 10 for generation of a power DC voltage supply. Using variable frequency drivers may generate harmonic distortion of the mains input. To minimize distortion of the mains input, the three phases of the mains are transformed into six phases which are rectified in the non-regulated 12-pulse full bridge rectifier 62. The combination of the 12-pulse rectifier 62, the related transformer 66 and the input filter 68 reduce harmonic feedback into the mains to a minimum. Further, the 12-pulse rectifier 62 includes soft start circuitry that limits the inrush current. Still further, utilization of the 12-pulse rectifier 62 results in a high input power factor, i.e. a power factor that is larger than 0.8; for example 0.96, which in turn results in a reduced input mains current.

[65] The filtered power DC voltage supply is routed to each of the compartments 34 for power supply of each of the variable frequency drivers 46 of the self-contained modules 36 when installed in the respective compartments 34.

[66] The filtered power DC voltage supply is further routed to variable frequency driver 56 for power supply of the blower 30 and to variable frequency driver 54 for power supply of the two condenser fans 48.

[67] The central controller 60 is based on a micro-controller and a digital signal processor that cooperate to regulate, supervise and diagnose possible external and internal failures. In addition, each variable frequency driver 46, 54, 56 comprises a micro-

controller to perform individual control of devices connected to the variable frequency driver in question. Further, the VFD-controller of each of the self-containing cooling modules 36 monitors the respective refrigeration system and decreases the cooling capacity or stops cooling if the refrigerant pressure is too low or too high.

[68] The central controller 60 automatically adjusts the cooling performed by the preconditioned air unit 10 to the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, the outgoing airflow from the preconditioned air unit 10, etc.

[69] The central controller 60 and the variable frequency drivers 46, 54, 56, and the SCR module 70 controlling the heater 32 are interfaced with a data and control bus, which in the illustrated example is the CAN bus.

[70] The preconditioned air unit 10 may share a mains power outlet with other equipment at the parked aircraft, such as a ground power unit, a cable coil, vehicle battery chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit 10 comprises a power sharing control input (not shown) for control of preconditioned air unit 10 power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit 10 power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit 10 during high load ground power unit operation The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit 10. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit 10.

[71] Fig. 7 shows the user interface panel 58 of the preconditioned air unit 10. The user interface panel 58 includes an LCD display 72 viewable in all weather conditions and displaying all relevant operational data. The display provides information at different levels: In a default mode, the display shows the status of the preconditioned air unit 10, such as aircraft type, cabin temperature, etc. In an alarm mode, the display shows type of alarm and alarm history. In a setup mode, the display shows various parameters that may be adjusted.

[72] The preconditioned air unit includes digital input/output ports, such as galvanic isolated RS485 port, TCP/IP Ethernet port, etc, for remote control of the preconditioned air unit 10 and monitoring including data dump for service tasks.

[73] The preconditioned air unit 10 may be mounted underneath or on top of an apron drive bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit 10 may be provided with pedestal legs for flexibility in preconditioned air unit location for fixed bridge and hangar applications.

[74] Other preconditioned air units may be provided within the scope of the appended claims. For example, other preconditioned air units may be provided that are not modular. Also, preconditioned air units may be provided with different numbers of refrigeration systems, such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., refrigeration systems.

[75] In the example illustrated in Figs, 1, 2, 4, 5, and 6, the refrigeration systems operate in a series. Other preconditioned air units may be provided with refrigeration systems operating in parallel; or with refrigeration systems operating both in parallel and in series.

[76] For example, Fig. 8 shows a top view of a new preconditioned air unit 10 with two sets of self-contained cooling modules 36a, 36b, and 36c, 36d. Within each set, the self-contained cooling modules operate in parallel, and the two sets of self-contained cooling modules operate in series for supplying preconditioned air to an aircraft parked on the ground.

[77] The preconditioned air unit 10 shown in Fig. 8 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 18a, 18b besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters through an air inlet 22 in a side wall 24 of the housing 12. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. An optional heater 32 is mounted at the air inlet 22 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

[78] A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

[79] The flow duct 20 has a manifold 21 for expanding the airflow for passage of the condensers 40 operating in parallel. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, 18a, 18b including the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

[80] The illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective self-contained cooling modules 36. It should be noted that parallel self-contained cooling modules to the left and right in Fig. 8 have different lay-outs with corresponding components positioned differently with respect

to each other in order to obtain the resulting configuration illustrated in Fig. 8. Evaporator geometries of parallel operating self-contained modules also differ since the air flow passes the respective evaporators in opposite directions with respect to the refrigeration circuit.

[81] The remaining components and the operation of the preconditioned air unit 10 illustrated in Fig. 8 are already explained in connection with the preconditioned air unit illustrated in the previous Figures and are not repeated here.

[82] Fig. 9 shows two of the new preconditioned air units 10a, 10b coupled in parallel in a master-slave configuration. The air outlets 25a, 25b of each of the preconditioned air units 10a, 10b are connected with a common hose 74. Proximate the parked aircraft, the common hose 74 is split into two hoses 76, 78 for supplying corresponding individual inputs of the aircraft for preconditioned air. The master 10a may control the slave 10b in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft.

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(71) Applicant *(for all designated States except US)*: **AXA POWER APS** [DK/DK]; Smedebakken 31, Søhus, DK-5270 Odense N (DK).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DAHL, Søren Risgaard** [DK/DK]; Kielshusvej 16, DK-5250 Odense SV (DK). **NIELSEN, Bo Vork** [DK/DK]; Birkevej 6, DK-5462 Morud (DK). **OLSSON, Henrik** [DK/DK]; Lærkedals Allé 30, DK-5250 Odense SV (DK). **SCHRØDER, Lars** [DK/DK]; Kildensmindensvej 16, DK-5610 Assens (DK).

(74) Common Representative: **AXA POWER APS**; c/o HAUPTMAN, Benjamin J., Lowe Hauptman Ham & Berner, Llp, 1700 Diagonal Road, Suite 300, Alexandria, Virginia 22314 (US).

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(54) Title: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

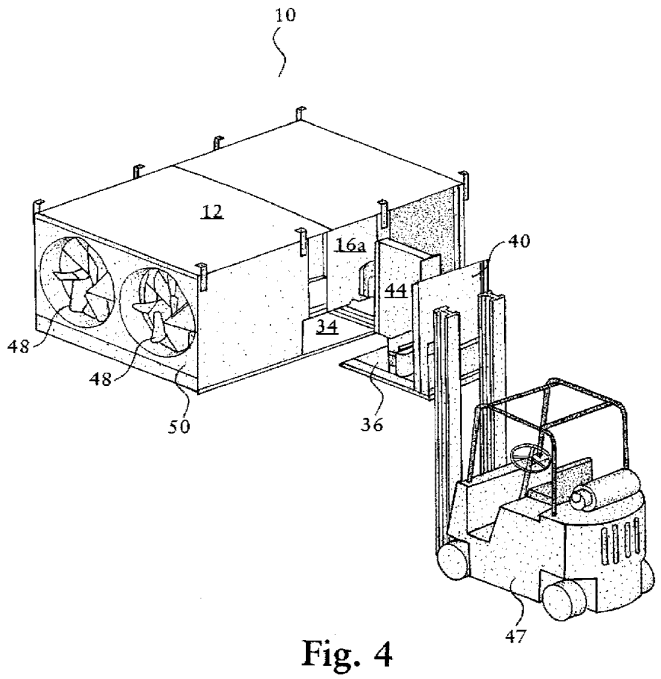

Fig. 4

(57) Abstract: A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

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Description

Title of Invention: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

The present invention related to a preconditioned air unit supplying preconditioned air, i.e. heated air or cooled air, to an aircraft parked on the ground.

On the ground, an aircraft typically uses the auxiliary power unit engine (APU) to drive air-conditioning equipment to cool or heat the aircraft cabin to a temperature that is comfortable for passengers. However, operation of the APU has a high cost in terms of jet fuel consumption, generated acoustic noise, CO_2 emissions, etc. For example, the APU of an A320 aircraft consumes app. 160 I fuel per hour. In addition to the general air pollution, the consumption of one litre of jet fuel leads to emission of 2.5 kg CO_2 into the atmosphere and thus, the APU emits app. 400 kg CO_2 per operational hour.

In order to avoid running the APU on the ground, preconditioned air units have been provided for supplying the required preconditioned air to the parked aircraft. The preconditioned air units are powered from the mains supply made available at the airport in question.

Cost, efficiency, flexibility, and serviceability remain an issue in known preconditioned air units.

A new preconditioned air unit is provided for supplying preconditioned air to an aircraft parked on the ground. The new preconditioned air unit has a housing with walls defining a flow duct with an air inlet for intake of ambient air to be conditioned to a low temperature, typically a temperature in the range from - 5°C to + 5 °C, and an air outlet for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. To prevent cooling losses, the outer walls of the flow duct may be provided with a layer of heat insulation material.

The preconditioned air unit further comprises a blower accommodated in the housing and connected with the flow duct for generation of an air flow from the air inlet toward the air outlet. The blower is preferably a highly efficient centrifugal fan. The blower is preferably mounted with vibration dampers and attached with flexible connections to the flow duct.

The new preconditioned air unit further comprises at least one refrigeration system, each of which comprises at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a refrigerant flow circuit containing a refrigerant.

At least one compressor of the at least one refrigeration system may be powered from a variable frequency driver. In a conventional preconditioned air unit, the compressor

is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the maximum capacity of the compressor is determined by the frequency of the mains supply. Advantageously, the output voltage and frequency of the variable frequency driver in the new preconditioned air unit are varied to control the at least one compressor in accordance with the current cooling requirement. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. In this way, each of the at least one refrigeration systems may operate continuously, i.e. the output voltage and frequency of the variable frequency driver may be adjusted to levels required by the at least one compressor in order for it to cool the airflow interacting with the respective at least one evaporator in accordance with a control setting. This increases the life time and decreases power consumption of the at least one refrigeration system as compared to conventional on/ off control.

Further, the maximum capacity of a compressor driven by a variable frequency driver may be increased as compared to the same compressor supplied directly from the mains supply. For example, supplying a compressor with a supply voltage with a 75 Hz output frequency increases the cooling capacity of the compressor by 50% over the same compressor supplied directly from the mains supply in Europe.

Preferably, the controller of the variable frequency driver (in the following denoted "VFD-controller") is capable of controlling the variable frequency driver to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rating of the compressor whereby the one or more compressors supplied from the variable frequency driver may be controlled for provision of variable cooling capacity, e.g. in response to the temperature and flow rate of the air flow in the flow duct.

A plurality of variable frequency drivers may be provided for power supply of respective compressors, e.g. each of the compressors may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective compressor.

Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more compressors.

The preconditioned air unit may further comprise at least one condenser fan for generation of a condenser airflow interacting with the at least one condenser of the at least one refrigeration system thereby increasing the heat removal capacity of the at least one condenser.

Each of the at least one condenser fan may be located in any suitable position in the housing for provision of a condenser air flow within the housing. Each of the at least one condenser fan may be located adjacent an air outlet in the housing for generation

of a condenser air flow out through the outlet, and each of the at least one condenser may be located adjacent an air inlet for interaction with the generated condenser airflow at ambient temperature. Obviously, the direction of the condenser air flow may be reversed although in this case the condenser air flow may be heated by internal components within the housing before interacting with the at least one condenser.

At least one of the at least one condenser fan may be powered from a variable frequency driver. In a conventional preconditioned air unit, the condenser fan is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA, and thus, the condenser fan performance is locked to the frequency of the mains supply. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the at least one condenser fan in accordance with the current operational requirements, such as current pressure within the at least one condenser, efficiency, etc. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the at least one condenser fan. A plurality of variable frequency drivers may be provided for power supply of respective condenser fans, e.g. each of the condenser fans may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective condenser fan by control of the condenser air flow rate generated by the condenser fan.

Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more condenser fans.

The preconditioned air unit may further comprise a variable frequency driver connected for electrical power supply of the blower. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the blower.

The new preconditioned air unit may comprise a main unit and one or more self-contained cooling modules mounted in the main unit. The main unit includes the housing having a plurality of compartments for receiving and holding the self-contained cooling modules. Each of the self-contained cooling modules comprises at least one of the at least one refrigeration systems.

Each of the at least one refrigeration system operates in accordance with well-known refrigerator principles and with a well-known refrigerant, such as R134a with low global warming potential.

The at least one evaporator of the at least one refrigeration system is mounted in the housing of the preconditioned air unit for interaction with the airflow in the flow duct for cooling of the air flow. For example, a cooling surface of the at least one evaporator may be positioned inside the flow duct for direct contact across a large surface area with the airflow in the flow duct.

One or more VFD-controllers of the at least one refrigeration system may further perform data collection of parameter values sensed by sensors of the at least one refrigeration system, e.g. temperature sensors sensing temperatures in the airflow upstream and downstream of the at least one evaporator and of the at least one condenser, pressure sensors sensing the pressure of the refrigerant in the at least one refrigeration system, etc.

Preferably, the preconditioned air unit has a central controller that is configured for controlling the operation of the preconditioned air unit. The central controller may be connected to a user interface for reception of user commands from a user and for outputting messages to the user. The preconditioned air unit may comprise at least one of the following: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, a loudspeaker, etc. For example, one of the primary user entries specifies the type of aircraft to be supplied by the preconditioned air unit. This information may be entered using entry keys of the user panel, or, using a remote control from the passenger boarding bridge, or, may be transmitted from the building management system of the airport, etc.

The central controller may further be connected with some or all of the VFD-controllers of the preconditioned air unit for individual control of the VFD-controllers. For example, if the preconditioned air unit comprises a plurality of refrigeration systems, the central controller may output an individual temperature setting to the VFD-controllers of each of the refrigeration systems, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective at least one compressor to adjust the temperature of the airflow having interacted with the corresponding at least one evaporator as required.

Further, each of the refrigeration systems may be configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing cooling refrigeration system may transmit a failure signal to the central controller and may shut down if required. In response to the failure signal, the central controller may operate to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the preconditioned air unit.

The central controller may be interfaced with some or all of the VFD-controllers and possibly other controlled devices, such as an SCR module controlling a heater in the flow duct, with a data and control bus, such as the CAN bus.

The preconditioned air unit may further have a rectifier connected to the mains supply input of the preconditioned air unit for generation of a power DC voltage supply for supplying the variable frequency drivers.

In order to suppress distortion and pollution of the mains supply, the rectifier circuit may comprise a 12-pulse rectifier, or a 18-pulse rectifier, or a 24-pulse rectifier, etc.

The preconditioned air unit may share a mains power outlet with other equipment at the parked aircraft, such as, a ground power unit, a cable coil, vehicle chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit may comprise a power sharing control input for control of preconditioned air unit power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit when the ground power unit draws a high supply current. The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, again, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit.

The preconditioned air unit may be mounted underneath or on top of a passenger boarding bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit may be provided with pedestal legs for flexibility in preconditioned air unit location at an apron or in a hangar.

A plurality of the new preconditioned air units may be interconnected for supplying preconditioned air to a parked aircraft in cooperation. Two of the new preconditioned air units may for example be coupled in parallel in a master-slave configuration wherein the outputs of each of the preconditioned air units supply a common hose that is connected to the parked aircraft and possibly split at the aircraft into two or more hoses for supplying possible individual inputs of the aircraft for preconditioned air. The master may control the slave in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft. Other control principles may also be applied. For example, the CAN-bus of the cooperating preconditioned air units may be inter-

connected for flexibility of control sharing between cooperating units.

The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

Fig. 1 shows a preconditioned air unit from above with the top removed,

Fig. 2 shows a preconditioned air unit in perspective with two self-contained cooling modules withdrawn from their respective compartments,

Fig. 3 shows a self-contained cooling module in perspective,

Fig. 4 illustrates handling of a self-contained cooling module with a fork lift truck,

Fig. 5 shows a preconditioned air unit in perspective ready for mounting,

Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit,

Fig. 7 shows the user interface panel of the preconditioned air unit,

Fig. 8 shows another preconditioned air unit from above with the top removed, and

Fig. 9 shows two preconditioned air units coupled in parallel in a master-slave configuration.

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

Fig. 1 shows a top view of an exemplified embodiment of the new preconditioned air unit 10 for supplying preconditioned air to an aircraft parked on the ground. The preconditioned air unit 10 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 16a, 16b, 18, besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters the flow duct 20 through an air inlet 22 in a side wall 24 of the housing 12. The flow duct 20 is folded inside the housing 12 so that walls 16a, 16b separate the flow duct into two parts with air flowing in opposite directions during operation of the preconditioned air unit 10. The side wall also has an air outlet 25 for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, and the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

A blower 30 is connected with the flow duct 20 for generation of the required air

flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

An optional heater 32 is mounted in the flow duct 20 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

As most clearly shown in Fig. 2, the illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective, identical self-contained cooling modules 36.

As shown in Fig. 3, each of the self-contained cooling modules 36 comprises a refrigeration system including a compressor 38, a condenser 40, an expansion valve 42, and an evaporator 44 connected in series in a refrigerant flow circuit containing a refrigerant selected in accordance with the expected high end ambient temperature of the airport in question, e.g. R134a selected for operation at high end ambient temperatures around 40 °C The refrigerant flow circuit forms a closed and sealed loop. Each of the self-contained cooling modules 36 operates in accordance with well-known refrigerator principles.

Each of the self-contained cooling modules 36 can be installed in the housing 12 of the main unit without interfering with the refrigeration system of the module 36 so that assembly and possible disassembly of self-contained cooling modules 36 in the preconditioned air unit housing 12 can be performed by persons without specific skills in the field of refrigeration systems. The self-contained cooling modules 36 may be manufactured at one site particularly suitable for manufacturing of refrigeration systems for subsequent integration with housings 12 of the main unit at a separate site particularly suitable for manufacturing of airport ground equipment in general thereby increasing manufacturing flexibility and decreasing manufacturing cost of the preconditioned air unit 10. Further, the self-contained cooling module 36 may be stored as a spare part including the refrigerant, whereby repair of a preconditioned air unit without having to perform the cumbersome task of emptying the preconditioned air unit for refrigerant is made possible.

The power supply, control circuitry, and user interface of the preconditioned air unit 10 allows the preconditioned air unit 10 to operate with any number of self-contained cooling modules 36 installed, i.e. the illustrated preconditioned air unit 10 may operate with a single self-contained cooling module 36 installed in an arbitrarily selected compartment 34; or, with two self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or, with three self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or with four self-contained cooling modules 36 installed in respective compartments 34. In this way, a product line

of preconditioned air units 10 is provided making four different preconditioned air units 10 available with different cooling capacities based on the same components. This lowers manufacturing cost by lowering purchase cost per component, and storage and handling cost both per component and per finished preconditioned air unit 10. Further, a preconditioned air unit 10 already in use in an airport with less than four self-contained cooling modules 36 installed may be upgraded on site by installing one or more self-contained cooling modules 36 in empty compartments 34.

Preferably, the self-contained cooling modules 36 are removably installed in the housing 12 of the main unit facilitating separation of an installed self-contained cooling module from the housing 12, e.g. utilizing screws, nuts and bolts for fastening each of the self-contained cooling modules 36 to the housing 12 and utilizing electrical connectors (not shown) to establish the required electrical interconnections between the cooling module and the housing 12 when the cooling module 36 is inserted in the housing 12 of the main unit 10.

Fig. 2 shows in perspective the preconditioned air unit of Fig. 1 with two self-contained cooling modules 36 withdrawn from the housing 12 of the main unit 10. Fig. 5 shows in perspective the preconditioned air unit of Figs. 1 and 2 with the two self-contained cooling modules 36 inserted and installed in the housing 12 of the main unit 10.

The removability of the modules 36 enhances the serviceability of the preconditioned air unit 10 since a possible malfunctioning self-contained cooling module can be separated from the housing 12 of the main unit 10 and replaced with a functioning module 36 with a minimum of down time of the preconditioned air unit 10. One cooling module 36 can be replaced in approximately 20 minutes. In the event that a functioning cooling module 36 is not available for substitution of the malfunctioning cooling module 36, the preconditioned air unit 10 will continue operation with the remaining cooling modules 36, i.e. the preconditioned air unit 10 remains fully operational, however with a lowered cooling capacity. Further, the malfunctioning module 36 can be moved for repair at a separate site particularly suitable for repair of refrigeration systems. Also, the possible requirement of dismounting and moving the entire preconditioned air unit for repair of a cooling circuit is hereby reduced. Preferably, the self-contained cooling module 36 has physical dimensions suitable for movement by a fork lift truck 47 as illustrated in Fig. 4 facilitating transportation of the module 36, e.g. for storage, assembly into a preconditioned air unit 10, and service. For example, a malfunctioning module 36 can be removed from the housing 12 with a fork lift truck 47 and a properly functioning module 36 can be installed in the housing 12 with a fork lift truck 47.

In the illustrated preconditioned air unit 10, the evaporator 44 of each self-contained

cooling module 36 is positioned inside the flow duct 20 through a slot in the wall 14a, 14b, 14c, 14d when installed in the housing 12 of the main unit for optimum heat exchange with the air flow in the duct 20. The evaporator 44 has a large number of channels for passage of the air flow in the duct 20 providing a large surface of heat exchange between the air flow and the refrigerant flowing inside the evaporator 44 as is well-known in the art of refrigeration systems. The slots in the walls 14a, 14b, 14c, 14d are sealed when the respective self-contained cooling modules 36 are mounted in their operational positions in the compartments 34. In absence of a self-contained cooling module 36, the slot is sealed with a cover plate.

Cooling in multiple steps as provided by a plurality of self-contained cooling modules 36 efficiently condenses the air humidity and protects the last downstream evaporator 44 from freezing over. A stainless steel condensate pan (not shown) and integrated condensate pump (not shown) ensure that the condensation moisture is removed in a controlled way.

The cooling air leaves the illustrated preconditioned air unit through one or two 14" hoses.

Each of the compressors 38 of the self-contained cooling modules 36 may be powered from a variable frequency driver 46 also located in the respective self-contained cooling module 36. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the capacity of the compressor is limited by the frequency of the mains supply. This limitation does not exist in the new preconditioned air unit 10. Advantageously, the variable frequency driver the VFD-controller is capable of varying the output voltage and frequency of the variable frequency driver 46 in order to control the compressor 38 in accordance with the current cooling requirement. In the illustrated preconditioned air unit, the variable frequency driver 46 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

The output voltage and frequency supplied by the variable frequency driver 46 is controlled by the VFD-controller in a way well-known in the art of variable frequency drivers. Preferably, the VFD-controller is capable of controlling the variable frequency driver 46 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the compressor 38 whereby each of the compressors 38 supplied from a respective variable frequency driver 46 may be controlled for provision of variable cooling capacity.

Each of the self-contained cooling modules has temperature sensors (39 in Fig. 6) in electrical connection with the VFD-controller of the module 36 and mounted for sensing temperatures in the air flow up-stream and down-stream of the evaporator 44

and transmitting the sensed temperature values to the VFD-controller, and the VFD-controller controls the cooling capacity of the compressor 38 in response to the sensed temperatures.

Each of the self-contained cooling modules 36 operates continuously, i.e. the output voltage and frequency of the variable frequency driver 46 are adjusted to levels required by the compressor 38 in order for it to cool the airflow having interacted with the evaporator 44 substantially to the temperature setting. This increases the life time and decreases power consumption of the cooling modules 36 as compared to on/off control of the compressors 38.

The preconditioned air unit 10 further comprises two condenser fans 48 mounted across apertures in the side wall 50 for generation of condenser airflow causing ambient air to enter the housing 12 through apertures in the self-contained cooling modules 36 covered by the condensers 40 as indicated by arrows 52a - 52f for heat removal from the heat exchanging surfaces of the condensers 40.

The condenser fans 48 are powered from one variable frequency driver 54. Advantageously, the VFD controller of the variable frequency driver 54 is capable of varying the output voltage and frequency of the variable frequency driver 54 in order to control the condenser fans 48 in accordance with the current operational requirements, such as current pressure within the condenser(s), efficiency, etc. Preferably, the variable frequency driver 54 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the condenser fans. The preconditioned air unit 10 further comprises a variable frequency driver 56 connected for electrical power supply of the blower 30. Advantageously, the VFD controller of the variable frequency driver 56 is capable of varying the output voltage and frequency of the variable frequency driver 56 in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver 56 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. Preferably, the controller of the variable frequency driver 56 is capable of controlling the variable frequency driver 56 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the blower whereby the blower 30 supplied from the variable frequency driver 56 may be controlled for provision of variable flow rate of the air flow in the flow duct 20, e.g. in response to a user control command, e.g. the type of aircraft.

The preconditioned air unit 10 has a central controller 60 that is configured for con-

trolling the operation of the preconditioned air unit 10. The central controller 60 is connected with the user interface panel 58 for reception of user commands and for outputting messages to the user, e.g. on a display of the user interface panel 58, by a loudspeaker of the user interface, etc.

The central controller 60 is connected with all of the VFD-controllers of the preconditioned air unit 10 for individual control of the VFD-controllers. For example, the central controller outputs an individual temperature setting to each of the VFD-controllers of the preconditioned air unit 10, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective compressor 38 to adjust the temperature of the airflow having interacted with the corresponding evaporator 44 as required. Further, in the event that one of the installed self-contained cooling modules 36 fails, the failing cooling module transmits a failure signal to the central controller 60 and shuts down if required. In response to the failure signal, the central controller 60 operates to automatically adjust the required amount of cooling among the remaining properly operating self-contained cooling modules 36 of the preconditioned air unit 10.

Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit 10.

The illustrated preconditioned air unit 10 has a 12-pulse rectifier 62 connected to a mains supply input 64 of the preconditioned air unit 10 for generation of a power DC voltage supply. Using variable frequency drivers may generate harmonic distortion of the mains input. To minimize distortion of the mains input, the three phases of the mains are transformed into six phases which are rectified in the non-regulated 12-pulse full bridge rectifier 62. The combination of the 12-pulse rectifier 62, the related transformer 66 and the input filter 68 reduce harmonic feedback into the mains to a minimum. Further, the 12-pulse rectifier 62 includes soft start circuitry that limits the inrush current. Still further, utilization of the 12-pulse rectifier 62 results in a high input power factor, i.e. a power factor that is larger than 0.8; for example 0.96, which in turn results in a reduced input mains current.

The filtered power DC voltage supply is routed to each of the compartments 34 for power supply of each of the variable frequency drivers 46 of the self-contained modules 36 when installed in the respective compartments 34.

The filtered power DC voltage supply is further routed to variable frequency driver 56 for power supply of the blower 30 and to variable frequency driver 54 for power supply of the two condenser fans 48.

The central controller 60 is based on a micro-controller and a digital signal processor that cooperate to regulate, supervise and diagnose possible external and internal failures. In addition, each variable frequency driver 46, 54, 56 comprises a micro-

controller to perform individual control of devices connected to the variable frequency driver in question. Further, the VFD-controller of each of the self-containing cooling modules 36 monitors the respective refrigeration system and decreases the cooling capacity or stops cooling if the refrigerant pressure is too low or too high.

The central controller 60 automatically adjusts the cooling performed by the preconditioned air unit 10 to the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, the outgoing airflow from the preconditioned air unit 10, etc.

The central controller 60 and the variable frequency drivers 46, 54, 56, and the SCR module 70 controlling the heater 32 are interfaced with a data and control bus, which in the illustrated example is the CAN bus.

The preconditioned air unit 10 may share a mains power outlet with other equipment at the parked aircraft, such as a ground power unit, a cable coil, vehicle battery chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit 10 comprises a power sharing control input (not shown) for control of preconditioned air unit 10 power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit 10 power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit 10 during high load ground power unit operation The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit 10. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit 10.

Fig. 7 shows the user interface panel 58 of the preconditioned air unit 10. The user interface panel 58 includes an LCD display 72 viewable in all weather conditions and displaying all relevant operational data. The display provides information at different levels: In a default mode, the display shows the status of the preconditioned air unit 10, such as aircraft type, cabin temperature, etc. In an alarm mode, the display shows type of alarm and alarm history. In a setup mode, the display shows various parameters that may be adjusted.

The preconditioned air unit includes digital input/output ports, such as galvanic isolated RS485 port, TCP/IP Ethernet port, etc, for remote control of the preconditioned air unit 10 and monitoring including data dump for service tasks.

The preconditioned air unit 10 may be mounted underneath or on top of an apron drive bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit 10 may be provided with pedestal legs for flexibility in preconditioned air unit location for fixed bridge and hangar applications.

Other preconditioned air units may be provided within the scope of the appended claims. For example, other preconditioned air units may be provided that are not modular. Also, preconditioned air units may be provided with different numbers of refrigeration systems, such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., refrigeration systems.

In the example illustrated in Figs, 1, 2, 4, 5, and 6, the refrigeration systems operate in a series. Other preconditioned air units may be provided with refrigeration systems operating in parallel; or with refrigeration systems operating both in parallel and in series.

For example, Fig. 8 shows a top view of a new preconditioned air unit 10 with two sets of self-contained cooling modules 36a, 36b, and 36c, 36d. Within each set, the self-contained cooling modules operate in parallel, and the two sets of self-contained cooling modules operate in series for supplying preconditioned air to an aircraft parked on the ground.

The preconditioned air unit 10 shown in Fig. 8 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 18a, 18b besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters through an air inlet 22 in a side wall 24 of the housing 12. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. An optional heater 32 is mounted at the air inlet 22 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

The flow duct 20 has a manifold 21 for expanding the airflow for passage of the condensers 40 operating in parallel. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, 18a, 18b including the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

The illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective self-contained cooling modules 36. It should be noted that parallel self-contained cooling modules to the left and right in Fig. 8 have different lay-outs with corresponding components positioned differently with respect

to each other in order to obtain the resulting configuration illustrated in Fig. 8. Evaporator geometries of parallel operating self-contained modules also differ since the air flow passes the respective evaporators in opposite directions with respect to the refrigeration circuit.

The remaining components and the operation of the preconditioned air unit 10 illustrated in Fig. 8 are already explained in connection with the preconditioned air unit illustrated in the previous Figures and are not repeated here.

Fig. 9 shows two of the new preconditioned air units 10a, 10b coupled in parallel in a master-slave configuration. The air outlets 25a, 25b of each of the preconditioned air units 10a, 10b are connected with a common hose 74. Proximate the parked aircraft, the common hose 74 is split into two hoses 76, 78 for supplying corresponding individual inputs of the aircraft for preconditioned air. The master 10a may control the slave 10b in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft.

Claims

[Claim 1] A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

[Claim 2] A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

[Claim 3] A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condensor fan for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

[Claim 4] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

[Claim 5] A preconditioned air unit according to any of the preceding claims, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

[Claim 6] A preconditioned air unit according to claim 5, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

[Claim 7] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a central controller that is

configured for controlling the operation of the preconditioned air unit.

[Claim 8] A preconditioned air unit according to claim 7 as dependent on claim 5 or 6, wherein the central controller is connected to at least one controller of the at least one voltage frequency driver.

[Claim 9] A preconditioned air unit according to claim 7 or 8, wherein the central controller has a power sharing control input for control of air unit power consumption.

[Claim 10] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

[Claim 11] A preconditioned air unit according to claim 10, wherein the rectifier is a 12-pulse rectifier.

[Claim 12] A preconditioned air unit according to claim 10, wherein the rectifier is a 24-pulse rectifier.

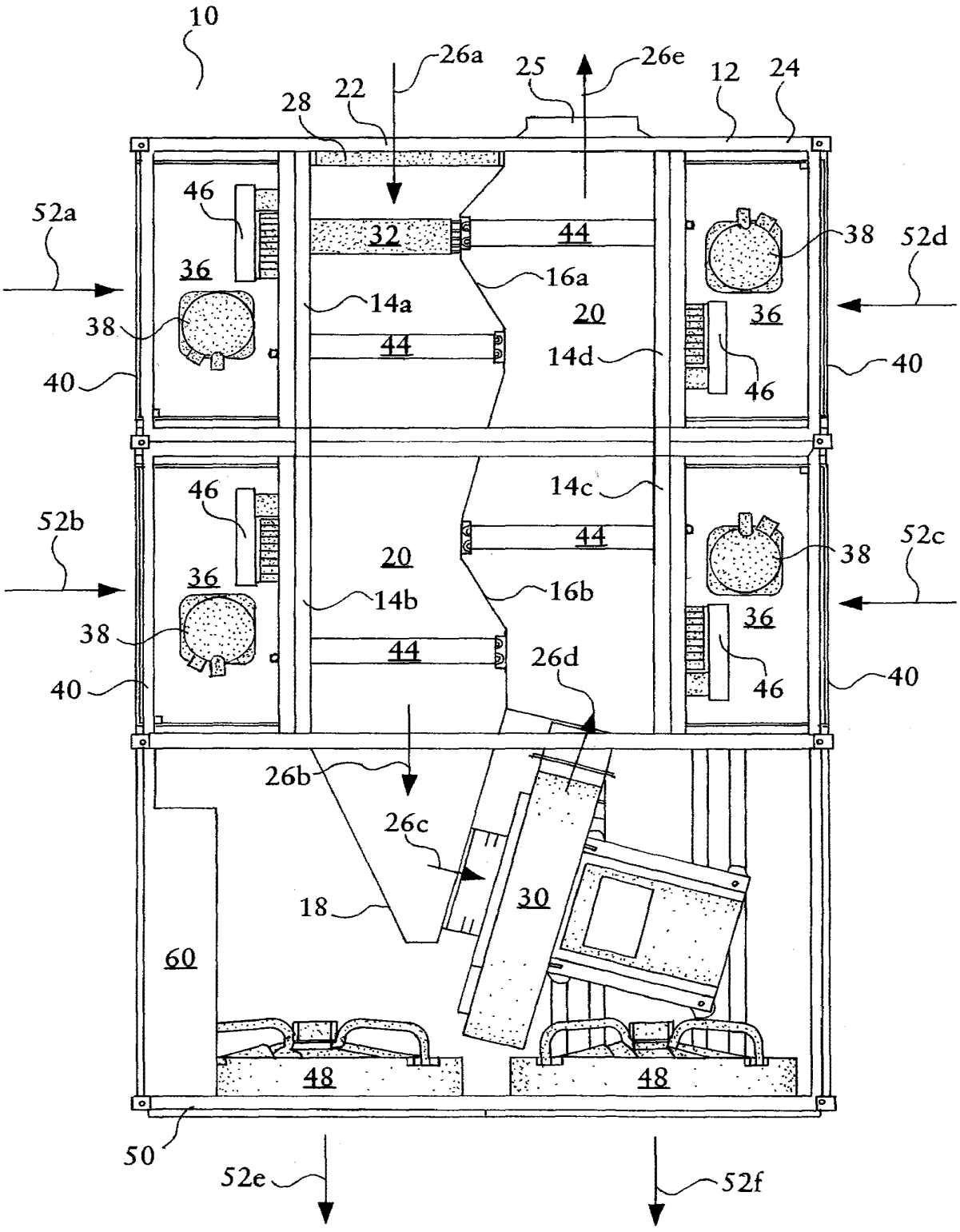

Fig. 1

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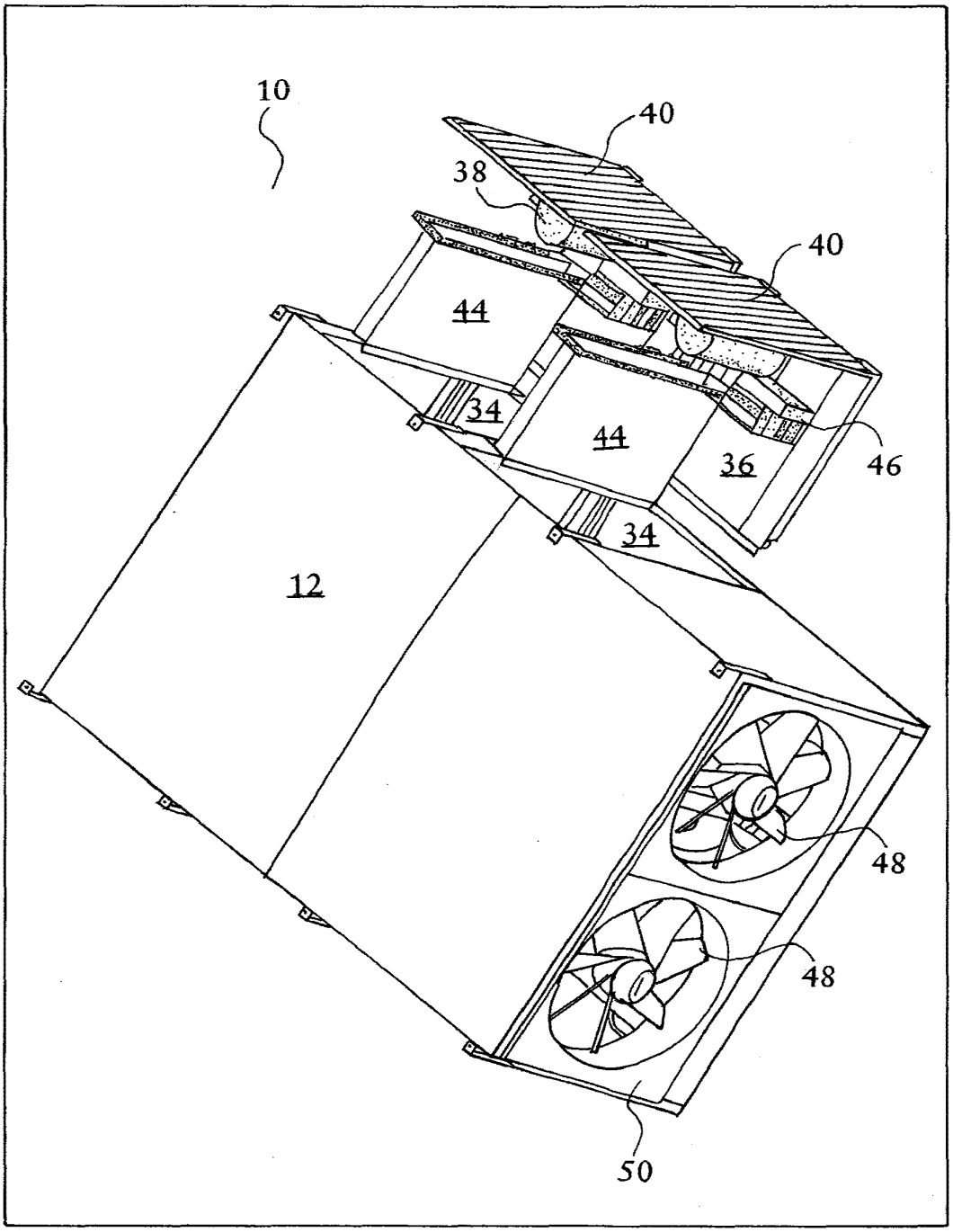

Fig. 2

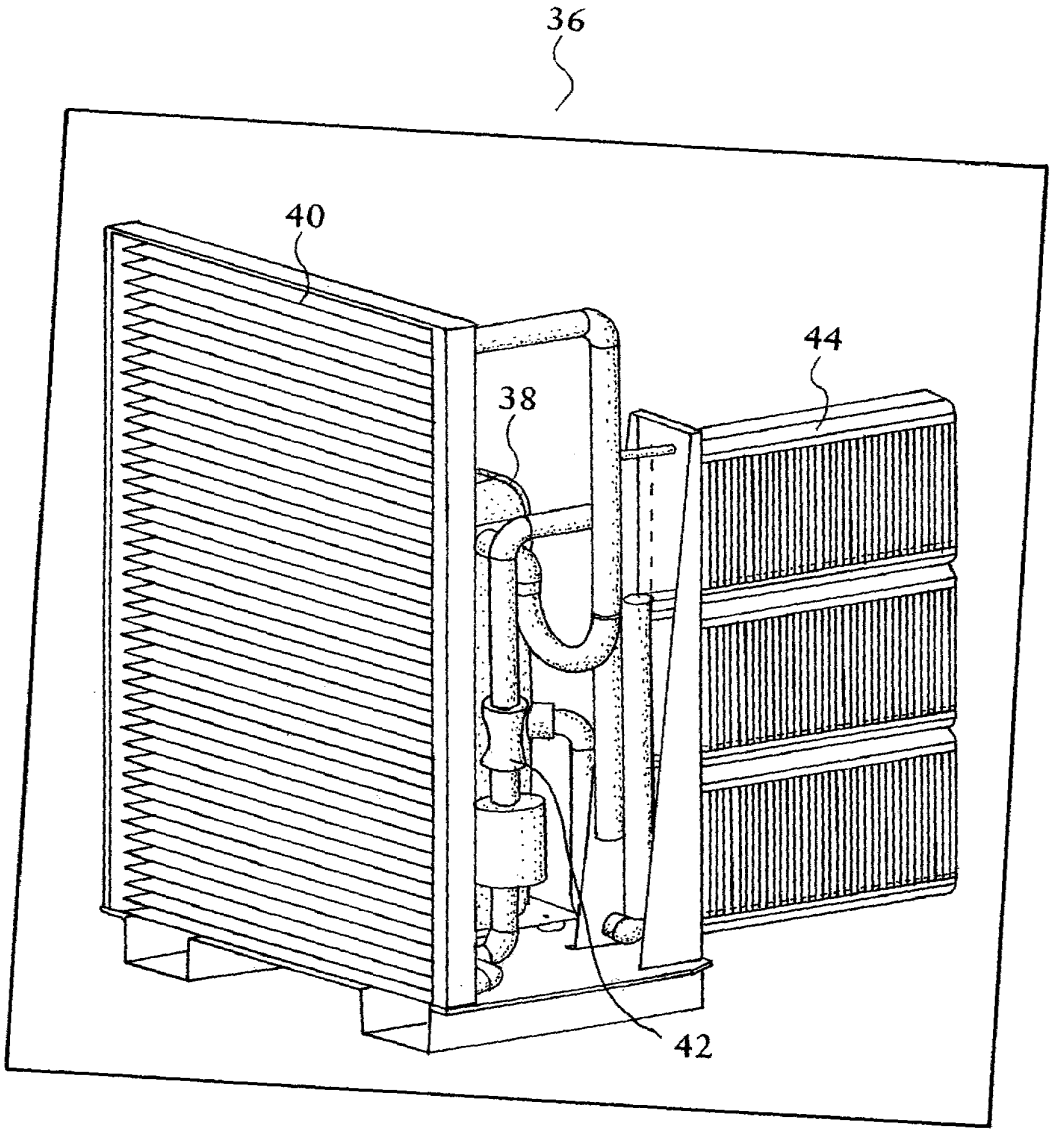

Fig. 3

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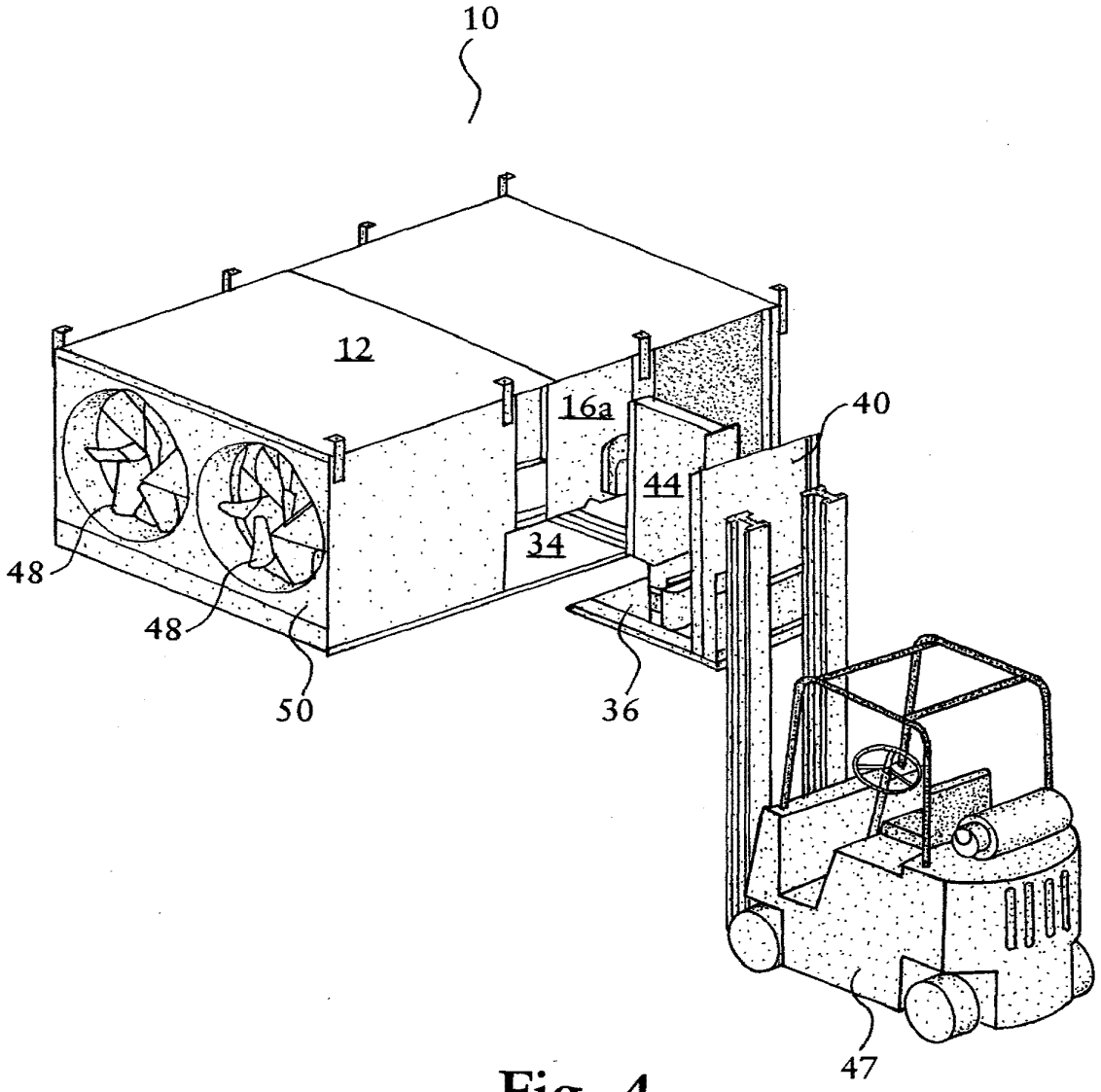

Fig. 4

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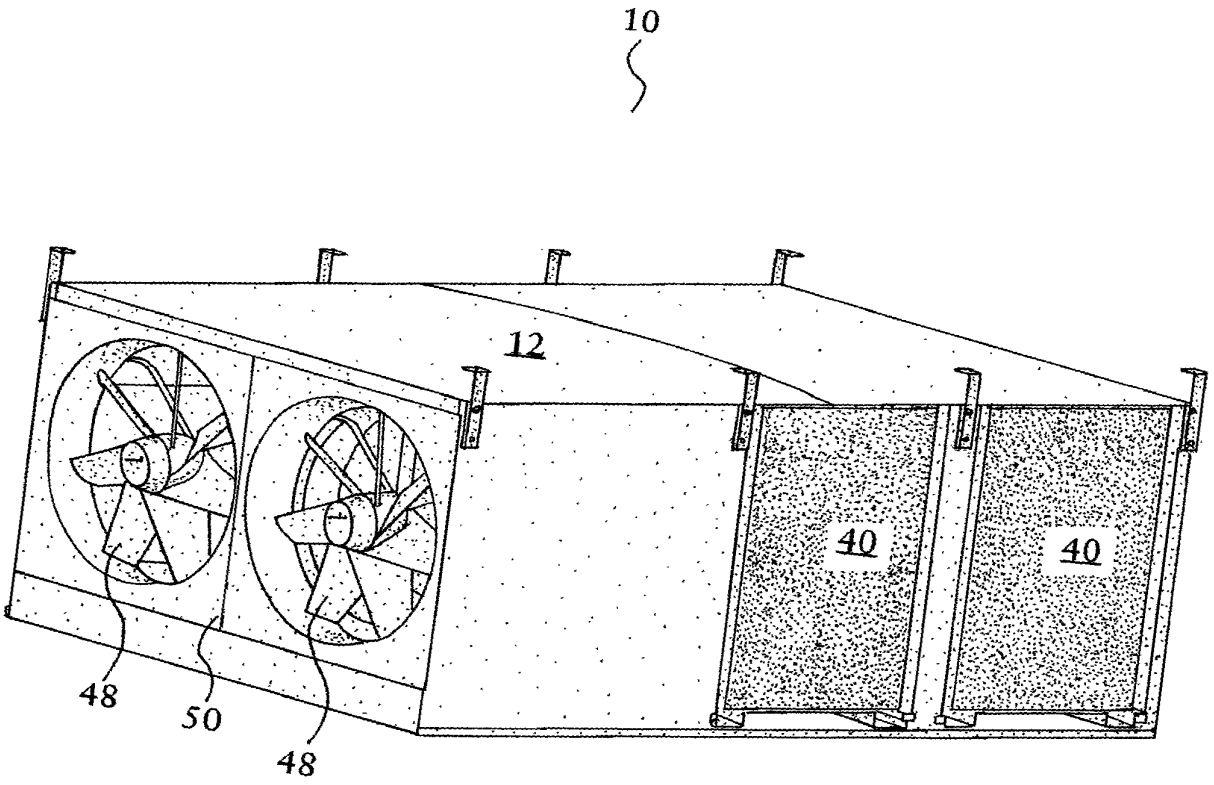

Fig. 5

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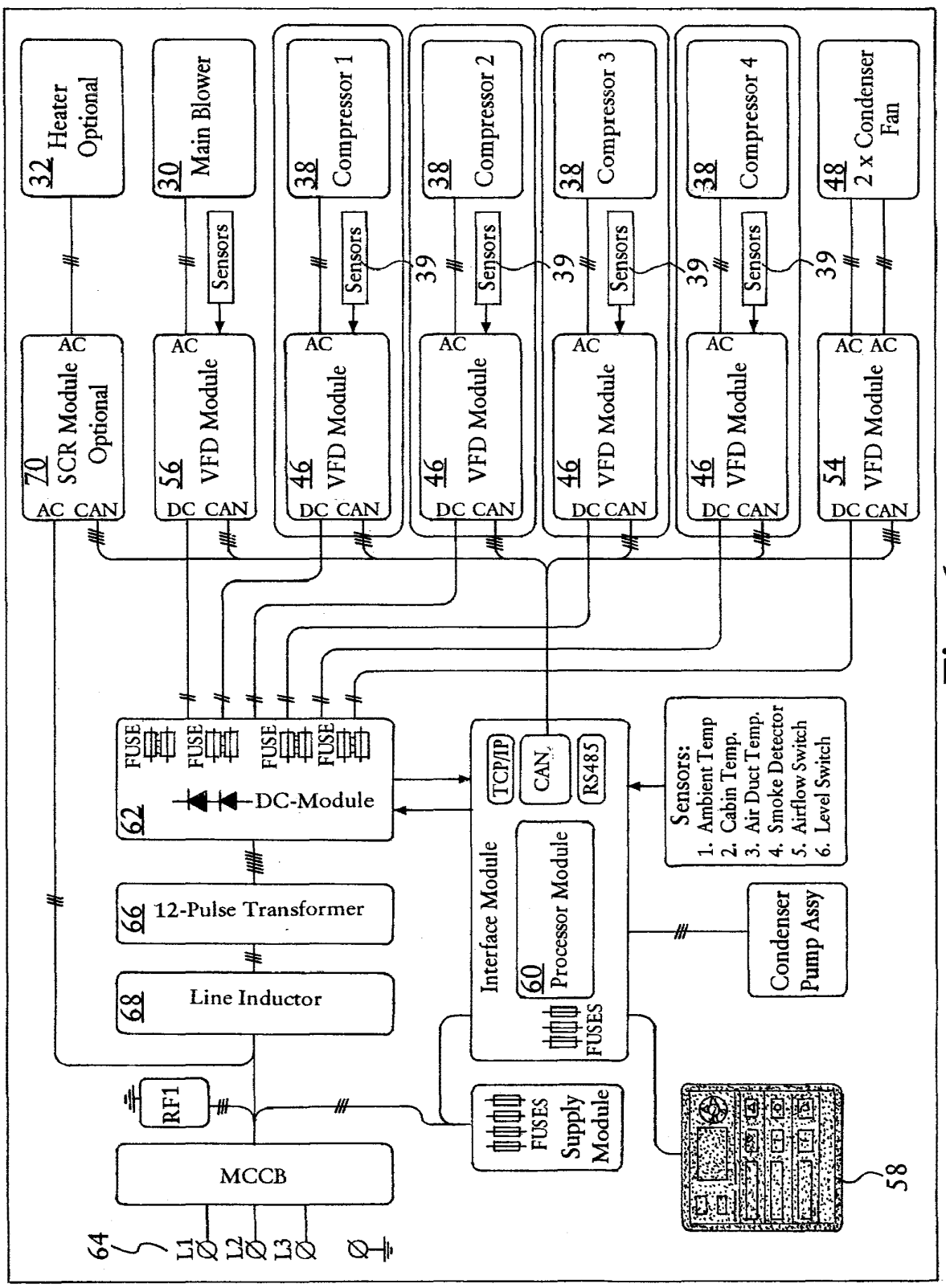

Fig. 6

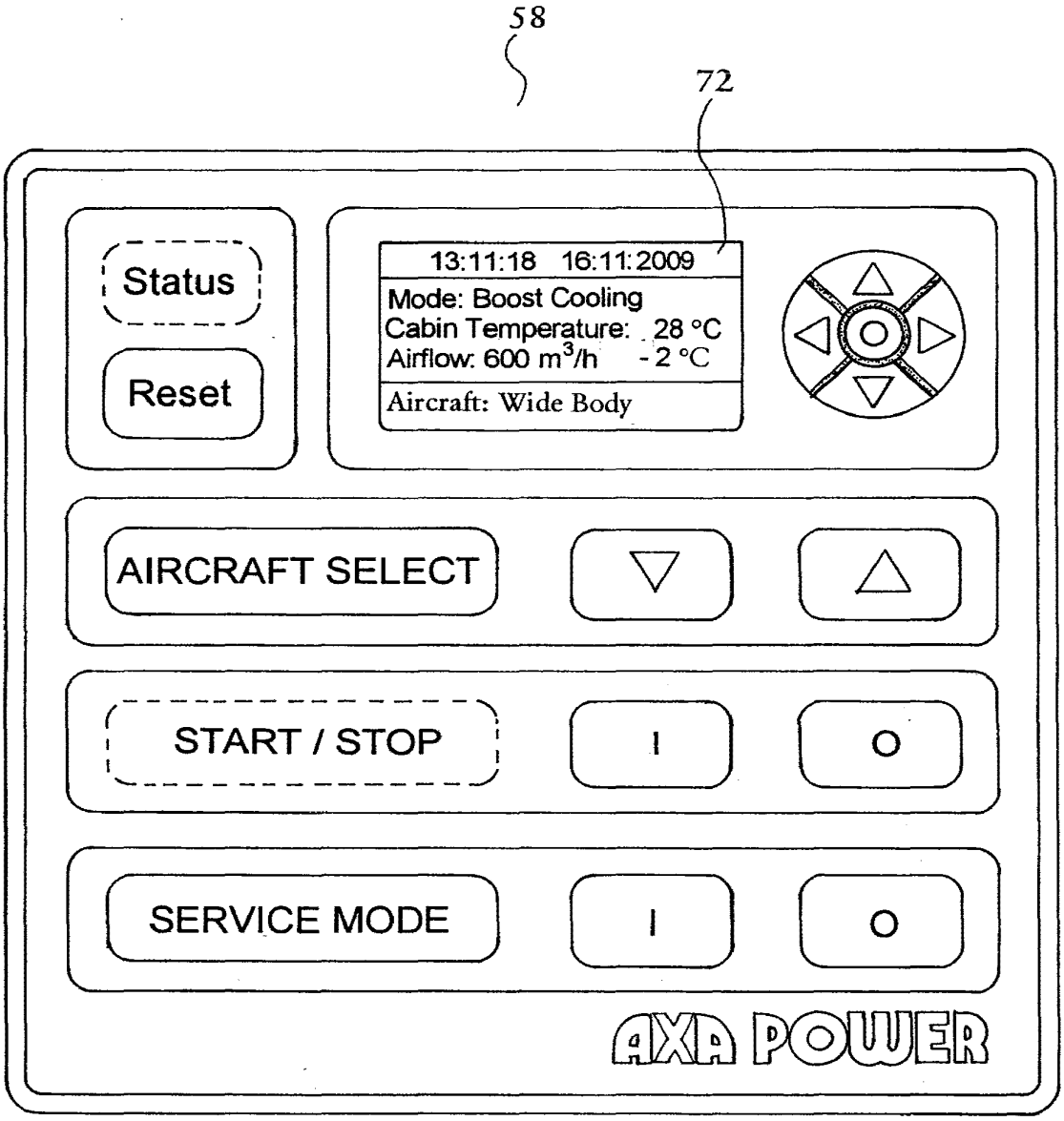

Fig. 7

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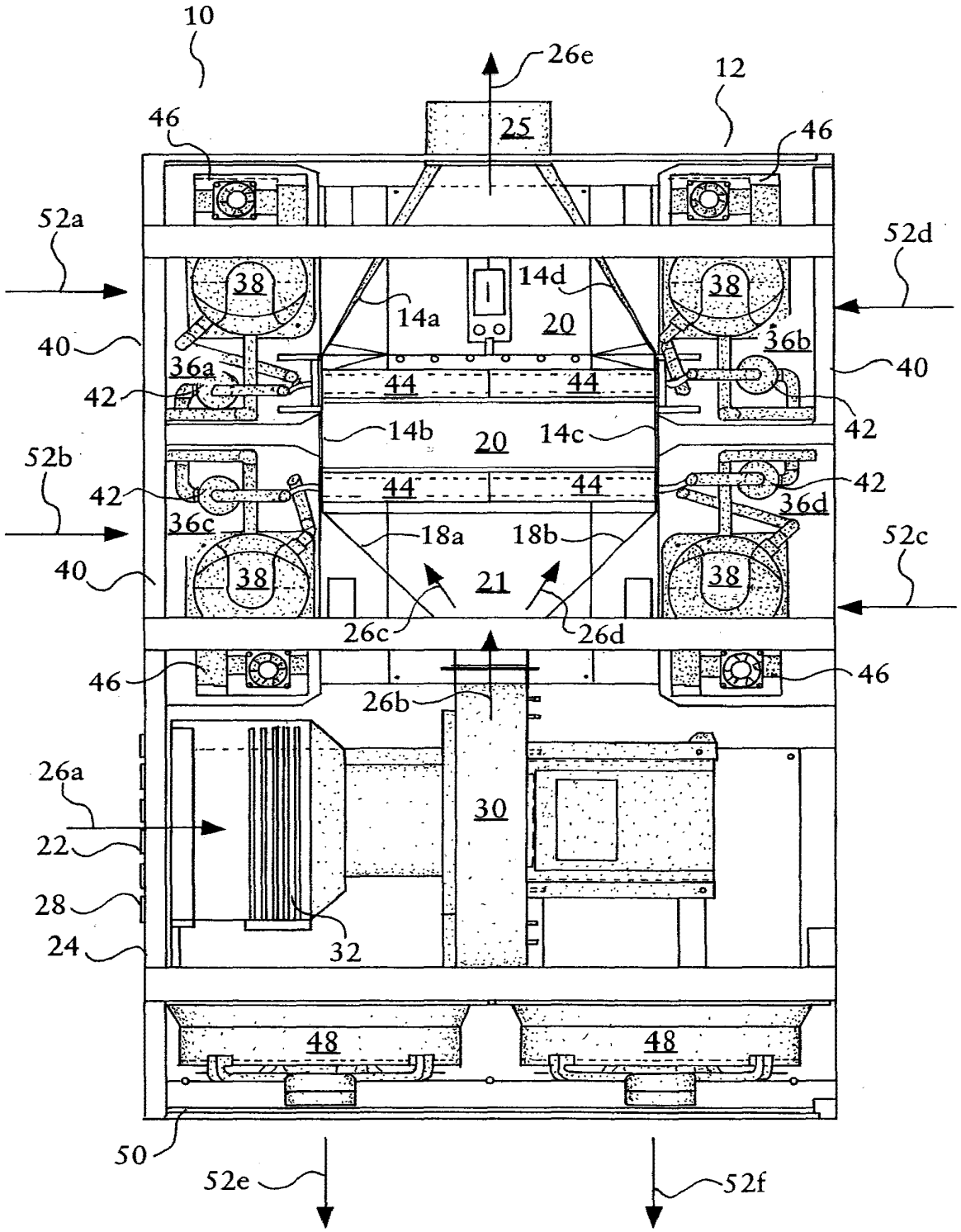

Fig. 8

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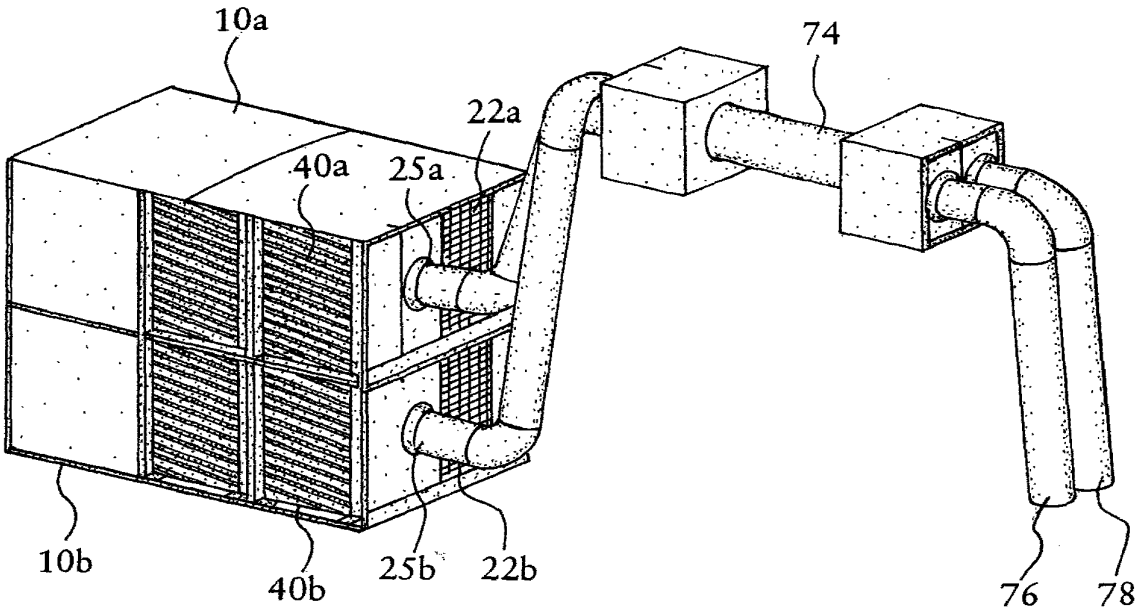

Fig. 9

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Exhibit 1002
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(71) Applicant *(for all designated States except US)*: **AXA POWER APS** [DK/DK]; Smedebakken 31, Søhus, DK-5270 Odense N (DK).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DAHL, Søren Risgaard** [DK/DK]; Kielshusvej 16, DK-5250 Odense SV (DK). **NIELSEN, Bo Vork** [DK/DK]; Birkevej 6, DK-5462 Morud (DK). **OLSSON, Henrik** [DK/DK]; Lærkedals Allé 30, DK-5250 Odense SV (DK). **SCHRØDER, Lars** [DK/DK]; Kildensmindensvej 16, DK-5610 Assens (DK).

(74) Common Representative: **AXA POWER APS**; c/o HAUPTMAN, Benjamin J., Lowe Hauptman Ham & Berner, Llp, 1700 Diagonal Road, Suite 300, Alexandria, Virginia 22314 (US).

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[Continued on next page]

(54) Title: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

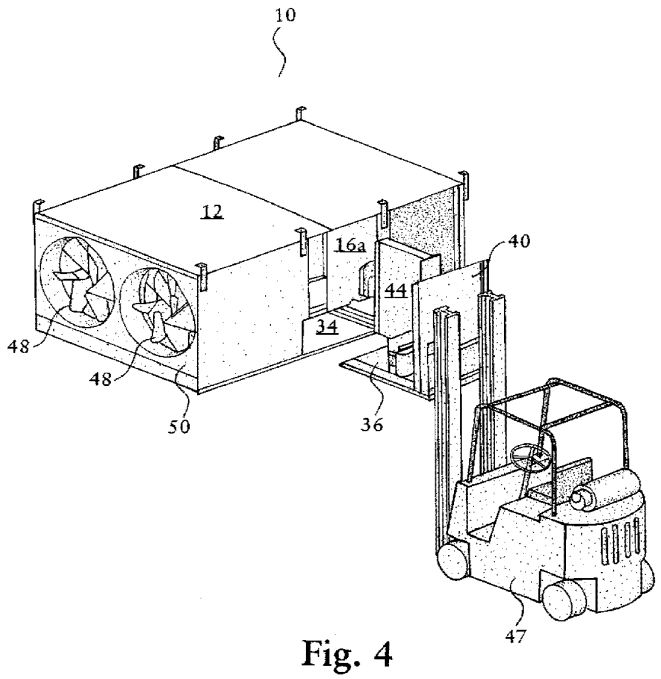

Fig. 4

(57) Abstract: A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

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MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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A. CLASSIFICATION OF SUBJECT MATTER
INV. B64F1/36
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B64F

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 Y	WO 2007/135103 A2 (LEBRUN NIMY EN ABREGE LEBRUN S [BE]; URBAIN CLAUDY CHRISTIAN [BE]) 29 November 2007 (2007-11-29) * abstract; figures 1/4-4/4 pages 10-14 pages 17-21	1-9 10-12
Y A	WO 2007/061622 A1 (ILLINOIS TOOL WORKS [US]; LEADINGHAM DAVID W [US]; BIVENS STEVE [US];) 31 May 2007 (2007-05-31) the whole document	10-12 1-9
A	EP 0 431 563 A2 (TOSHIBA KK [JP]; TOSHIBA AUDIO VIDEO ENG [JP] TOSHIBA KK [JP]; TOSHIBA) 12 June 1991 (1991-06-12) * abstract; figures 1-4,6 column 1, lines 1-48	1-7

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

[X] See patent family 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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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 December 2010	11/01/2011

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, Fax: (+31-70) 340-3016	Larrañeta Reclusa, I

Form PCT/ISA/210 (second sheet) (April 2005)

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Exhibit 1002
Page 088

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/051189

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 10 257796 A (MITSUBISHI ELECTRIC CORP) 25 September 1998 (1998-09-25) * abstract -----	1-7

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

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Page 089

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2010/051189

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007135103 A2	29-11-2007	AT 461109 T	15-04-2010
		CN 101448702 A	03-06-2009
		EP 1857363 A1	21-11-2007
		EP 2021247 A2	11-02-2009
		JP 2009537779 T	29-10-2009
		US 2010031676 A1	11-02-2010
WO 2007061622 A1	31-05-2007	AT 423063 T	15-03-2009
		CN 101331059 A	24-12-2008
		EP 1951573 A1	06-08-2008
		JP 2009516622 T	23-04-2009
		US 2008250803 A1	16-10-2008
EP 0431563 A2	12-06-1991	JP 3177736 A	01-08-1991
		US 5107685 A	28-04-1992
JP 10257796 A	25-09-1998	JP 3414612 B2	09-06-2003

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1	Transmittal of New Application	2011-9-20-Application-Transmittal.pdf	37785 3bb9549ccf388cb9ebb6188e7ee7600cf1ae744f	no	2
Warnings:					
Information:					
2	Application Data Sheet	2011-9-20-ADS.pdf	1275676 f7b2c452a6aaa0ab859ed2abdf5d67404b8b7731	no	5
Warnings:					
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3		2011-9-20-Preliminary-Amendment.pdf	36046 99ec6714f82b1d46a41f7afc84a70f374ee60d5b	yes	6

Multipart Description/PDF files in .zip description

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Claims	3	5
Applicant Arguments/Remarks Made in an Amendment	6	6

Warnings:					
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4	Information Disclosure Statement (IDS) Form (SB08)	2011-9-20-IDS.pdf	820286 588163e89359373b567b849d29e83814cc71193b	no	4
Warnings:					
Information:					
5	Foreign Reference	EP0431563.pdf	778625 e84f51b180085146963ade430b2a54777c7f9613	no	15
Warnings:					
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6	Foreign Reference	GB2150278.pdf	1015536 f23bdbe009db765161f913cfc2d7d6c7f53ad68e	no	12
Warnings:					
Information:					
7	Foreign Reference	JP10257796A.pdf	292879 753f1e6c53c9a6174aa7b7429c81759d7e929e0f	no	8
Warnings:					

Information:					
8	Foreign Reference	WO2007135103A2.pdf	1481317 ec1cc0fd5a920d62c4d587c0fb88d642ae1060ac	no	37
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Information:					
9	Foreign Reference	WO2007061622A1.pdf	970605 3d3ed37105f44b614358a1eaa19303740a1e761a	no	25
Warnings:					
Information:					
10	Non Patent Literature	2009-11-03-DK-PA200900392-Examination-Report.pdf	128642 ec91c9fd0056ee0969713849b5688ef326346083	no	4
Warnings:					
Information:					
11	Non Patent Literature	ISR.pdf	84485 420892ca980c0f248602971f3692e0ad23a23bdf	no	3
Warnings:					
Information:					
12	Documents submitted with 371 Applications	WO2010-106520.pdf	1495709 8107fcb6c227e44e61cd21c360f9dba8ed6eb443	no	32
Warnings:					
Information:					
13		Application-As-Filed.pdf	2323210 063556207dd21c40f95dc50015800a7e5bcc0c62	yes	36

Multipart Description/PDF files in .zip description

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Drawings-only black and white line drawings	18	26
Oath or Declaration filed	27	36

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14	Fee Worksheet (SB06)	fee-info.pdf	33572 e6a3a9e5e91af0d429210b6f080c351235513586	no	2

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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(71) Applicant *(for all designated States except US)*: **AXA POWER APS** [DK/DK]; Smedebakken 31, Søhus, DK-5270 Odense N (DK).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DAHL, Søren Risgaard** [DK/DK]; Kielshusvej 16, DK-5250 Odense SV (DK). **NIELSEN, Bo Vork** [DK/DK]; Birkevej 6, DK-5462 Morud (DK). **OLSSON, Henrik** [DK/DK]; Lærkedals Allé 30, DK-5250 Odense SV (DK). **SCHRØDER, Lars** [DK/DK]; Kildensmindensvej 16, DK-5610 Assens (DK).

(74) Common Representative: **AXA POWER APS**; c/o HAUPTMAN, Benjamin J., Lowe Hauptman Ham & Berner, Llp, 1700 Diagonal Road, Suite 300, Alexandria, Virginia 22314 (US).

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[Continued on next page]

(54) Title: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

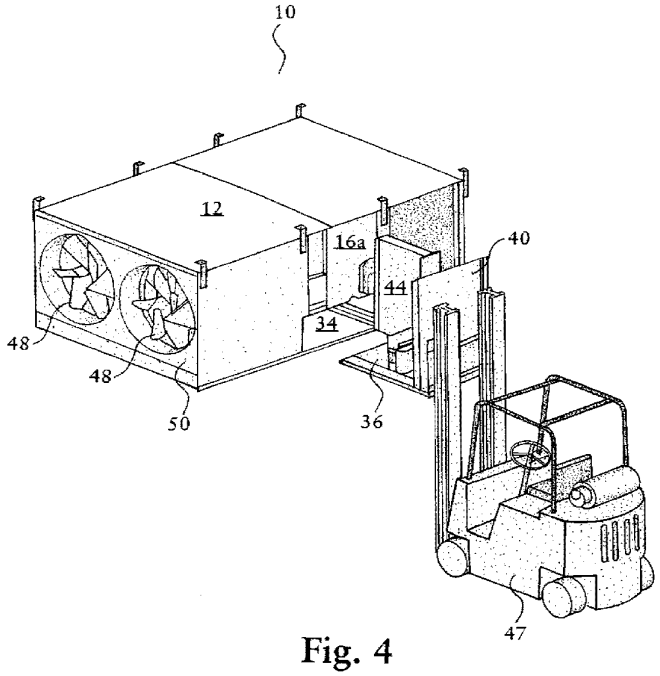

Fig. 4

(57) Abstract: A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

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Description

Title of Invention: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

The present invention related to a preconditioned air unit supplying preconditioned air, i.e. heated air or cooled air, to an aircraft parked on the ground.

On the ground, an aircraft typically uses the auxiliary power unit engine (APU) to drive air-conditioning equipment to cool or heat the aircraft cabin to a temperature that is comfortable for passengers. However, operation of the APU has a high cost in terms of jet fuel consumption, generated acoustic noise, CO_2 emissions, etc. For example, the APU of an A320 aircraft consumes app. 160 I fuel per hour. In addition to the general air pollution, the consumption of one litre of jet fuel leads to emission of 2.5 kg CO_2 into the atmosphere and thus, the APU emits app. 400 kg CO_2 per operational hour.

In order to avoid running the APU on the ground, preconditioned air units have been provided for supplying the required preconditioned air to the parked aircraft. The preconditioned air units are powered from the mains supply made available at the airport in question.

Cost, efficiency, flexibility, and serviceability remain an issue in known preconditioned air units.

A new preconditioned air unit is provided for supplying preconditioned air to an aircraft parked on the ground. The new preconditioned air unit has a housing with walls defining a flow duct with an air inlet for intake of ambient air to be conditioned to a low temperature, typically a temperature in the range from - 5°C to + 5 °C, and an air outlet for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. To prevent cooling losses, the outer walls of the flow duct may be provided with a layer of heat insulation material.

The preconditioned air unit further comprises a blower accommodated in the housing and connected with the flow duct for generation of an air flow from the air inlet toward the air outlet. The blower is preferably a highly efficient centrifugal fan. The blower is preferably mounted with vibration dampers and attached with flexible connections to the flow duct.

The new preconditioned air unit further comprises at least one refrigeration system, each of which comprises at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a refrigerant flow circuit containing a refrigerant.

At least one compressor of the at least one refrigeration system may be powered from a variable frequency driver. In a conventional preconditioned air unit, the compressor

is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the maximum capacity of the compressor is determined by the frequency of the mains supply. Advantageously, the output voltage and frequency of the variable frequency driver in the new preconditioned air unit are varied to control the at least one compressor in accordance with the current cooling requirement. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. In this way, each of the at least one refrigeration systems may operate continuously, i.e. the output voltage and frequency of the variable frequency driver may be adjusted to levels required by the at least one compressor in order for it to cool the airflow interacting with the respective at least one evaporator in accordance with a control setting. This increases the life time and decreases power consumption of the at least one refrigeration system as compared to conventional on/ off control.

Further, the maximum capacity of a compressor driven by a variable frequency driver may be increased as compared to the same compressor supplied directly from the mains supply. For example, supplying a compressor with a supply voltage with a 75 Hz output frequency increases the cooling capacity of the compressor by 50% over the same compressor supplied directly from the mains supply in Europe.

Preferably, the controller of the variable frequency driver (in the following denoted "VFD-controller") is capable of controlling the variable frequency driver to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rating of the compressor whereby the one or more compressors supplied from the variable frequency driver may be controlled for provision of variable cooling capacity, e.g. in response to the temperature and flow rate of the air flow in the flow duct.

A plurality of variable frequency drivers may be provided for power supply of respective compressors, e.g. each of the compressors may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective compressor.

Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more compressors.

The preconditioned air unit may further comprise at least one condenser fan for generation of a condenser airflow interacting with the at least one condenser of the at least one refrigeration system thereby increasing the heat removal capacity of the at least one condenser.

Each of the at least one condenser fan may be located in any suitable position in the housing for provision of a condenser air flow within the housing. Each of the at least one condenser fan may be located adjacent an air outlet in the housing for generation

of a condenser air flow out through the outlet, and each of the at least one condenser may be located adjacent an air inlet for interaction with the generated condenser airflow at ambient temperature. Obviously, the direction of the condenser air flow may be reversed although in this case the condenser air flow may be heated by internal components within the housing before interacting with the at least one condenser.

At least one of the at least one condenser fan may be powered from a variable frequency driver. In a conventional preconditioned air unit, the condenser fan is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA, and thus, the condenser fan performance is locked to the frequency of the mains supply. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the at least one condenser fan in accordance with the current operational requirements, such as current pressure within the at least one condenser, efficiency, etc. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the at least one condenser fan. A plurality of variable frequency drivers may be provided for power supply of respective condenser fans, e.g. each of the condenser fans may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective condenser fan by control of the condenser air flow rate generated by the condenser fan.

Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more condenser fans.

The preconditioned air unit may further comprise a variable frequency driver connected for electrical power supply of the blower. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the blower.

The new preconditioned air unit may comprise a main unit and one or more self-contained cooling modules mounted in the main unit. The main unit includes the housing having a plurality of compartments for receiving and holding the self-contained cooling modules. Each of the self-contained cooling modules comprises at least one of the at least one refrigeration systems.

Each of the at least one refrigeration system operates in accordance with well-known refrigerator principles and with a well-known refrigerant, such as R134a with low global warming potential.

The at least one evaporator of the at least one refrigeration system is mounted in the housing of the preconditioned air unit for interaction with the airflow in the flow duct for cooling of the air flow. For example, a cooling surface of the at least one evaporator may be positioned inside the flow duct for direct contact across a large surface area with the airflow in the flow duct.

One or more VFD-controllers of the at least one refrigeration system may further perform data collection of parameter values sensed by sensors of the at least one refrigeration system, e.g. temperature sensors sensing temperatures in the airflow upstream and downstream of the at least one evaporator and of the at least one condenser, pressure sensors sensing the pressure of the refrigerant in the at least one refrigeration system, etc.

Preferably, the preconditioned air unit has a central controller that is configured for controlling the operation of the preconditioned air unit. The central controller may be connected to a user interface for reception of user commands from a user and for outputting messages to the user. The preconditioned air unit may comprise at least one of the following: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, a loudspeaker, etc. For example, one of the primary user entries specifies the type of aircraft to be supplied by the preconditioned air unit. This information may be entered using entry keys of the user panel, or, using a remote control from the passenger boarding bridge, or, may be transmitted from the building management system of the airport, etc.

The central controller may further be connected with some or all of the VFD-controllers of the preconditioned air unit for individual control of the VFD-controllers. For example, if the preconditioned air unit comprises a plurality of refrigeration systems, the central controller may output an individual temperature setting to the VFD-controllers of each of the refrigeration systems, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective at least one compressor to adjust the temperature of the airflow having interacted with the corresponding at least one evaporator as required.

Further, each of the refrigeration systems may be configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing cooling refrigeration system may transmit a failure signal to the central controller and may shut down if required. In response to the failure signal, the central controller may operate to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the preconditioned air unit.

The central controller may be interfaced with some or all of the VFD-controllers and possibly other controlled devices, such as an SCR module controlling a heater in the flow duct, with a data and control bus, such as the CAN bus.

The preconditioned air unit may further have a rectifier connected to the mains supply input of the preconditioned air unit for generation of a power DC voltage supply for supplying the variable frequency drivers.

In order to suppress distortion and pollution of the mains supply, the rectifier circuit may comprise a 12-pulse rectifier, or a 18-pulse rectifier, or a 24-pulse rectifier, etc.

The preconditioned air unit may share a mains power outlet with other equipment at the parked aircraft, such as, a ground power unit, a cable coil, vehicle chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit may comprise a power sharing control input for control of preconditioned air unit power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit when the ground power unit draws a high supply current. The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, again, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit.

The preconditioned air unit may be mounted underneath or on top of a passenger boarding bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit may be provided with pedestal legs for flexibility in preconditioned air unit location at an apron or in a hangar.

A plurality of the new preconditioned air units may be interconnected for supplying preconditioned air to a parked aircraft in cooperation. Two of the new preconditioned air units may for example be coupled in parallel in a master-slave configuration wherein the outputs of each of the preconditioned air units supply a common hose that is connected to the parked aircraft and possibly split at the aircraft into two or more hoses for supplying possible individual inputs of the aircraft for preconditioned air. The master may control the slave in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft. Other control principles may also be applied. For example, the CAN-bus of the cooperating preconditioned air units may be inter-

connected for flexibility of control sharing between cooperating units.

The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

Fig. 1 shows a preconditioned air unit from above with the top removed,

Fig. 2 shows a preconditioned air unit in perspective with two self-contained cooling modules withdrawn from their respective compartments,

Fig. 3 shows a self-contained cooling module in perspective,

Fig. 4 illustrates handling of a self-contained cooling module with a fork lift truck,

Fig. 5 shows a preconditioned air unit in perspective ready for mounting,

Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit,

Fig. 7 shows the user interface panel of the preconditioned air unit,

Fig. 8 shows another preconditioned air unit from above with the top removed, and

Fig. 9 shows two preconditioned air units coupled in parallel in a master-slave configuration.

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

Fig. 1 shows a top view of an exemplified embodiment of the new preconditioned air unit 10 for supplying preconditioned air to an aircraft parked on the ground. The preconditioned air unit 10 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 16a, 16b, 18, besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters the flow duct 20 through an air inlet 22 in a side wall 24 of the housing 12. The flow duct 20 is folded inside the housing 12 so that walls 16a, 16b separate the flow duct into two parts with air flowing in opposite directions during operation of the preconditioned air unit 10. The side wall also has an air outlet 25 for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, and the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

A blower 30 is connected with the flow duct 20 for generation of the required air

flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

An optional heater 32 is mounted in the flow duct 20 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

As most clearly shown in Fig. 2, the illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective, identical self-contained cooling modules 36.

As shown in Fig. 3, each of the self-contained cooling modules 36 comprises a refrigeration system including a compressor 38, a condenser 40, an expansion valve 42, and an evaporator 44 connected in series in a refrigerant flow circuit containing a refrigerant selected in accordance with the expected high end ambient temperature of the airport in question, e.g. R134a selected for operation at high end ambient temperatures around 40 °C The refrigerant flow circuit forms a closed and sealed loop. Each of the self-contained cooling modules 36 operates in accordance with well-known refrigerator principles.

Each of the self-contained cooling modules 36 can be installed in the housing 12 of the main unit without interfering with the refrigeration system of the module 36 so that assembly and possible disassembly of self-contained cooling modules 36 in the preconditioned air unit housing 12 can be performed by persons without specific skills in the field of refrigeration systems. The self-contained cooling modules 36 may be manufactured at one site particularly suitable for manufacturing of refrigeration systems for subsequent integration with housings 12 of the main unit at a separate site particularly suitable for manufacturing of airport ground equipment in general thereby increasing manufacturing flexibility and decreasing manufacturing cost of the preconditioned air unit 10. Further, the self-contained cooling module 36 may be stored as a spare part including the refrigerant, whereby repair of a preconditioned air unit without having to perform the cumbersome task of emptying the preconditioned air unit for refrigerant is made possible.

The power supply, control circuitry, and user interface of the preconditioned air unit 10 allows the preconditioned air unit 10 to operate with any number of self-contained cooling modules 36 installed, i.e. the illustrated preconditioned air unit 10 may operate with a single self-contained cooling module 36 installed in an arbitrarily selected compartment 34; or, with two self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or, with three self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or with four self-contained cooling modules 36 installed in respective compartments 34. In this way, a product line

of preconditioned air units 10 is provided making four different preconditioned air units 10 available with different cooling capacities based on the same components. This lowers manufacturing cost by lowering purchase cost per component, and storage and handling cost both per component and per finished preconditioned air unit 10. Further, a preconditioned air unit 10 already in use in an airport with less than four self-contained cooling modules 36 installed may be upgraded on site by installing one or more self-contained cooling modules 36 in empty compartments 34.

Preferably, the self-contained cooling modules 36 are removably installed in the housing 12 of the main unit facilitating separation of an installed self-contained cooling module from the housing 12, e.g. utilizing screws, nuts and bolts for fastening each of the self-contained cooling modules 36 to the housing 12 and utilizing electrical connectors (not shown) to establish the required electrical interconnections between the cooling module and the housing 12 when the cooling module 36 is inserted in the housing 12 of the main unit 10.

Fig. 2 shows in perspective the preconditioned air unit of Fig. 1 with two self-contained cooling modules 36 withdrawn from the housing 12 of the main unit 10. Fig. 5 shows in perspective the preconditioned air unit of Figs. 1 and 2 with the two self-contained cooling modules 36 inserted and installed in the housing 12 of the main unit 10.

The removability of the modules 36 enhances the serviceability of the preconditioned air unit 10 since a possible malfunctioning self-contained cooling module can be separated from the housing 12 of the main unit 10 and replaced with a functioning module 36 with a minimum of down time of the preconditioned air unit 10. One cooling module 36 can be replaced in approximately 20 minutes. In the event that a functioning cooling module 36 is not available for substitution of the malfunctioning cooling module 36, the preconditioned air unit 10 will continue operation with the remaining cooling modules 36, i.e. the preconditioned air unit 10 remains fully operational, however with a lowered cooling capacity. Further, the malfunctioning module 36 can be moved for repair at a separate site particularly suitable for repair of refrigeration systems. Also, the possible requirement of dismounting and moving the entire preconditioned air unit for repair of a cooling circuit is hereby reduced. Preferably, the self-contained cooling module 36 has physical dimensions suitable for movement by a fork lift truck 47 as illustrated in Fig. 4 facilitating transportation of the module 36, e.g. for storage, assembly into a preconditioned air unit 10, and service. For example, a malfunctioning module 36 can be removed from the housing 12 with a fork lift truck 47 and a properly functioning module 36 can be installed in the housing 12 with a fork lift truck 47.

In the illustrated preconditioned air unit 10, the evaporator 44 of each self-contained

cooling module 36 is positioned inside the flow duct 20 through a slot in the wall 14a, 14b, 14c, 14d when installed in the housing 12 of the main unit for optimum heat exchange with the air flow in the duct 20. The evaporator 44 has a large number of channels for passage of the air flow in the duct 20 providing a large surface of heat exchange between the air flow and the refrigerant flowing inside the evaporator 44 as is well-known in the art of refrigeration systems. The slots in the walls 14a, 14b, 14c, 14d are sealed when the respective self-contained cooling modules 36 are mounted in their operational positions in the compartments 34. In absence of a self-contained cooling module 36, the slot is sealed with a cover plate.

Cooling in multiple steps as provided by a plurality of self-contained cooling modules 36 efficiently condenses the air humidity and protects the last downstream evaporator 44 from freezing over. A stainless steel condensate pan (not shown) and integrated condensate pump (not shown) ensure that the condensation moisture is removed in a controlled way.

The cooling air leaves the illustrated preconditioned air unit through one or two 14" hoses.

Each of the compressors 38 of the self-contained cooling modules 36 may be powered from a variable frequency driver 46 also located in the respective self-contained cooling module 36. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the capacity of the compressor is limited by the frequency of the mains supply. This limitation does not exist in the new preconditioned air unit 10. Advantageously, the variable frequency driver the VFD-controller is capable of varying the output voltage and frequency of the variable frequency driver 46 in order to control the compressor 38 in accordance with the current cooling requirement. In the illustrated preconditioned air unit, the variable frequency driver 46 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

The output voltage and frequency supplied by the variable frequency driver 46 is controlled by the VFD-controller in a way well-known in the art of variable frequency drivers. Preferably, the VFD-controller is capable of controlling the variable frequency driver 46 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the compressor 38 whereby each of the compressors 38 supplied from a respective variable frequency driver 46 may be controlled for provision of variable cooling capacity.

Each of the self-contained cooling modules has temperature sensors (39 in Fig. 6) in electrical connection with the VFD-controller of the module 36 and mounted for sensing temperatures in the air flow up-stream and down-stream of the evaporator 44

and transmitting the sensed temperature values to the VFD-controller, and the VFD-controller controls the cooling capacity of the compressor 38 in response to the sensed temperatures.

Each of the self-contained cooling modules 36 operates continuously, i.e. the output voltage and frequency of the variable frequency driver 46 are adjusted to levels required by the compressor 38 in order for it to cool the airflow having interacted with the evaporator 44 substantially to the temperature setting. This increases the life time and decreases power consumption of the cooling modules 36 as compared to on/off control of the compressors 38.

The preconditioned air unit 10 further comprises two condenser fans 48 mounted across apertures in the side wall 50 for generation of condenser airflow causing ambient air to enter the housing 12 through apertures in the self-contained cooling modules 36 covered by the condensers 40 as indicated by arrows 52a - 52f for heat removal from the heat exchanging surfaces of the condensers 40.

The condenser fans 48 are powered from one variable frequency driver 54. Advantageously, the VFD controller of the variable frequency driver 54 is capable of varying the output voltage and frequency of the variable frequency driver 54 in order to control the condenser fans 48 in accordance with the current operational requirements, such as current pressure within the condenser(s), efficiency, etc. Preferably, the variable frequency driver 54 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the condenser fans. The preconditioned air unit 10 further comprises a variable frequency driver 56 connected for electrical power supply of the blower 30. Advantageously, the VFD controller of the variable frequency driver 56 is capable of varying the output voltage and frequency of the variable frequency driver 56 in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver 56 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. Preferably, the controller of the variable frequency driver 56 is capable of controlling the variable frequency driver 56 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the blower whereby the blower 30 supplied from the variable frequency driver 56 may be controlled for provision of variable flow rate of the air flow in the flow duct 20, e.g. in response to a user control command, e.g. the type of aircraft.

The preconditioned air unit 10 has a central controller 60 that is configured for con-

trolling the operation of the preconditioned air unit 10. The central controller 60 is connected with the user interface panel 58 for reception of user commands and for outputting messages to the user, e.g. on a display of the user interface panel 58, by a loudspeaker of the user interface, etc.

The central controller 60 is connected with all of the VFD-controllers of the preconditioned air unit 10 for individual control of the VFD-controllers. For example, the central controller outputs an individual temperature setting to each of the VFD-controllers of the preconditioned air unit 10, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective compressor 38 to adjust the temperature of the airflow having interacted with the corresponding evaporator 44 as required. Further, in the event that one of the installed self-contained cooling modules 36 fails, the failing cooling module transmits a failure signal to the central controller 60 and shuts down if required. In response to the failure signal, the central controller 60 operates to automatically adjust the required amount of cooling among the remaining properly operating self-contained cooling modules 36 of the preconditioned air unit 10.

Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit 10.

The illustrated preconditioned air unit 10 has a 12-pulse rectifier 62 connected to a mains supply input 64 of the preconditioned air unit 10 for generation of a power DC voltage supply. Using variable frequency drivers may generate harmonic distortion of the mains input. To minimize distortion of the mains input, the three phases of the mains are transformed into six phases which are rectified in the non-regulated 12-pulse full bridge rectifier 62. The combination of the 12-pulse rectifier 62, the related transformer 66 and the input filter 68 reduce harmonic feedback into the mains to a minimum. Further, the 12-pulse rectifier 62 includes soft start circuitry that limits the inrush current. Still further, utilization of the 12-pulse rectifier 62 results in a high input power factor, i.e. a power factor that is larger than 0.8; for example 0.96, which in turn results in a reduced input mains current.

The filtered power DC voltage supply is routed to each of the compartments 34 for power supply of each of the variable frequency drivers 46 of the self-contained modules 36 when installed in the respective compartments 34.

The filtered power DC voltage supply is further routed to variable frequency driver 56 for power supply of the blower 30 and to variable frequency driver 54 for power supply of the two condenser fans 48.

The central controller 60 is based on a micro-controller and a digital signal processor that cooperate to regulate, supervise and diagnose possible external and internal failures. In addition, each variable frequency driver 46, 54, 56 comprises a micro-

controller to perform individual control of devices connected to the variable frequency driver in question. Further, the VFD-controller of each of the self-containing cooling modules 36 monitors the respective refrigeration system and decreases the cooling capacity or stops cooling if the refrigerant pressure is too low or too high.

The central controller 60 automatically adjusts the cooling performed by the preconditioned air unit 10 to the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, the outgoing airflow from the preconditioned air unit 10, etc.

The central controller 60 and the variable frequency drivers 46, 54, 56, and the SCR module 70 controlling the heater 32 are interfaced with a data and control bus, which in the illustrated example is the CAN bus.

The preconditioned air unit 10 may share a mains power outlet with other equipment at the parked aircraft, such as a ground power unit, a cable coil, vehicle battery chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit 10 comprises a power sharing control input (not shown) for control of preconditioned air unit 10 power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit 10 power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit 10 during high load ground power unit operation The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit 10. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit 10.

Fig. 7 shows the user interface panel 58 of the preconditioned air unit 10. The user interface panel 58 includes an LCD display 72 viewable in all weather conditions and displaying all relevant operational data. The display provides information at different levels: In a default mode, the display shows the status of the preconditioned air unit 10, such as aircraft type, cabin temperature, etc. In an alarm mode, the display shows type of alarm and alarm history. In a setup mode, the display shows various parameters that may be adjusted.

The preconditioned air unit includes digital input/output ports, such as galvanic isolated RS485 port, TCP/IP Ethernet port, etc, for remote control of the preconditioned air unit 10 and monitoring including data dump for service tasks.

The preconditioned air unit 10 may be mounted underneath or on top of an apron drive bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit 10 may be provided with pedestal legs for flexibility in preconditioned air unit location for fixed bridge and hangar applications.

Other preconditioned air units may be provided within the scope of the appended claims. For example, other preconditioned air units may be provided that are not modular. Also, preconditioned air units may be provided with different numbers of refrigeration systems, such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., refrigeration systems.

In the example illustrated in Figs, 1, 2, 4, 5, and 6, the refrigeration systems operate in a series. Other preconditioned air units may be provided with refrigeration systems operating in parallel; or with refrigeration systems operating both in parallel and in series.

For example, Fig. 8 shows a top view of a new preconditioned air unit 10 with two sets of self-contained cooling modules 36a, 36b, and 36c, 36d. Within each set, the self-contained cooling modules operate in parallel, and the two sets of self-contained cooling modules operate in series for supplying preconditioned air to an aircraft parked on the ground.

The preconditioned air unit 10 shown in Fig. 8 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 18a, 18b besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters through an air inlet 22 in a side wall 24 of the housing 12. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. An optional heater 32 is mounted at the air inlet 22 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

The flow duct 20 has a manifold 21 for expanding the airflow for passage of the condensers 40 operating in parallel. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, 18a, 18b including the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

The illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective self-contained cooling modules 36. It should be noted that parallel self-contained cooling modules to the left and right in Fig. 8 have different lay-outs with corresponding components positioned differently with respect

to each other in order to obtain the resulting configuration illustrated in Fig. 8. Evaporator geometries of parallel operating self-contained modules also differ since the air flow passes the respective evaporators in opposite directions with respect to the refrigeration circuit.

The remaining components and the operation of the preconditioned air unit 10 illustrated in Fig. 8 are already explained in connection with the preconditioned air unit illustrated in the previous Figures and are not repeated here.

Fig. 9 shows two of the new preconditioned air units 10a, 10b coupled in parallel in a master-slave configuration. The air outlets 25a, 25b of each of the preconditioned air units 10a, 10b are connected with a common hose 74. Proximate the parked aircraft, the common hose 74 is split into two hoses 76, 78 for supplying corresponding individual inputs of the aircraft for preconditioned air. The master 10a may control the slave 10b in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft.

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(71) Applicant *(for all designated States except US)*: **AXA POWER APS** [DK/DK]; Smedebakken 31, Søhus, DK-5270 Odense N (DK).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DAHL, Søren Risgaard** [DK/DK]; Kielshusvej 16, DK-5250 Odense SV (DK). **NIELSEN, Bo Vork** [DK/DK]; Birkevej 6, DK-5462 Morud (DK). **OLSSON, Henrik** [DK/DK]; Lærkedals Allé 30, DK-5250 Odense SV (DK). **SCHRØDER, Lars** [DK/DK]; Kildensmindensvej 16, DK-5610 Assens (DK).

(74) Common Representative: **AXA POWER APS**; c/o HAUPTMAN, Benjamin J., Lowe Hauptman Ham & Berner, Llp, 1700 Diagonal Road, Suite 300, Alexandria, Virginia 22314 (US).

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(54) Title: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

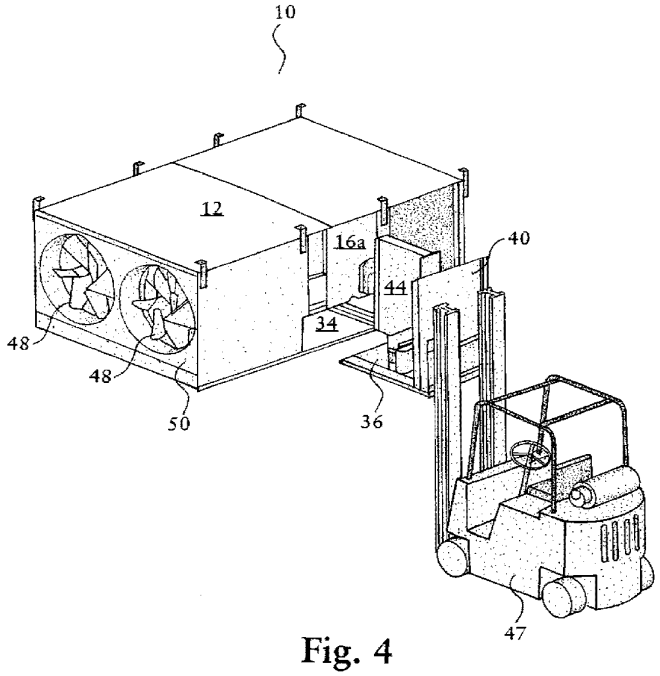

Fig. 4

(57) Abstract: A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

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Claims

[Claim 1] A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

[Claim 2] A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

[Claim 3] A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condensor fan for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

[Claim 4] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

[Claim 5] A preconditioned air unit according to any of the preceding claims, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

[Claim 6] A preconditioned air unit according to claim 5, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

[Claim 7] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a central controller that is

configured for controlling the operation of the preconditioned air unit.

[Claim 8] A preconditioned air unit according to claim 7 as dependent on claim 5 or 6, wherein the central controller is connected to at least one controller of the at least one voltage frequency driver.

[Claim 9] A preconditioned air unit according to claim 7 or 8, wherein the central controller has a power sharing control input for control of air unit power consumption.

[Claim 10] A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

[Claim 11] A preconditioned air unit according to claim 10, wherein the rectifier is a 12-pulse rectifier.

[Claim 12] A preconditioned air unit according to claim 10, wherein the rectifier is a 24-pulse rectifier.

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Applicant:
(Name and address)

AXA Power A/S
Smedebakken 31, Søhus
DK-5270 Odense N
Denmark

Title: A preconditioned air unit with variable frequency driving

IPC: --

This is to certify that the attached documents are exact copies of the above mentioned patent application as originally filed.

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Patent- og Varemærkestyrelsen
Økonomi- og Erhvervsministeriet

11 March 2010

Gitta Storch Priess

PATENT- OG VAREMÆRKESTYRELSEN

A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

The present invention related to a preconditioned air unit supplying preconditioned air, i.e. heated air or cooled air, to an aircraft parked on the ground.

On the ground, an aircraft typically uses the auxiliary power unit engine (APU) to drive air-conditioning equipment to cool or heat the aircraft cabin to a temperature that is comfortable for passengers. However, operation of the APU has a high cost in terms of jet fuel consumption, generated acoustic noise, CO_2 emissions, etc. For example, the APU of an A320 aircraft consumes app. 160 l fuel per hour. In addition to the general air pollution, the consumption of one litre of jet fuel leads to emission of 2.5 kg CO_2 into the atmosphere and thus, the APU emits app. 400 kg CO_2 per operational hour.

In order to avoid running the APU on the ground, preconditioned air units have been provided for supplying the required preconditioned air to the parked aircraft. The preconditioned air units are powered from the mains supply made available at the airport in question.

Cost, efficiency, flexibility, and serviceability remain an issue in known preconditioned air units.

A new preconditioned air unit is provided for supplying preconditioned air to an aircraft parked on the ground. The new preconditioned air unit has a housing with walls defining a flow duct with an air inlet for intake of ambient air to be conditioned to a low temperature, typically a temperature in the range from – 5°C to + 5 °C, and an air outlet for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. To prevent cooling losses, the outer walls of the flow duct may be provided with a layer of heat insulation material.

The preconditioned air unit further comprises a blower accommodated in the housing and connected with the flow duct for generation of an air flow from the air inlet toward the air outlet. The blower is preferably a highly efficient centrifugal fan. The blower is preferably mounted with vibration dampers and attached with flexible connections to the flow duct.

The new preconditioned air unit further comprises at least one refrigeration system, each of which comprises at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a refrigerant flow circuit containing a refrigerant.

At least one compressor of the at least one refrigeration system may be powered from a variable frequency driver. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the maximum capacity of the compressor is determined by the frequency of the mains supply. Advantageously, the output voltage and frequency of the variable frequency driver in the new preconditioned air unit are varied to control the at least one compressor in accordance with the current cooling requirement. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. In this way, each of the at least one refrigeration systems may operate continuously, i.e. the output voltage and frequency of the variable frequency driver may be adjusted to levels required by the at least one compressor in order for it to cool the airflow interacting with the respective at least one evaporator in accordance with a control setting. This increases the life time and decreases power consumption of the at least one refrigeration system as compared to conventional on/off control.

Further, the maximum capacity of a compressor driven by a variable frequency driver may be increased as compared to the same compressor supplied directly from the mains supply. For example, supplying a compressor with a supply voltage with a 75 Hz output frequency increases the cooling capacity of the compressor by 50% over the same compressor supplied directly from the mains supply in Europe.

Preferably, the controller of the variable frequency driver (in the following denoted "VFD-controller") is capable of controlling the variable frequency driver to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rating of the compressor whereby the one or more compressors supplied from the variable frequency driver may be controlled for provision of variable cooling capacity, e.g. in response to the temperature and flow rate of the air flow in the flow duct.

A plurality of variable frequency drivers may be provided for power supply of respective compressors, e.g. each of the compressors may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective compressor.

Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more compressors.

The preconditioned air unit may further comprise at least one condenser fan for generation of a condenser airflow interacting with the at least one condenser of the at

least one refrigeration system thereby increasing the heat removal capacity of the at least one condenser.

Each of the at least one condenser fan may be located in any suitable position in the housing for provision of a condenser air flow within the housing. Each of the at least one condenser fan may be located adjacent an air outlet in the housing for generation of a condenser air flow out through the outlet, and each of the at least one condenser may be located adjacent an air inlet for interaction with the generated condenser airflow at ambient temperature. Obviously, the direction of the condenser air flow may be reversed although in this case the condenser air flow may be heated by internal components within the housing before interacting with the at least one condenser.

At least one of the at least one condenser fan may be powered from a variable frequency driver. In a conventional preconditioned air unit, the condenser fan is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA, and thus, the condenser fan performance is locked to the frequency of the mains supply. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the at least one condenser fan in accordance with the current operational requirements, such as current pressure within the at least one condenser, efficiency, etc. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the at least one condenser fan. A plurality of variable frequency drivers may be provided for power supply of respective condenser fans, e.g. each of the condenser fans may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective condenser fan by control of the condenser air flow rate generated by the condenser fan.

Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more condenser fans.

The preconditioned air unit may further comprise a variable frequency driver connected for electrical power supply of the blower. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the

type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the blower.

The new preconditioned air unit may comprise a main unit and one or more self-contained cooling modules mounted in the main unit. The main unit includes the housing having a plurality of compartments for receiving and holding the self-contained cooling modules. Each of the self-contained cooling modules comprises at least one of the at least one refrigeration systems.

Each of the at least one refrigeration system operates in accordance with well-known refrigerator principles and with a well-known refrigerant, such as R134a with low global warming potential.

The at least one evaporator of the at least one refrigeration system is mounted in the housing of the preconditioned air unit for interaction with the airflow in the flow duct for cooling of the air flow. For example, a cooling surface of the at least one evaporator may be positioned inside the flow duct for direct contact across a large surface area with the airflow in the flow duct.

One or more VFD-controllers of the at least one refrigeration system may further perform data collection of parameter values sensed by sensors of the at least one refrigeration system, e.g. temperature sensors sensing temperatures in the airflow upstream and downstream of the at least one evaporator and of the at least one condenser, pressure sensors sensing the pressure of the refrigerant in the at least one refrigeration system, etc.

Preferably, the preconditioned air unit has a central controller that is configured for controlling the operation of the preconditioned air unit. The central controller may be connected to a user interface for reception of user commands from a user and for outputting messages to the user. The preconditioned air unit may comprise at least one of the following: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, a loudspeaker, etc. For example, one of the primary user entries specifies the type of aircraft to be supplied by the preconditioned air unit. This information may be entered using entry keys of the user panel, or, using a remote control from the passenger boarding bridge, or, may be transmitted from the building management system of the airport, etc.

The central controller may further be connected with some or all of the VFD-controllers of the preconditioned air unit for individual control of the VFD-controllers. For example, if the preconditioned air unit comprises a plurality of refrigeration systems, the central controller may output an individual temperature setting to the VFD-controllers of each of the refrigeration systems, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective at least one compressor to adjust the temperature of the airflow having interacted with the corresponding at least one evaporator as required.

Further, each of the refrigeration systems may be configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing cooling refrigeration system may transmit a failure signal to the central controller and may shut down if required. In response to the failure signal, the central controller may operate to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the preconditioned air unit.

The central controller may be interfaced with some or all of the VFD-controllers and possibly other controlled devices, such as an SCR module controlling a heater in the flow duct, with a data and control bus, such as the CAN bus.

The preconditioned air unit may further have a rectifier connected to the mains supply input of the preconditioned air unit for generation of a power DC voltage supply for supplying the variable frequency drivers.

In order to suppress distortion and pollution of the mains supply, the rectifier circuit may comprise a 12-pulse rectifier, or a 18-pulse rectifier, or a 24-pulse rectifier, etc.

The preconditioned air unit may share a mains power outlet with other equipment at the parked aircraft, such as, a ground power unit, a cable coil, vehicle chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit may comprise a power sharing control input for control of preconditioned air unit power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit when the ground power unit draws a high supply current. The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, again, lowering the cooling capacity for a short period of time

before push back does not seriously diminish the overall performance of the preconditioned air unit. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit.

The preconditioned air unit may be mounted underneath or on top of a passenger boarding bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit may be provided with pedestal legs for flexibility in preconditioned air unit location at an apron or in a hangar.

A plurality of the new preconditioned air units may be interconnected for supplying preconditioned air to a parked aircraft in cooperation. Two of the new preconditioned air units may for example be coupled in parallel in a master-slave configuration wherein the outputs of each of the preconditioned air units supply a common hose that is connected to the parked aircraft and possibly split at the aircraft into two or more hoses for supplying possible individual inputs of the aircraft for preconditioned air. The master may control the slave in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft. Other control principles may also be applied. For example, the CAN-bus of the cooperating preconditioned air units may be interconnected for flexibility of control sharing between cooperating units.

The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

Fig. 1 shows a preconditioned air unit from above with the top removed,

Fig. 2 shows a preconditioned air unit in perspective with two self-contained cooling modules withdrawn from their respective compartments,

Fig. 3 shows a self-contained cooling module in perspective,

Fig. 4 illustrates handling of a self-contained cooling module with a fork lift truck,

Fig. 5 shows a preconditioned air unit in perspective ready for mounting,

Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit,

Fig. 7 shows the user interface panel of the preconditioned air unit,

Fig. 8 shows another preconditioned air unit from above with the top removed, and

Fig. 9 shows two preconditioned air units coupled in parallel in a master-slave configuration.

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

Fig. 1 shows a top view of an exemplified embodiment of the new preconditioned air unit 10 for supplying preconditioned air to an aircraft parked on the ground. The preconditioned air unit 10 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 16a, 16b, 18, besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters the flow duct 20 through an air inlet 22 in a side wall 24 of the housing 12. The flow duct 20 is folded inside the housing 12 so that walls 16a, 16b separate the flow duct into two parts with air flowing in opposite directions during operation of the preconditioned air unit 10. The side wall also has an air outlet 25 for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, and the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

An optional heater 32 is mounted in the flow duct 20 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

As most clearly shown in Fig. 2, the illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective, identical self-contained cooling modules 36.

As shown in Fig. 3, each of the self-contained cooling modules 36 comprises a refrigeration system including a compressor 38, a condenser 40, an expansion valve 42, and an evaporator 44 connected in series in a refrigerant flow circuit containing a refrigerant selected in accordance with the expected high end ambient temperature of the airport in question, e.g. R134a selected for operation at high end ambient temperatures around 40 °C The refrigerant flow circuit forms a closed and sealed loop. Each of the self-contained cooling modules 36 operates in accordance with well-known refrigerator principles.

Each of the self-contained cooling modules 36 can be installed in the housing 12 of the main unit without interfering with the refrigeration system of the module 36 so that assembly and possible disassembly of self-contained cooling modules 36 in the preconditioned air unit housing 12 can be performed by persons without specific skills in the field of refrigeration systems. The self-contained cooling modules 36 may be manufactured at one site particularly suitable for manufacturing of refrigeration systems for subsequent integration with housings 12 of the main unit at a separate site particularly suitable for manufacturing of airport ground equipment in general thereby increasing manufacturing flexibility and decreasing manufacturing cost of the preconditioned air unit 10. Further, the self-contained cooling module 36 may be stored as a spare part including the refrigerant, whereby repair of a preconditioned air unit without having to perform the cumbersome task of emptying the preconditioned air unit for refrigerant is made possible.

The power supply, control circuitry, and user interface of the preconditioned air unit 10 allows the preconditioned air unit 10 to operate with any number of self-contained cooling modules 36 installed, i.e. the illustrated preconditioned air unit 10 may operate with a single self-contained cooling module 36 installed in an arbitrarily selected compartment 34; or, with two self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or, with three self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or with four self-contained cooling modules 36 installed in respective compartments 34. In this way, a product line of preconditioned air units 10 is provided making four different preconditioned air units 10 available with different cooling capacities based on the same components. This lowers manufacturing cost by lowering purchase cost per component, and storage and handling cost both per component and per finished

preconditioned air unit 10. Further, a preconditioned air unit 10 already in use in an airport with less than four self-contained cooling modules 36 installed may be upgraded on site by installing one or more self-contained cooling modules 36 in empty compartments 34.

Preferably, the self-contained cooling modules 36 are removably installed in the housing 12 of the main unit facilitating separation of an installed self-contained cooling module from the housing 12, e.g. utilizing screws, nuts and bolts for fastening each of the self-contained cooling modules 36 to the housing 12 and utilizing electrical connectors (not shown) to establish the required electrical interconnections between the cooling module and the housing 12 when the cooling module 36 is inserted in the housing 12 of the main unit 10.

Fig. 2 shows in perspective the preconditioned air unit of Fig. 1 with two self-contained cooling modules 36 withdrawn from the housing 12 of the main unit 10. Fig. 5 shows in perspective the preconditioned air unit of Figs. 1 and 2 with the two self-contained cooling modules 36 inserted and installed in the housing 12 of the main unit 10.

The removability of the modules 36 enhances the serviceability of the preconditioned air unit 10 since a possible malfunctioning self-contained cooling module can be separated from the housing 12 of the main unit 10 and replaced with a functioning module 36 with a minimum of down time of the preconditioned air unit 10. One cooling module 36 can be replaced in approximately 20 minutes. In the event that a functioning cooling module 36 is not available for substitution of the malfunctioning cooling module 36, the preconditioned air unit 10 will continue operation with the remaining cooling modules 36, i.e. the preconditioned air unit 10 remains fully operational, however with a lowered cooling capacity. Further, the malfunctioning module 36 can be moved for repair at a separate site particularly suitable for repair of refrigeration systems. Also, the possible requirement of dismounting and moving the entire preconditioned air unit for repair of a cooling circuit is hereby reduced. Preferably, the self-contained cooling module 36 has physical dimensions suitable for movement by a fork lift truck 47 as illustrated in Fig. 4 facilitating transportation of the module 36, e.g. for storage, assembly into a preconditioned air unit 10, and service. For example, a malfunctioning module 36 can be removed from the housing 12 with a fork lift truck 47 and a properly functioning module 36 can be installed in the housing 12 with a fork lift truck 47.

In the illustrated preconditioned air unit 10, the evaporator 44 of each self-contained cooling module 36 is positioned inside the flow duct 20 through a slot in the wall 14a, 14b, 14c, 14d when installed in the housing 12 of the main unit for optimum heat exchange with the air flow in the duct 20. The evaporator 44 has a large number of channels for passage of the air flow in the duct 20 providing a large surface of heat exchange between the air flow and the refrigerant flowing inside the evaporator 44 as is well-known in the art of refrigeration systems. The slots in the walls 14a, 14b, 14c, 14d are sealed when the respective self-contained cooling modules 36 are mounted in their operational positions in the compartments 34. In absence of a self-contained cooling module 36, the slot is sealed with a cover plate.

Cooling in multiple steps as provided by a plurality of self-contained cooling modules 36 efficiently condenses the air humidity and protects the last downstream evaporator 44 from freezing over. A stainless steel condensate pan (not shown) and integrated condensate pump (not shown) ensure that the condensation moisture is removed in a controlled way.

The cooling air leaves the illustrated preconditioned air unit through one or two 14" hoses.

Each of the compressors 38 of the self-contained cooling modules 36 may be powered from a variable frequency driver 46 also located in the respective self-contained cooling module 36. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the capacity of the compressor is limited by the frequency of the mains supply. This limitation does not exist in the new preconditioned air unit 10. Advantageously, the variable frequency driver the VFD-controller is capable of varying the output voltage and frequency of the variable frequency driver 46 in order to control the compressor 38 in accordance with the current cooling requirement. In the illustrated preconditioned air unit, the variable frequency driver 46 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

The output voltage and frequency supplied by the variable frequency driver 46 is controlled by the VFD-controller in a way well-known in the art of variable frequency drivers. Preferably, the VFD-controller is capable of controlling the variable frequency driver 46 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the compressor 38 whereby each of the compressors

38 supplied from a respective variable frequency driver 46 may be controlled for provision of variable cooling capacity.

Each of the self-contained cooling modules has temperature sensors (39 in Fig. 6) in electrical connection with the VFD-controller of the module 36 and mounted for sensing temperatures in the air flow up-stream and down-stream of the evaporator 44 and transmitting the sensed temperature values to the VFD-controller, and the VFD-controller controls the cooling capacity of the compressor 38 in response to the sensed temperatures.

Each of the self-contained cooling modules 36 operates continuously, i.e. the output voltage and frequency of the variable frequency driver 46 are adjusted to levels required by the compressor 38 in order for it to cool the airflow having interacted with the evaporator 44 substantially to the temperature setting. This increases the life time and decreases power consumption of the cooling modules 36 as compared to on/off control of the compressors 38.

The preconditioned air unit 10 further comprises two condenser fans 48 mounted across apertures in the side wall 50 for generation of condenser airflow causing ambient air to enter the housing 12 through apertures in the self-contained cooling modules 36 covered by the condensers 40 as indicated by arrows 52a – 52f for heat removal from the heat exchanging surfaces of the condensers 40.

The condenser fans 48 are powered from one variable frequency driver 54. Advantageously, the VFD controller of the variable frequency driver 54 is capable of varying the output voltage and frequency of the variable frequency driver 54 in order to control the condenser fans 48 in accordance with the current operational requirements, such as current pressure within the condenser(s), efficiency, etc. Preferably, the variable frequency driver 54 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the condenser fans. The preconditioned air unit 10 further comprises a variable frequency driver 56 connected for electrical power supply of the blower 30. Advantageously, the VFD controller of the variable frequency driver 56 is capable of varying the output voltage and frequency of the variable frequency driver 56 in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver 56 keeps the ratio between the output voltage and the

frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. Preferably, the controller of the variable frequency driver 56 is capable of controlling the variable frequency driver 56 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the blower whereby the blower 30 supplied from the variable frequency driver 56 may be controlled for provision of variable flow rate of the air flow in the flow duct 20, e.g. in response to a user control command, e.g. the type of aircraft.

The preconditioned air unit 10 has a central controller 60 that is configured for controlling the operation of the preconditioned air unit 10. The central controller 60 is connected with the user interface panel 58 for reception of user commands and for outputting messages to the user, e.g. on a display of the user interface panel 58, by a loudspeaker of the user interface, etc.

The central controller 60 is connected with all of the VFD-controllers of the preconditioned air unit 10 for individual control of the VFD-controllers. For example, the central controller outputs an individual temperature setting to each of the VFD-controllers of the preconditioned air unit 10, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective compressor 38 to adjust the temperature of the airflow having interacted with the corresponding evaporator 44 as required. Further, in the event that one of the installed self-contained cooling modules 36 fails, the failing cooling module transmits a failure signal to the central controller 60 and shuts down if required. In response to the failure signal, the central controller 60 operates to automatically adjust the required amount of cooling among the remaining properly operating self-contained cooling modules 36 of the preconditioned air unit 10.

Fig. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit 10.

The illustrated preconditioned air unit 10 has a 12-pulse rectifier 62 connected to a mains supply input 64 of the preconditioned air unit 10 for generation of a power DC voltage supply. Using variable frequency drivers may generate harmonic distortion of the mains input. To minimize distortion of the mains input, the three phases of the mains are transformed into six phases which are rectified in the non-regulated 12-pulse full bridge rectifier 62. The combination of the 12-pulse rectifier 62, the related transformer 66 and the input filter 68 reduce harmonic feedback into the mains to a minimum. Further, the 12-pulse rectifier 62 includes soft start circuitry that limits the inrush current. Still further, utilization of the 12-pulse rectifier 62 results in a high input

power factor, i.e. a power factor that is larger than 0.8; for example 0.96, which in turn results in a reduced input mains current.

The filtered power DC voltage supply is routed to each of the compartments 34 for power supply of each of the variable frequency drivers 46 of the self-contained modules 36 when installed in the respective compartments 34.

The filtered power DC voltage supply is further routed to variable frequency driver 56 for power supply of the blower 30 and to variable frequency driver 54 for power supply of the two condenser fans 48.

The central controller 60 is based on a micro-controller and a digital signal processor that cooperate to regulate, supervise and diagnose possible external and internal failures. In addition, each variable frequency driver 46, 54, 56 comprises a micro-controller to perform individual control of devices connected to the variable frequency driver in question. Further, the VFD-controller of each of the self-containing cooling modules 36 monitors the respective refrigeration system and decreases the cooling capacity or stops cooling if the refrigerant pressure is too low or too high.

The central controller 60 automatically adjusts the cooling performed by the preconditioned air unit 10 to the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, the outgoing airflow from the preconditioned air unit 10, etc.

The central controller 60 and the variable frequency drivers 46, 54, 56, and the SCR module 70 controlling the heater 32 are interfaced with a data and control bus, which in the illustrated example is the CAN bus.

The preconditioned air unit 10 may share a mains power outlet with other equipment at the parked aircraft, such as a ground power unit, a cable coil, vehicle battery chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit 10 comprises a power sharing control input (not shown) for control of preconditioned air unit 10 power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit 10 power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit 10 during high load ground power unit operation The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, lowering the cooling capacity for a short

period of time before push back does not seriously diminish the overall performance of the preconditioned air unit 10. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit 10.

Fig. 7 shows the user interface panel 58 of the preconditioned air unit 10. The user interface panel 58 includes an LCD display 72 viewable in all weather conditions and displaying all relevant operational data. The display provides information at different levels: In a default mode, the display shows the status of the preconditioned air unit 10, such as aircraft type, cabin temperature, etc. In an alarm mode, the display shows type of alarm and alarm history. In a setup mode, the display shows various parameters that may be adjusted.

The preconditioned air unit includes digital input/output ports, such as galvanic isolated RS485 port, TCP/IP Ethernet port, etc, for remote control of the preconditioned air unit 10 and monitoring including data dump for service tasks.

The preconditioned air unit 10 may be mounted underneath or on top of an apron drive bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit 10 may be provided with pedestal legs for flexibility in preconditioned air unit location for fixed bridge and hangar applications.

Other preconditioned air units may be provided within the scope of the appended claims. For example, other preconditioned air units may be provided that are not modular. Also, preconditioned air units may be provided with different numbers of refrigeration systems, such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., refrigeration systems.

In the example illustrated in Figs, 1, 2, 4, 5, and 6, the refrigeration systems operate in a series. Other preconditioned air units may be provided with refrigeration systems operating in parallel; or with refrigeration systems operating both in parallel and in series.

For example, Fig. 8 shows a top view of a new preconditioned air unit 10 with two sets of self-contained cooling modules 36a, 36b, and 36c, 36d. Within each set, the self-contained cooling modules operate in parallel, and the two sets of self-contained cooling modules operate in series for supplying preconditioned air to an aircraft parked on the ground.

The preconditioned air unit 10 shown in Fig. 8 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 18a, 18b besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters through an air inlet 22 in a side wall 24 of the

housing 12. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. An optional heater 32 is mounted at the air inlet 22 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

The flow duct 20 has a manifold 21 for expanding the airflow for passage of the condensers 40 operating in parallel. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, 18a, 18b including the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

The illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective self-contained cooling modules 36. It should be noted that parallel self-contained cooling modules to the left and right in Fig. 8 have different lay-outs with corresponding components positioned differently with respect to each other in order to obtain the resulting configuration illustrated in Fig. 8. Evaporator geometries of parallel operating self-contained modules also differ since the air flow passes the respective evaporators in opposite directions with respect to the refrigeration circuit.

The remaining components and the operation of the preconditioned air unit 10 illustrated in Fig. 8 are already explained in connection with the preconditioned air unit illustrated in the previous Figures and are not repeated here.

Fig. 9 shows two of the new preconditioned air units 10a, 10b coupled in parallel in a master-slave configuration. The air outlets 25a, 25b of each of the preconditioned air units 10a, 10b are connected with a common hose 74. Proximate the parked aircraft, the common hose 74 is split into two hoses 76, 78 for supplying corresponding individual inputs of the aircraft for preconditioned air. The master 10a may control the slave 10b in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft.

CLAIMS

1. A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating

a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,

a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

at least one refrigeration system, each of which includes at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of at least one of the at least one compressor of the at least one refrigeration system.

2. A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

3. A preconditioned air unit according to claim 1, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condensor fan for generation of an airflow interacting with at least one of the at least one condenser of the at least one refrigeration system.

4. A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

5. A preconditioned air unit according to any of the preceding claims, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

6. A preconditioned air unit according to claim 5, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

7. A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a central controller that is configured for controlling the operation of the preconditioned air unit.

8. A preconditioned air unit according to claim 7 as dependent on claim 5 or 6, wherein the central controller is connected to at least one controller of the at least one voltage frequency driver.

9. A preconditioned air unit according to claim 7 or 8, wherein the central controller has a power sharing control input for control of air unit power consumption.

10. A preconditioned air unit according to any of the preceding claims, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

11. A preconditioned air unit according to claim 10, wherein the rectifier is a 12-pulse rectifier.

12. A preconditioned air unit according to claim 10, wherein the rectifier is a 24-pulse rectifier.

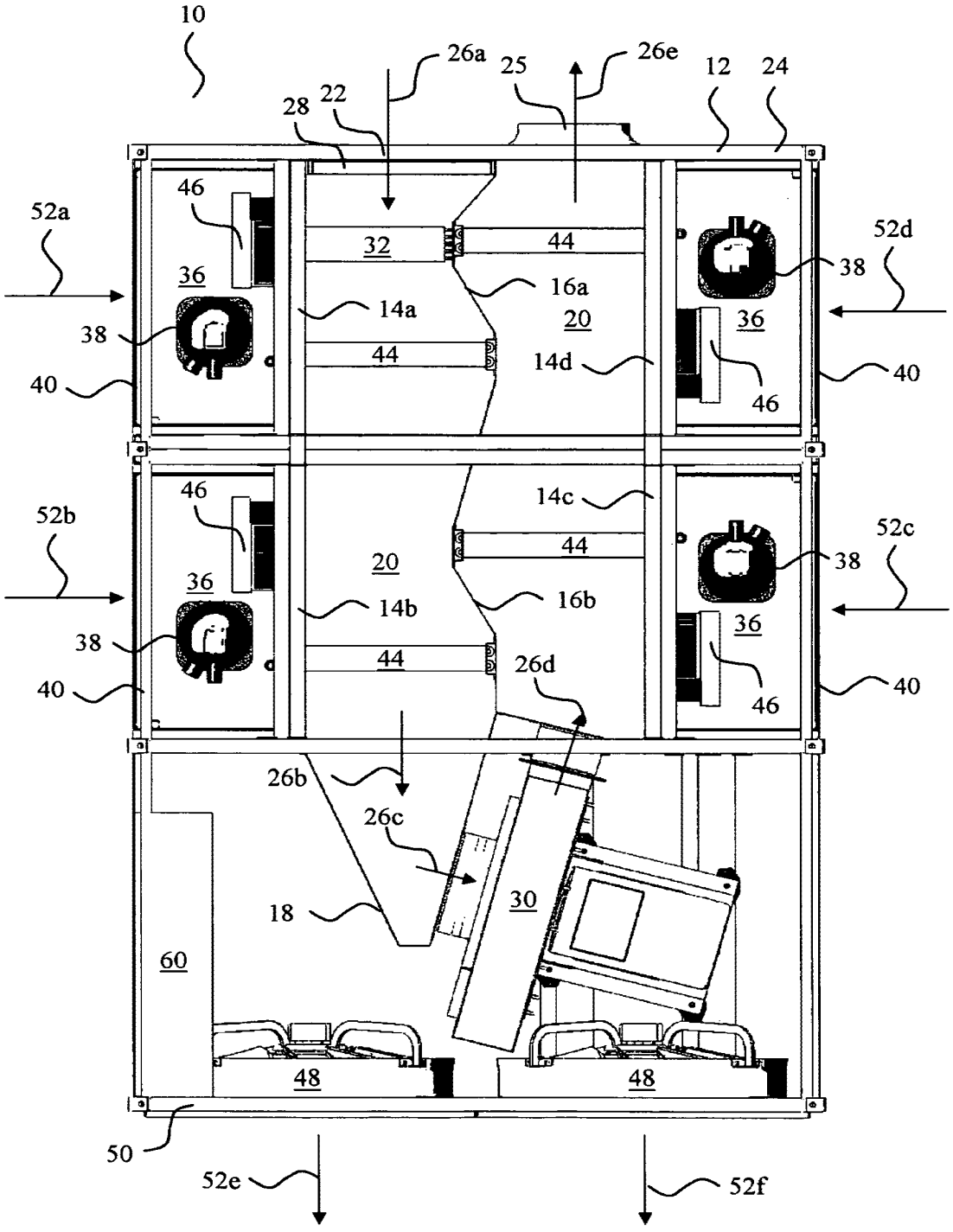
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Fig. 1

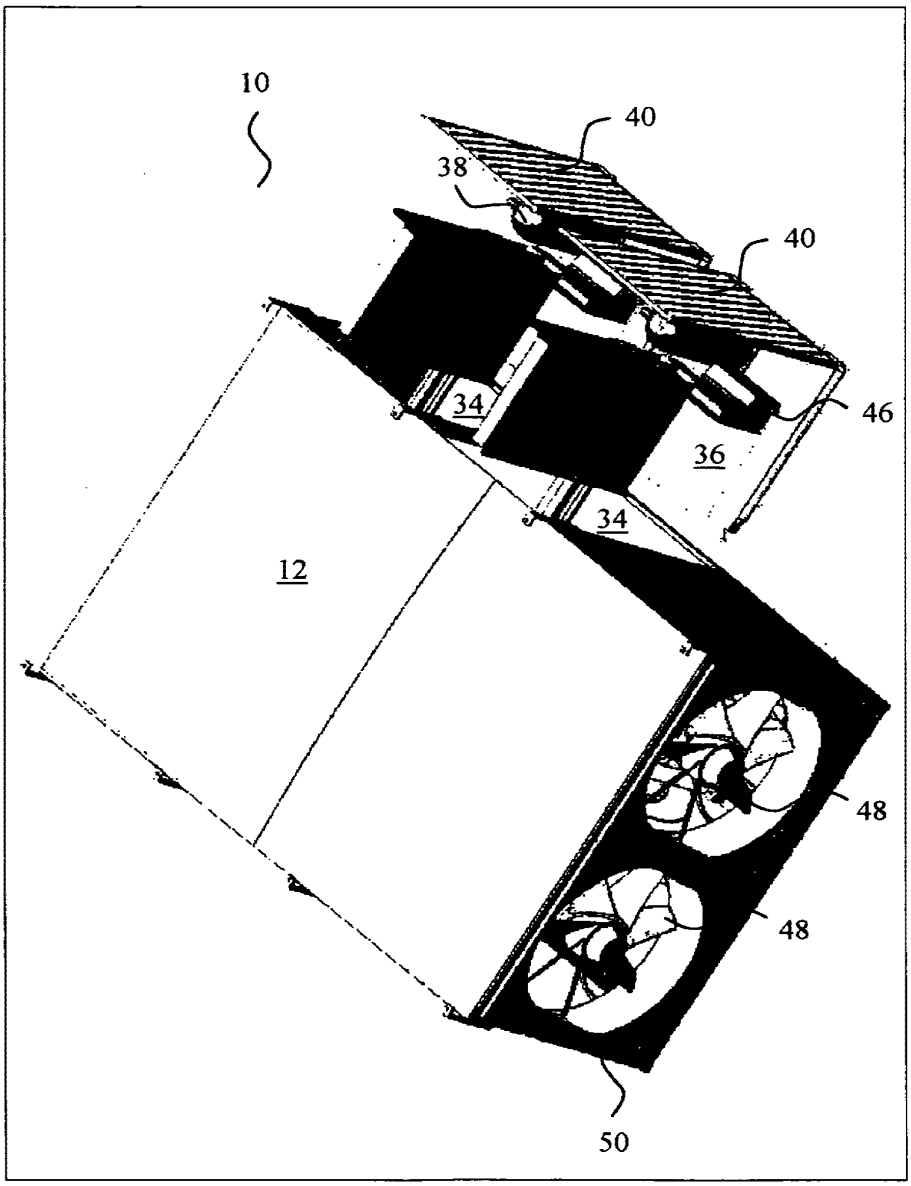


Fig. 2

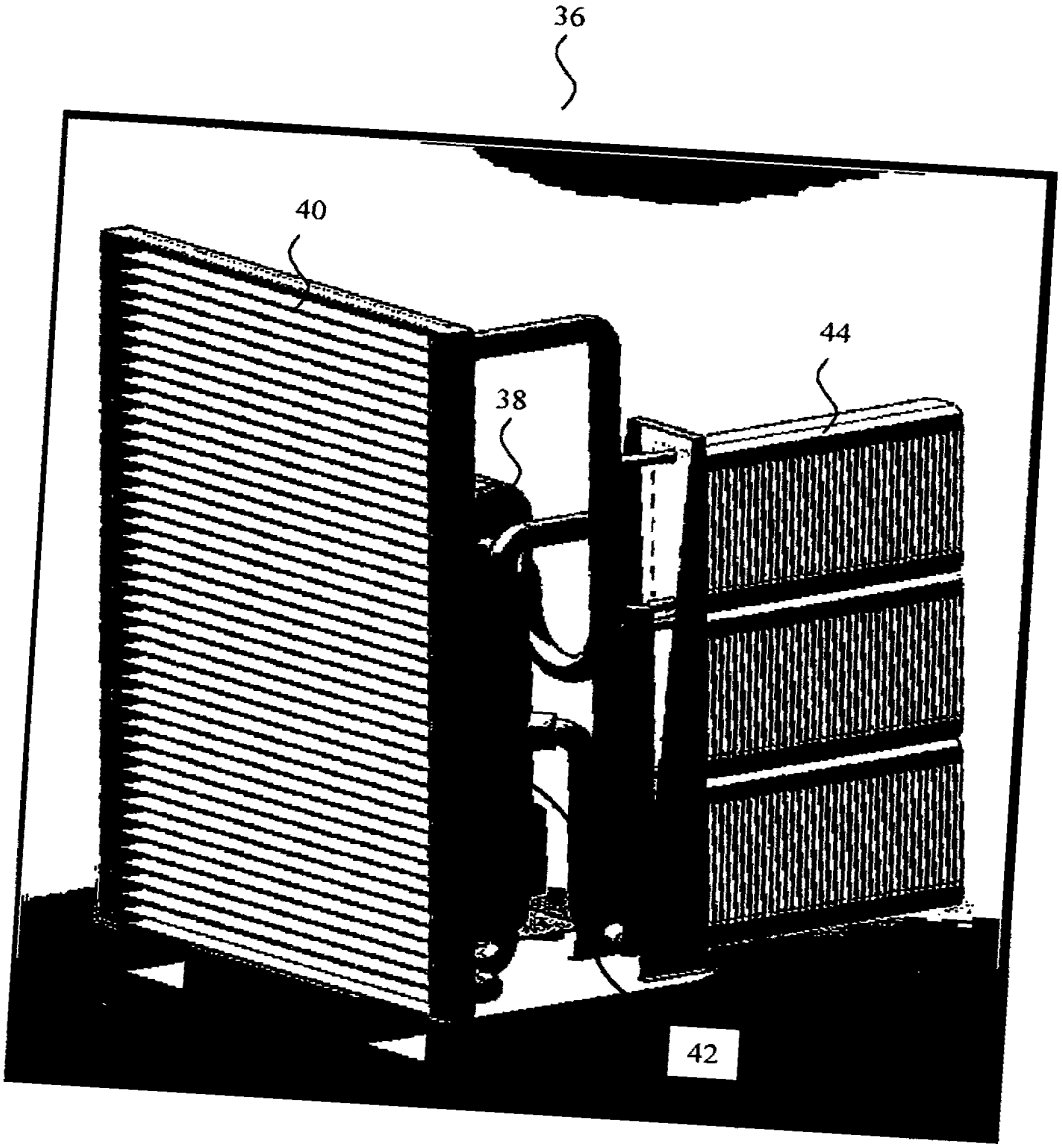


Fig. 3

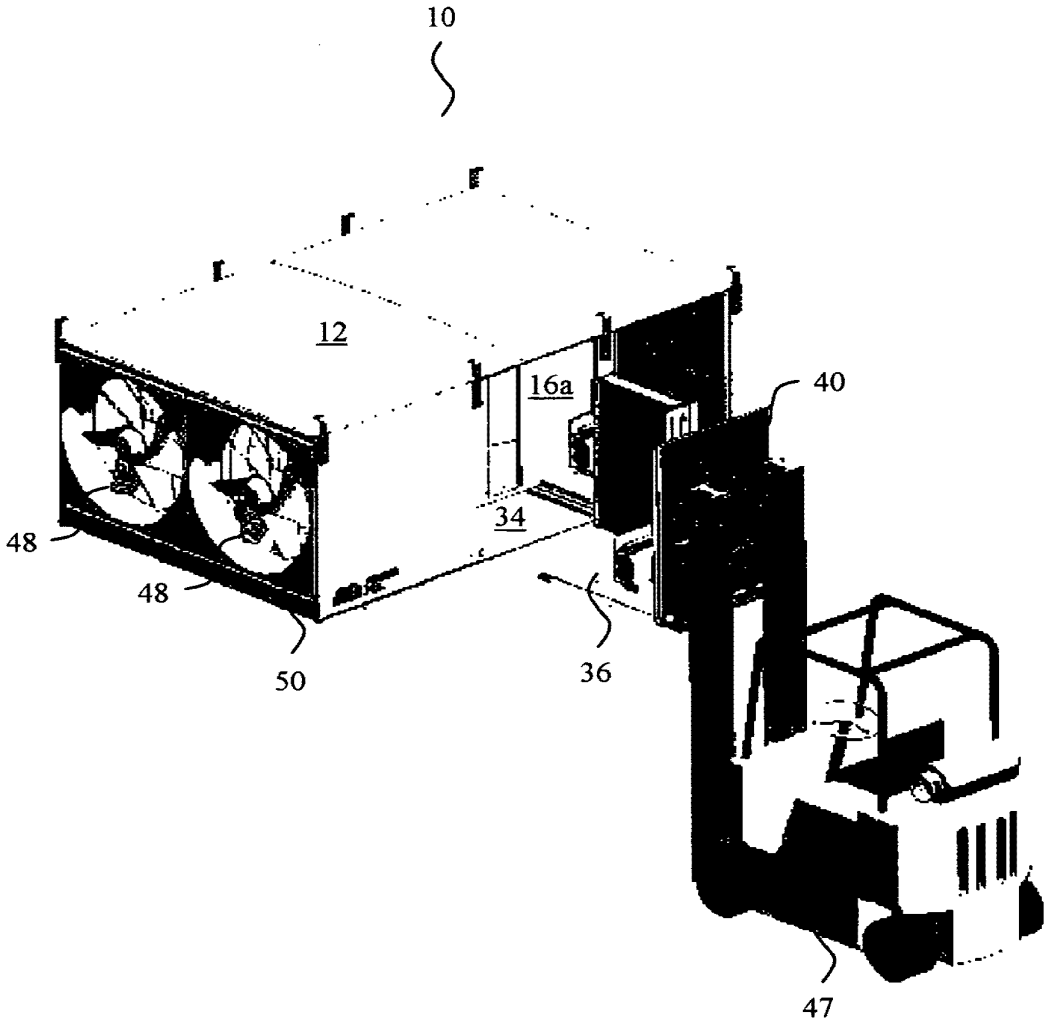


Fig. 4

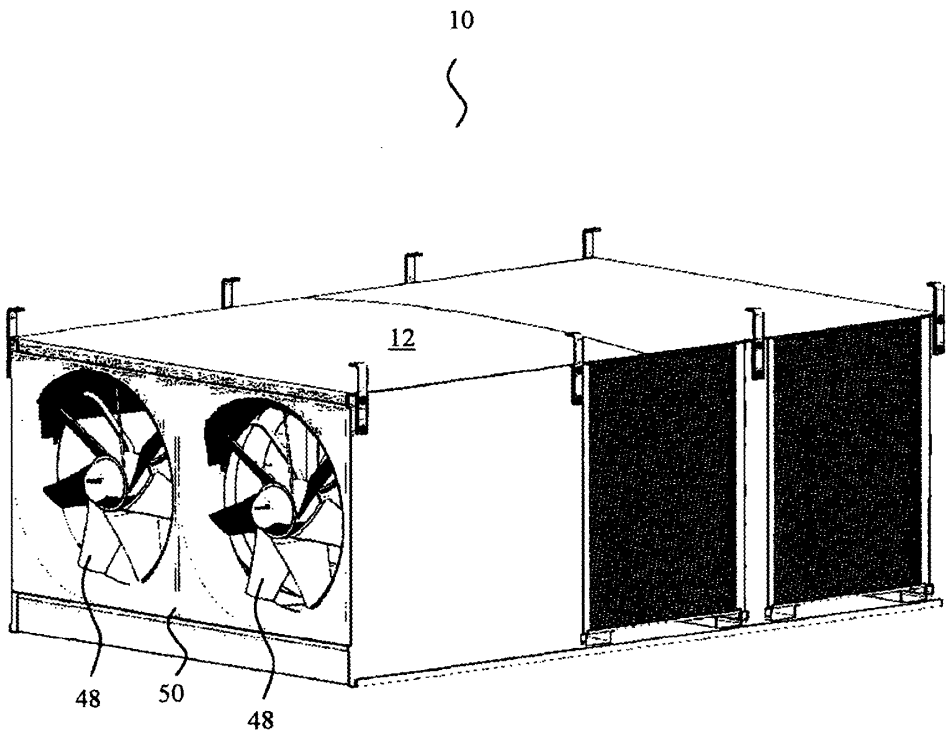
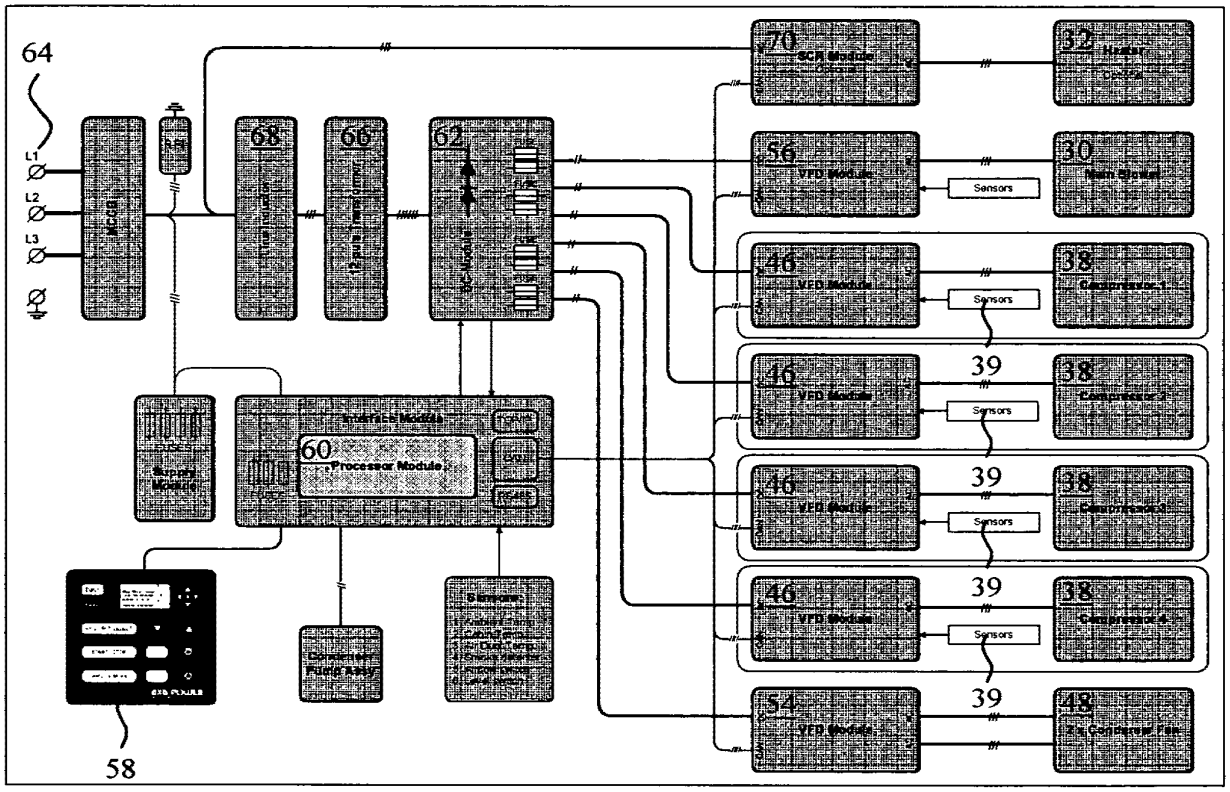


Fig. 5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Processor Module
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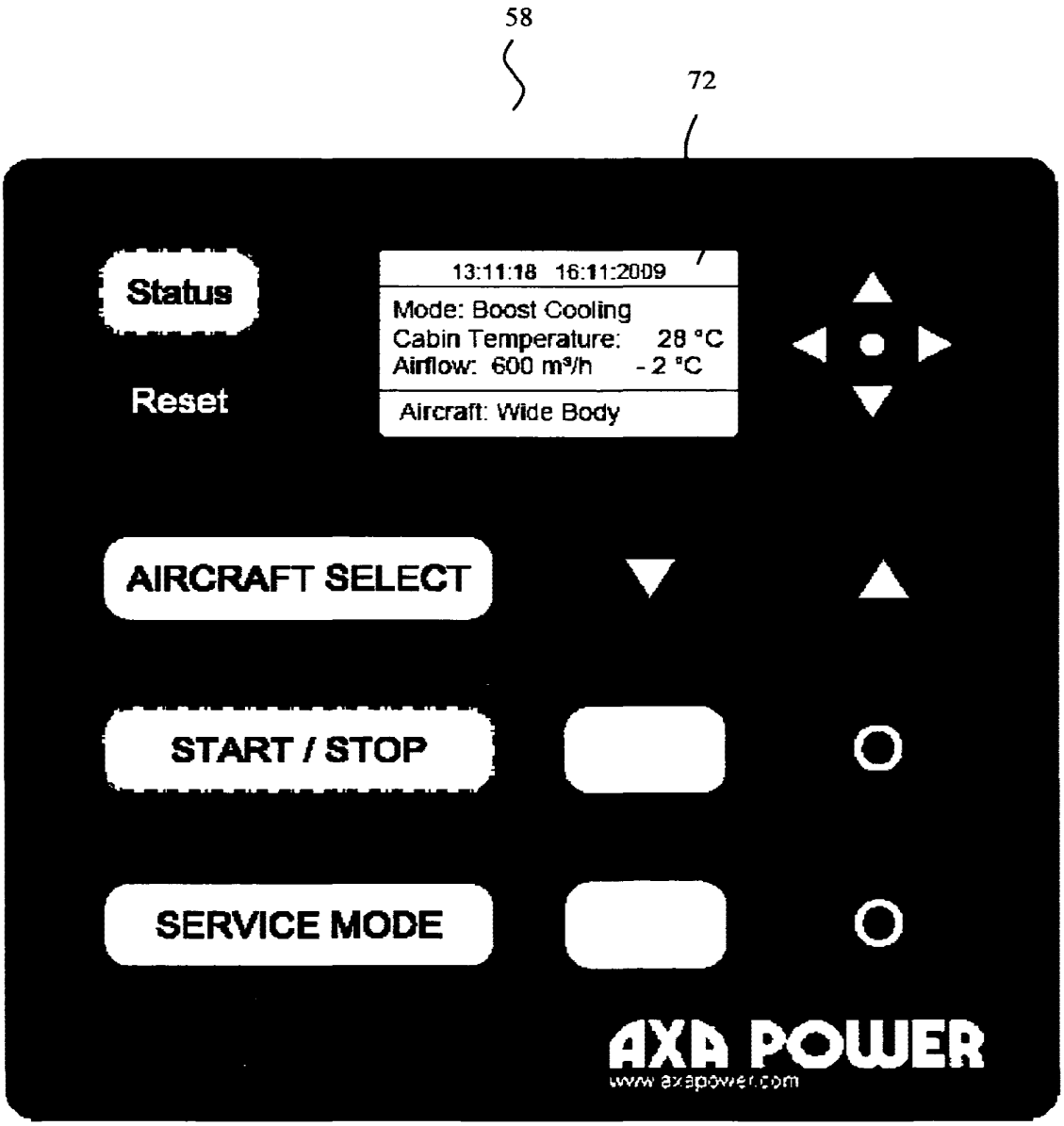
Fig. 6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Aircraft: Wide Body
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START / STOP
SERVICE MODE
AXA POWER
www.axapower.com

Fig. 7

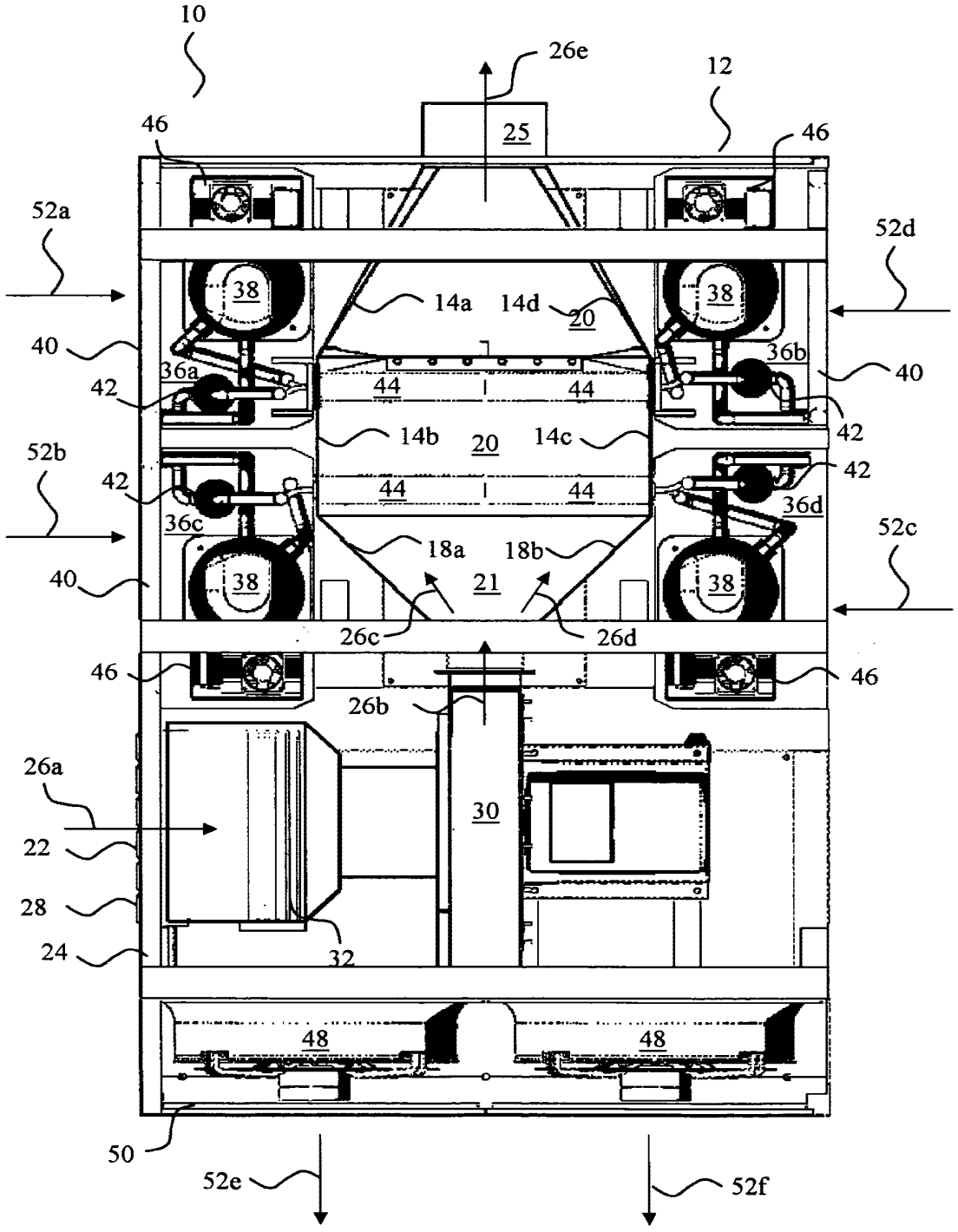
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Fig. 8

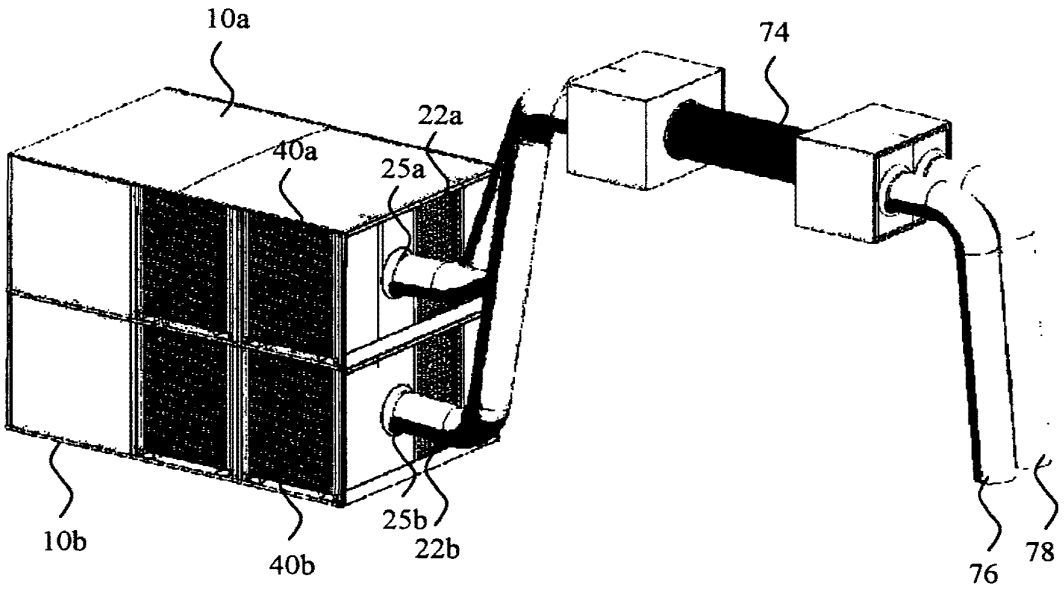

Fig. 9

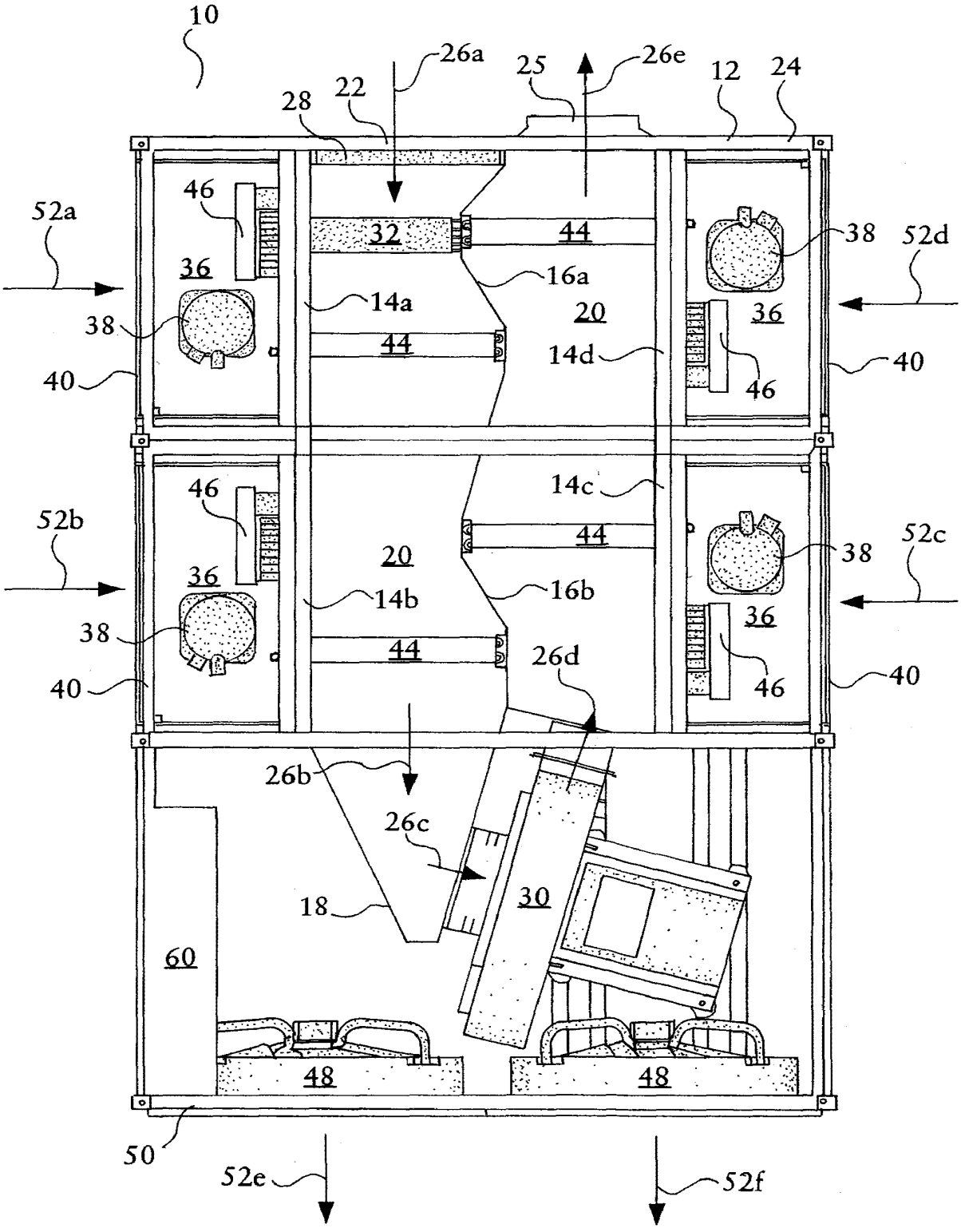

Fig. 1

SUBSTITUTE SHEET (RULE 26)

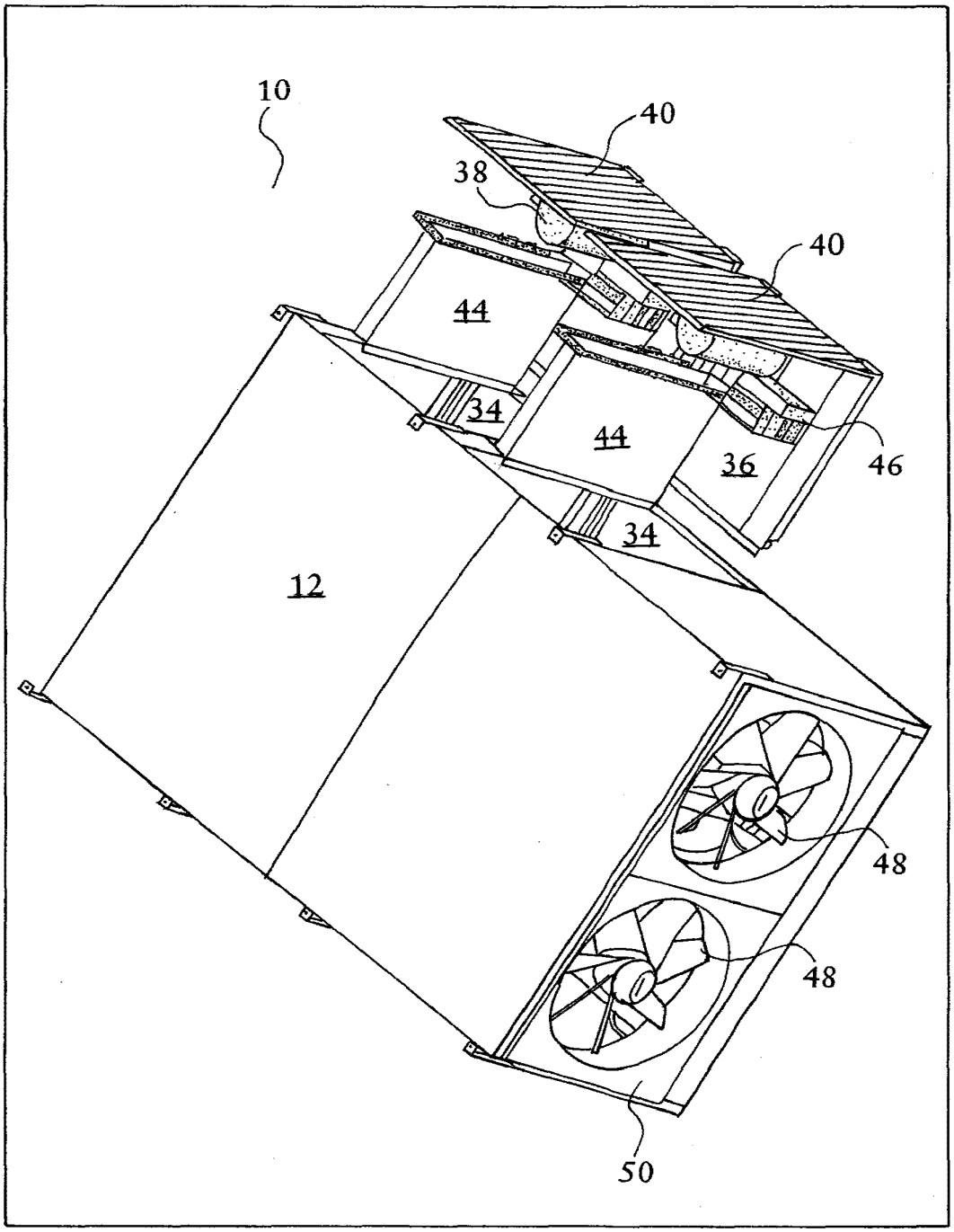

Fig. 2

Dabico
Exhibit 1002
Page 144

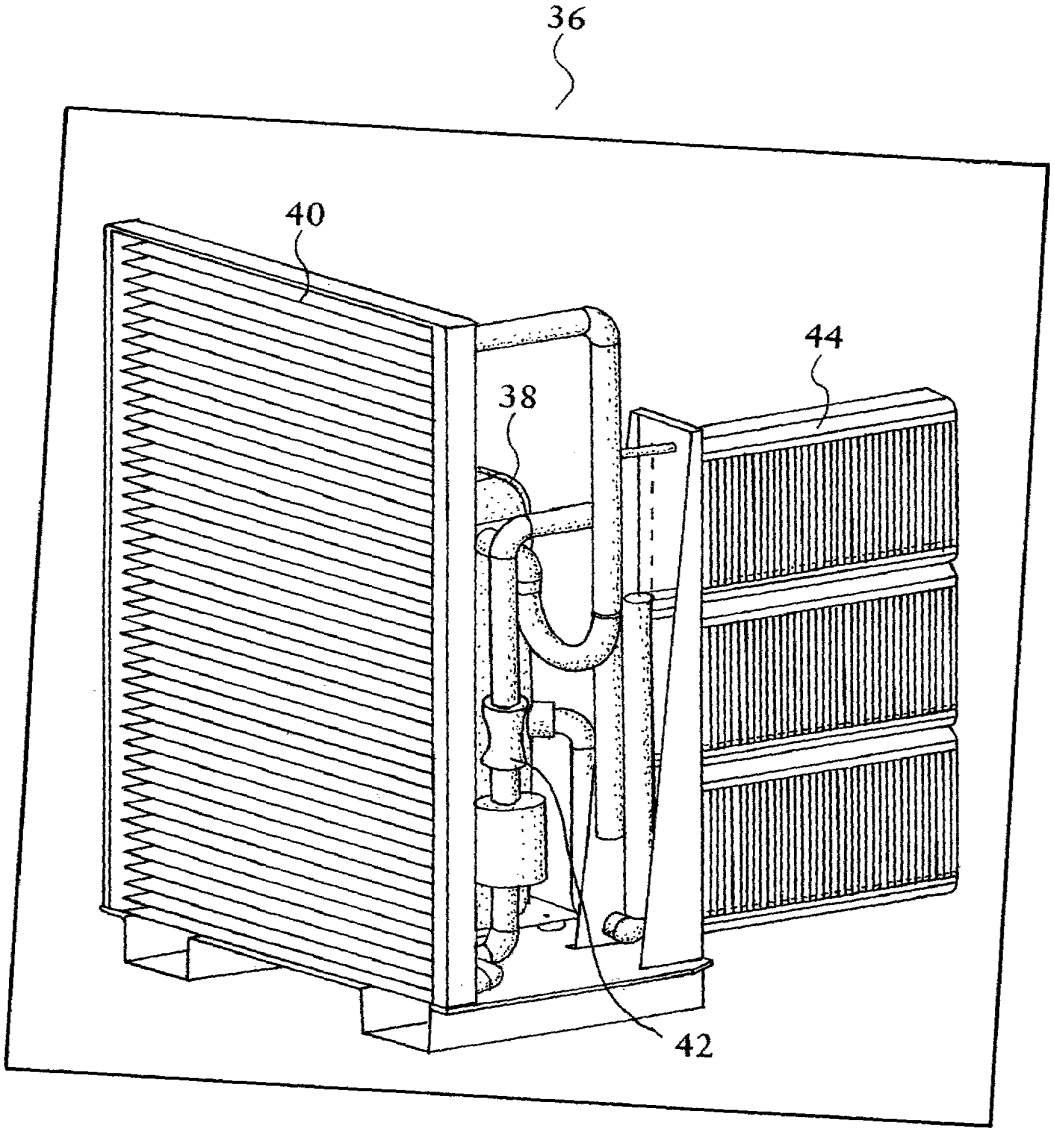

Fig. 3

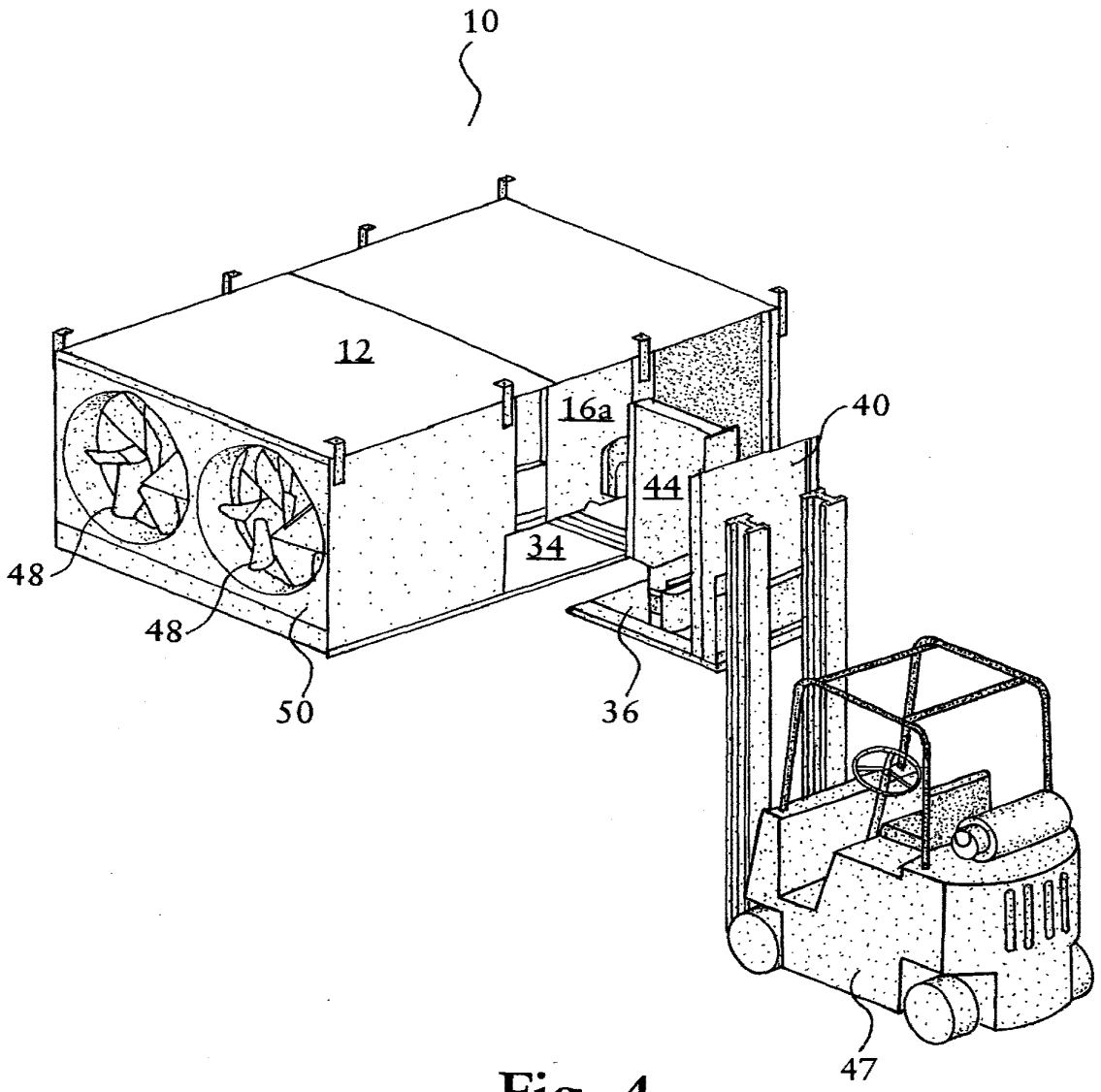

Fig. 4

Dabico
Exhibit 1002
Page 146

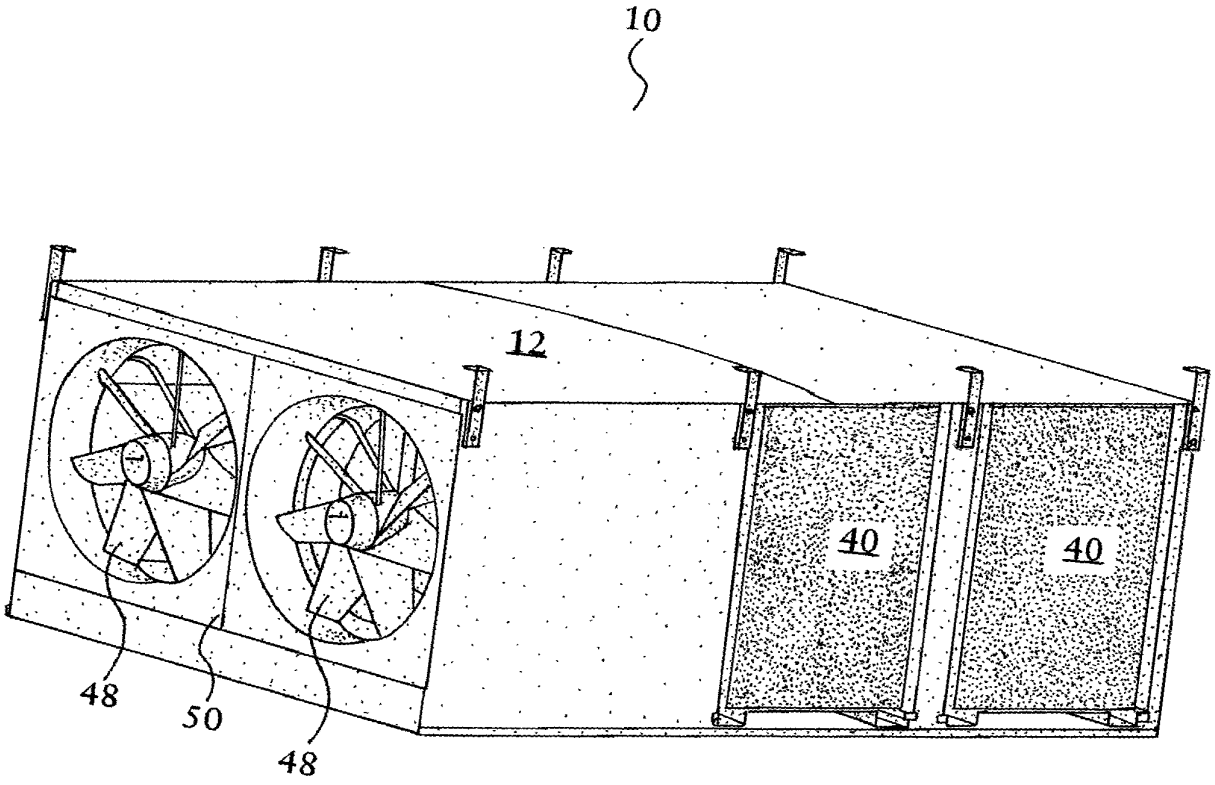

Fig. 5

Dabico
Exhibit 1002
Page 147

Dabico
Exhibit 1002
Page 148

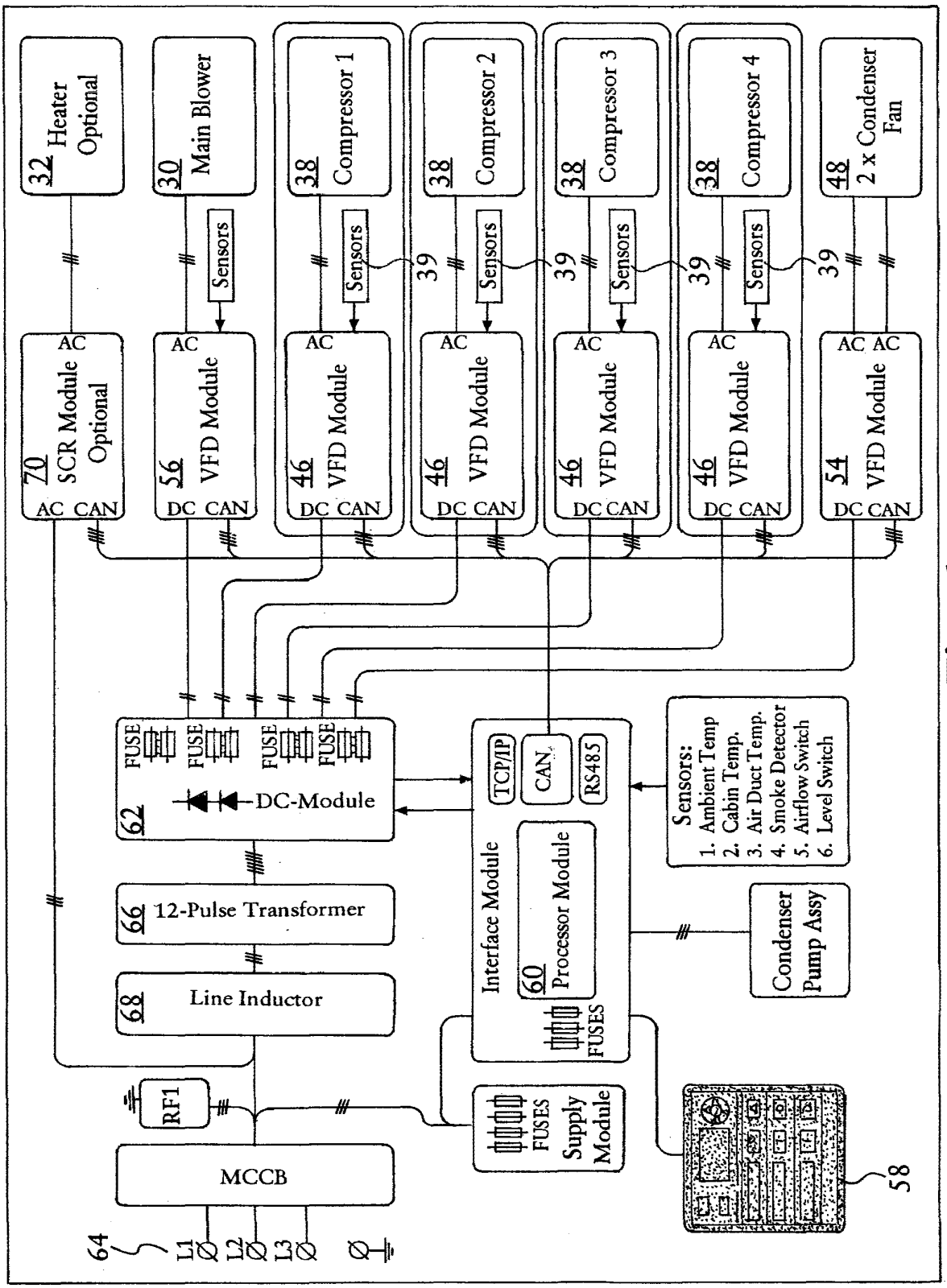

Fig. 6

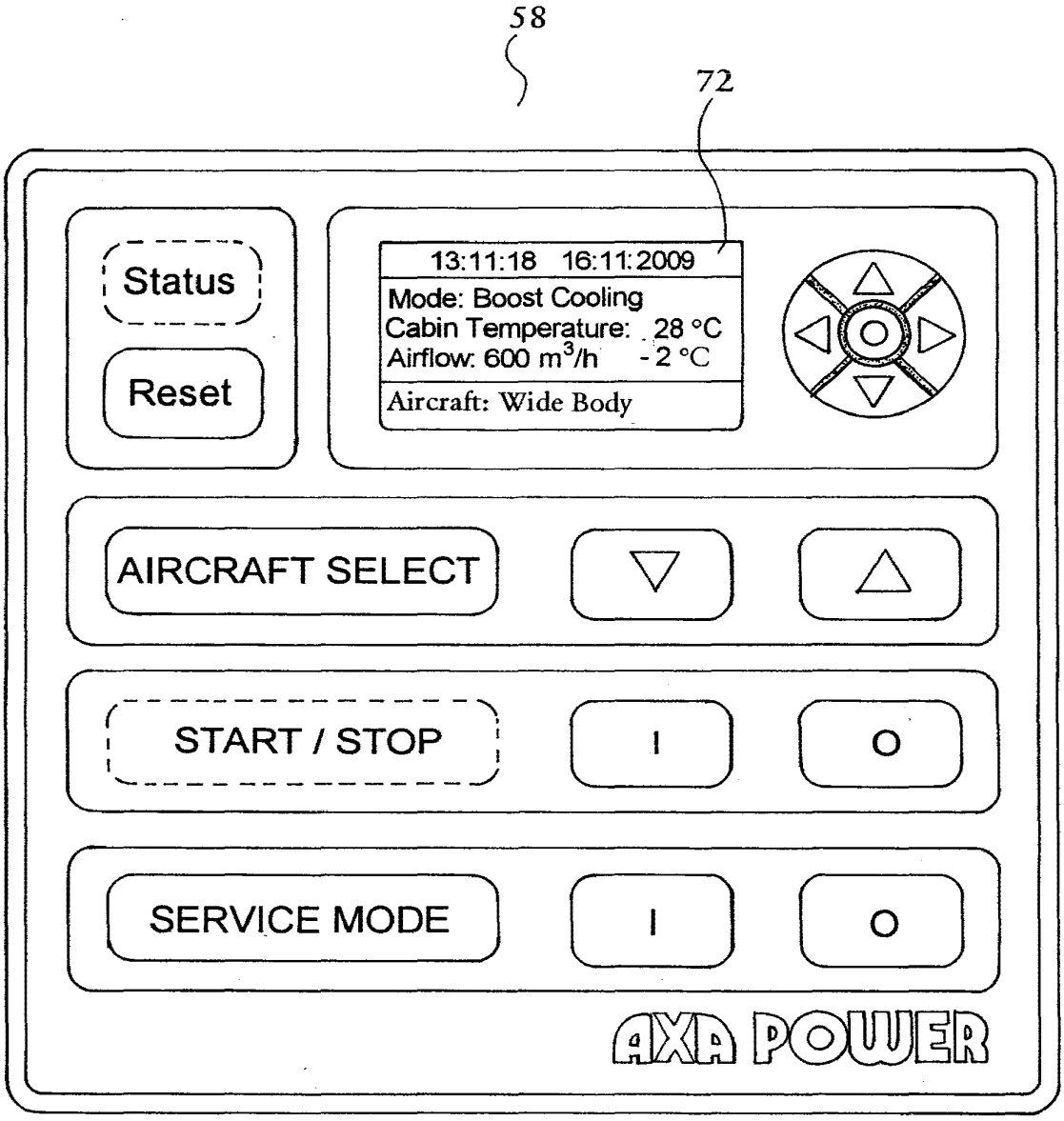

Fig. 7

Dabico
Exhibit 1002
Page 149

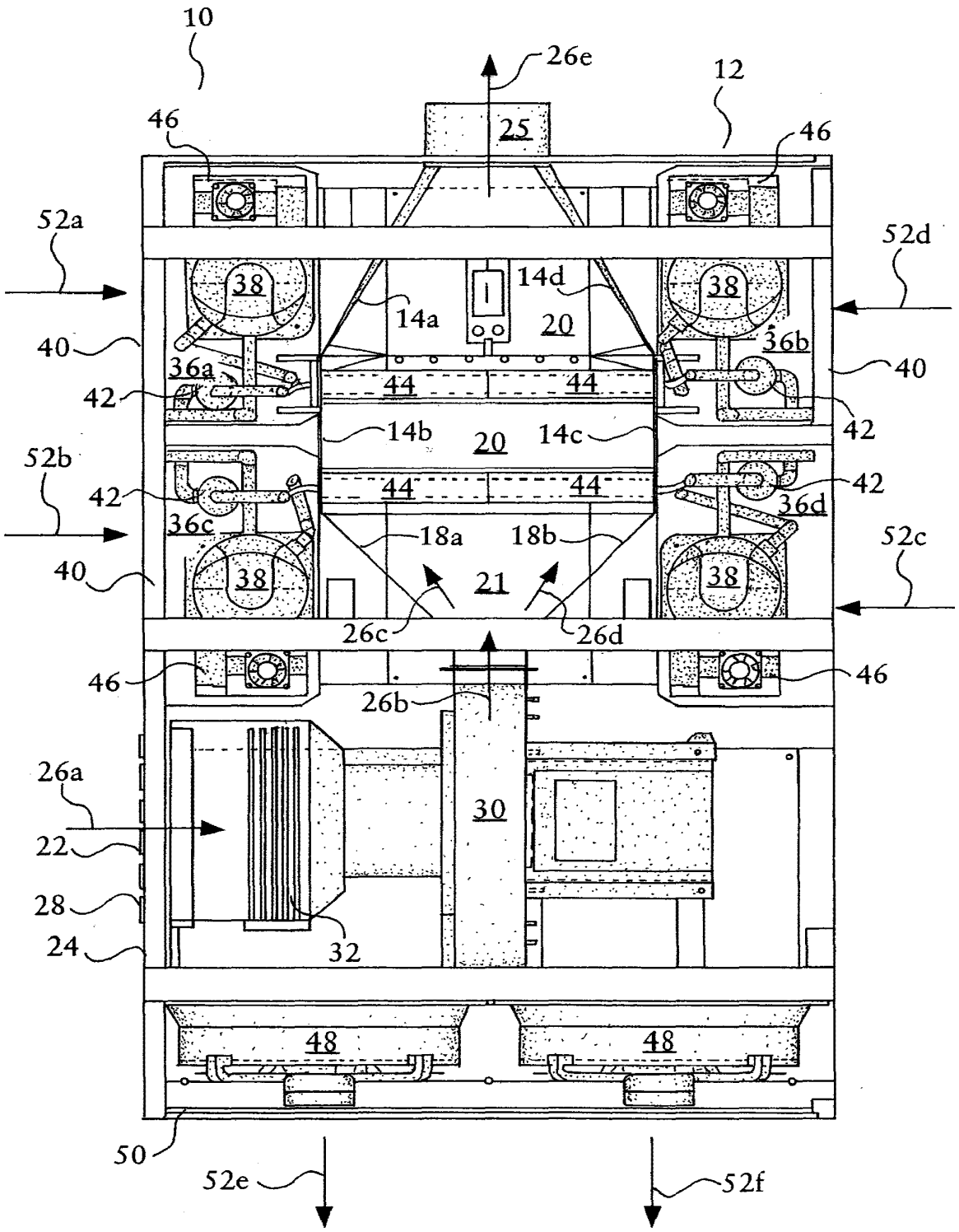

Fig. 8

Dabico
Exhibit 1002
Page 150

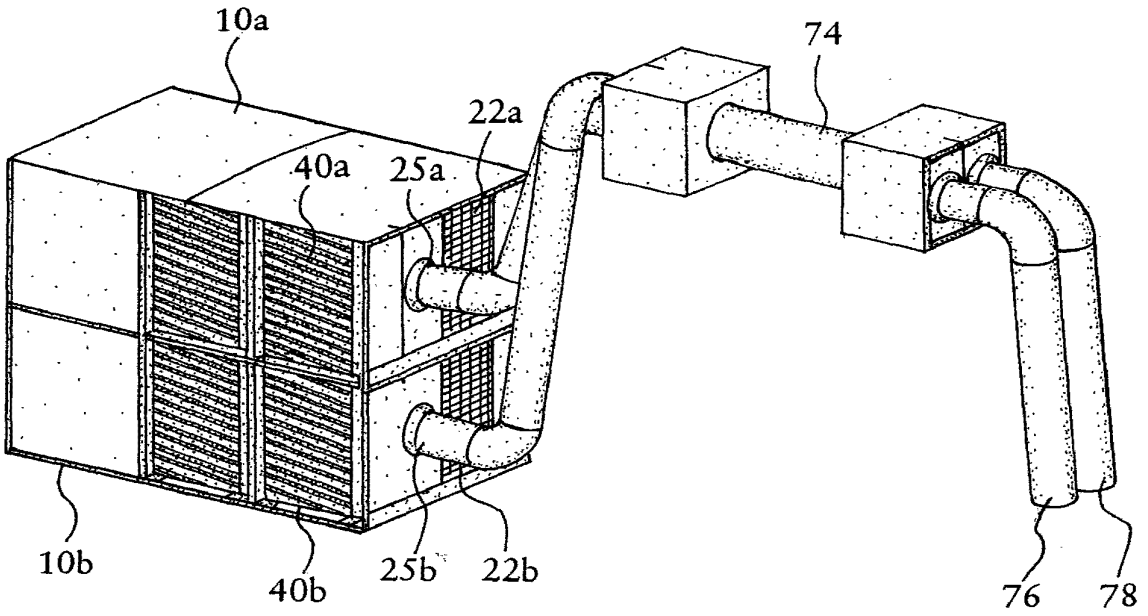

Fig. 9

Dabico
Exhibit 1002
Page 151

PCT

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VIII-2-1	**Declaration: Entitlement to apply for and be granted a patent** Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name (LAST, First)	In relation to this international application AXA Power ApS is entitled to apply for and be granted a patent by virtue of the following:
VIII-2-1(iv)		an assignment from DAHL, Søren Risgaard, NIELSEN, Bo Vork, OLSSON, Henrik, and SCHRØDER, Lars to AXA Power ApS, dated 09 March 2010 (09.03.2010)

PCT

Print Out (Original in Electronic Form)

VIII-4-1	**Declaration: Inventorship (only for the purposes of the designation of the United States of America)** Declaration of Inventorship (Rules 4.17(iv) and 51bis.1(a)(iv)) for the purposes of the designation of the United States of America:	I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought. This declaration is directed to the international application of which it forms a part (if filing declaration with application). This declaration is directed to international application No. PCT/ . . . . . (if furnishing declaration pursuant to Rule 26ter). I hereby declare that my residence, mailing address, and citizenship are as stated next to my name. I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.
VIII-4-1-1	Prior applications:	

		I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.
VIII-4-1-1-1	Name (LAST, First)	DAHL, Søren Risgaard
VIII-4-1-1-2	Residence: (city and either US State, if applicable, or country)	Odense SV, Denmark
VIII-4-1-1-3	Mailing address:	Kielshusvej 16 5250 Odense SV Denmark
VIII-4-1-1-4	Citizenship:	DK
VIII-4-1-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/søren risgaard dahl, 9 March 2010/
VIII-4-1-1-6	Date:	12 March 2010 (12.03.2010)
VIII-4-1-2-1	Name (LAST, First)	NIELSEN, Bo Vork
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Morud, Denmark
VIII-4-1-2-3	Mailing address:	Birkevej 6 5462 Morud Denmark
VIII-4-1-2-4	Citizenship:	DK
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/bo vork Nielsen, 9 March 2010/
VIII-4-1-2-6	Date	12 March 2010 (12.03.2010)

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VIII-4-1-3-1	Name (LAST, First)	OLSSON, Henrik
VIII-4-1-3-2	Residence: (city and either US State, if applicable, or country)	Odense SV, Denmark
VIII-4-1-3-3	Mailing address:	Lærkedals Allé 30 5250 Odense SV Denmark
VIII-4-1-3-4	Citizenship:	DK
VIII-4-1-3-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/henrik olsson, 9 March 2010/
VIII-4-1-3-6	Date	12 March 2010 (12.03.2010)
VIII-4-1-4-1	Name (LAST, First)	SCHRØDER, Lars
VIII-4-1-4-2	Residence: (city and either US State, if applicable, or country)	Assens, Denmark
VIII-4-1-4-3	Mailing address:	Kildensmindensvej 16 5610 Assens Denmark
VIII-4-1-4-4	Citizenship:	DK
VIII-4-1-4-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	/lars schrøder, 9 March 2010/
VIII-4-1-4-6	Date	12 March 2010 (12.03.2010)

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
13/257,669	09/20/2011	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 09/20/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	X $ =		OR	X $52=	0
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $ =		OR	X $220=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LAJUAN HICKSON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

SCORE Placeholder Sheet for IFW Content

Application Number: 13257669 Document Date: 9/20/2011

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

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Form Revision Date: February 8, 2006

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www.uspto.gov

U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/257,669	Soren Risgaard Dahl	713-2354 (22664)

33712
LOWE, HAUPTMAN, HAM & BERNER, LLP (ITW)
1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314

INTERNATIONAL APPLICATION NO.	
PCT/IB2010/051189	
I.A. FILING DATE	PRIORITY DATE
03/18/2010	03/20/2009

CONFIRMATION NO. 9301
371 ACCEPTANCE LETTER

OC000000050123163

Date Mailed: 10/03/2011

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

09/20/2011	09/20/2011
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	DATE OF COMPLETION OF ALL 35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** *The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363).* Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Copy of the International Application filed on 09/20/2011
- Copy of the International Search Report filed on 09/20/2011
- Preliminary Amendments filed on 09/20/2011
- Information Disclosure Statements filed on 09/20/2011
- Oath or Declaration filed on 09/20/2011
- Request for Immediate Examination filed on 09/20/2011
- U.S. Basic National Fees filed on 09/20/2011

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

VALERIE D KINARD

Telephone: (703) 756-1432

FORM PCT/DO/EO/903 (371 Acceptance Notice)

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/257,669

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	490
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	17 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1120

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/257,669	09/20/2011		980	713-2354 (22664)	17	1

CONFIRMATION NO. 9301

33712
LOWE, HAUPTMAN, HAM & BERNER, LLP (ITW)
1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314

FILING RECEIPT

OC000000050123162

Date Mailed: 10/03/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Soren Risgaard Dahl, Odense SV, DENMARK;
Bo Vork Nielsen, Morud, DENMARK;
Henrik Olsson, Odense SV, DENMARK;
Lars Schroder, Assens, DENMARK;

Assignment For Published Patent Application

AXA POWER APS, Odense N, DK

Power of Attorney: The patent practitioners associated with Customer Number 33712

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/IB2010/051189 03/18/2010

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
DENMARK PA 2009 00392 03/20/2009

If Required, Foreign Filing License Granted: 09/29/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/257,669**

Projected Publication Date: 371 Perfected

Non-Publication Request: No

Early Publication Request: No

Title

PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Preliminary Class

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

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Address: COMMISSIONER FOR PATENTS
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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/257,669	Soren Risgaard Dahl	713-2354 (22664)

33712
LOWE, HAUPTMAN, HAM & BERNER, LLP (ITW)
1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314

INTERNATIONAL APPLICATION NO.	
PCT/IB2010/051189	
I.A. FILING DATE	PRIORITY DATE
03/18/2010	03/20/2009

CONFIRMATION NO. 9301
371 ACCEPTANCE LETTER

OC000000050123163

Date Mailed: 10/27/2011

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

09/20/2011	09/20/2011
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	DATE OF COMPLETION OF ALL 35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** *The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363).* Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Copy of the International Application filed on 09/20/2011
- Copy of the International Search Report filed on 09/20/2011
- Preliminary Amendments filed on 09/20/2011
- Information Disclosure Statements filed on 09/20/2011
- Oath or Declaration filed on 09/20/2011
- Request for Immediate Examination filed on 09/20/2011
- U.S. Basic National Fees filed on 09/20/2011

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

VALERIE D KINARD

Telephone: (703) 756-1432

FORM PCT/DO/EO/903 (371 Acceptance Notice)

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/257,669

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	490
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	17 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1120

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/257,669	09/20/2011		980	713-2354 (22664)	17	1

CONFIRMATION NO. 9301

33712
LOWE, HAUPTMAN, HAM & BERNER, LLP (ITW)
1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314

FILING RECEIPT

OC000000050123162

Date Mailed: 10/27/2011

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Lars Schroder, Assens, DENMARK;

Assignment For Published Patent Application

AXA POWER APS, Odense N, DK

Power of Attorney: The patent practitioners associated with Customer Number 33712

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/IB2010/051189 03/18/2010

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
DENMARK PA 2009 00392 03/20/2009

If Required, Foreign Filing License Granted: 09/29/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/257,669**

Projected Publication Date: 02/02/2012

Non-Publication Request: No

Early Publication Request: No

Title

PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Preliminary Class

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)

CONFIRMATION NO. 9301

33712
LOWE, HAUPTMAN, HAM & BERNER, LLP (ITW)
1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314

PUBLICATION NOTICE

OC00000052355577

Title:PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Publication No.US-2012-0023985-A1
Publication Date:02/02/2012

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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PLUS Search Results for S/N 13257669, Searched Wed Mar 05 08:53:10 EST 2014

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3717953 99
20110093182 82
20120042685 99
3929628 82
4646966 82
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PLUS Search Results for S/N 13257669, Searched Wed Mar 05 08:53:06 EST 2014

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5540757 99
5958346 95
4274371 90
4781729 90
4891892 90
5318099 90
5547421 90
5740846 90
3640256 85
3929628 85
3929285 85
4049395 85
4060393 85
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Electronic Acknowledgement Receipt

EFS ID:	18837236
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	23-APR-2014
Filing Date:	20-SEP-2011
Time Stamp:	13:54:56
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	2014-04-23-IDS.pdf	612189 db0c3f496c29a29c414d7cf89fb0252895aef40f	no	4

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2	Foreign Reference	JPH03273927A.pdf	369822 ca08abebdad05b72c7331359339af6c349b80fe2	no	6
Warnings:					
Information:					
3	Foreign Reference	JPH08156580A.pdf	540062 f28c72cd75d7994828675efffcf7b82403fb47a2	no	25
Warnings:					
Information:					
			Total Files Size (in bytes):	1522073	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1	03-273927	JP	A	1991-12-05	TOSHIBA CORP		☐
	2	08-156580	JP	A	1996-06-18	MATSUSHITA ELECTRIC IND CO LTD		☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13257669
	Filing Date	2011-09-20
	First Named Inventor	Soren Risgaard DAHL
	Art Unit	
	Examiner Name	
	Attorney Docket Number	713-2354 (22664)

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2014-04-23
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

CPC- SEARCHED		
Symbol	Date	Examiner
b64f1/362; g05d	3/10/2014	htc
g05d23/19	3/10/2014	htc
y02t50/82	3/10/2014	htc

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	228.4		

SEARCH NOTES		
Search Notes	Date	Examiner
Plus and claims search. Inventor and continuity search. East searches for US and foreign patents. NPL searches for variable speed drives.	3/10/2014	htc

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/08/2014								
	1	-								
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	29	✓								

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BIB DATA SHEET

CONFIRMATION NO. 9301

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/257,669	09/20/2011	062	3744	713-2354 (22664)

APPLICANTS

INVENTORS

Soren Risgaard Dahl, Odense SV, DENMARK;
Bo Vork Nielsen, Morud, DENMARK;
Henrik Olsson, Odense SV, DENMARK;
Lars Schroder, Assens, DENMARK;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/IB2010/051189 03/18/2010

**** FOREIGN APPLICATIONS ***************************

DENMARK PA 2009 00392 03/20/2009

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

09/29/2011

Foreign Priority claimed	☑ Yes ☐ No	☐ Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☑ Yes ☐ No		DENMARK	9	17	1
Verified and Acknowledged	/HENRY T CRENSHAW/ Examiner's Signature	Initials				

ADDRESS

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314
UNITED STATES

TITLE

PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

FILING FEE RECEIVED		
980	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

Notice of References Cited	Application/Control No. 13/257,669	Applicant(s)/Patent Under Reexamination DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,272,967 A	06-1981	White et al.	62/236
*	B	US-4,514,991 A	05-1985	Zinsmeyer, Thomas M.	62/209
*	C	US-5,107,685 A	04-1992	Kobayashi, Takehiro	62/115
*	D	US-6,446,447 B1	09-2002	Goth et al.	62/176.1
*	E	US-6,600,278 B1	07-2003	Bretzius, Jonathan	318/34
*	F	US-6,751,979 B2	06-2004	Leathers, Thomas M.	62/401
*	G	US-2006/0086124 A1	04-2006	Sellers, Gerald	062/298
*	H	US-2007/0035263 A1	02-2007	Rastogi et al.	318/432
*	I	US-2008/0141703 A1	06-2008	Bean, Jr., John H.	62/434
*	J	US-2008/0314064 A1	12-2008	Al-Eidan, Abdullah A.	62/324.6
*	K	US-2009/0084120 A1	04-2009	Meier et al.	62/129
*	L	US-2010/0031676 A1	02-2010	Urbain, Claudy Christian	62/89
*	M	US-7,685,838 B2	03-2010	Hutton, Neil	62/434

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	“Understanding of Variable Speed Drives (Part 2)” , 1999, Solomon S. Turkel, Electrical Construction and Maintenance
,	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 05/09/2014

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	
ART UNIT	**PAPER NUMBER**
3744	

NOTIFICATION DATE	DELIVERY MODE
05/09/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Office Action Summary	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *9/20/2011*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-29* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *13-29* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *9/20/2011* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *9/20/2011*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

OBJECTIONS

Arrangement of the Specification

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.

(b) CROSS-REFERENCE TO RELATED APPLICATIONS.

(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.

(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.

(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC OR AS A TEXT FILE VIA THE OFFICE ELECTRONIC FILING SYSTEM (EFS-WEB).

(f) STATEMENT REGARDING PRIOR DISCLOSURES BY THE INVENTOR OR A JOINT INVENTOR.

(g) BACKGROUND OF THE INVENTION.

(1) Field of the Invention.

(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.

(h) BRIEF SUMMARY OF THE INVENTION.

(i) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).

(j) DETAILED DESCRIPTION OF THE INVENTION.

(k) CLAIM OR CLAIMS (commencing on a separate sheet).

(l) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).

(m) SEQUENCE LISTING. (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document either on compact disc or as a text file via the Office electronic filing system (EFS-Web.)

Claim Objections

Claims 23 and 28 are objected to because of the following informalities.

Appropriate correction is required.

Claim 23

"The" at the end of line 2 should not be capitalized.

Claim 28

"A" at the end of line 1 should not be capitalized.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 20 is rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, there is no information on how to build a variable frequency driver that keeps the ratio between the output voltage and the frequency substantially constant throughout the over the entire output frequency range, with a resultant “high torque”. (see subsequent 112 rejection of this claim)

The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13-29 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 13

It is unclear if the vfd for the compressor is to be included in the vfds of the plurality of refrigeration systems.

Claim 17

It is unclear if the “controller” is meant to be a “controller” different from the “central controller” of claim 13, since they are both performing the same function.

Claim 18

“the frequency of the mains supply of the preconditioned air unit” is unclear, but the office assumes it to mean the 50hz or 60hz power supplied by the electric distribution grids in Europe and the US, respectively.

Claim 20.

Recites "variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The meaning of "high motor torque is unclear." The term is a relative term which renders the claim indefinite. The term is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Does the torque remain at the same "high" torque throughout the frequency range?

Claim 21

There is no antecedent basis for "voltage frequency divider".

Claim 22

Recites a preconditioned air unit . . . . ., wherein the central controller has a power sharing control input for control of air unit power consumption. It is unclear if "air unit" means the same thing as "preconditioned air unit".

Claim 23

Recites "wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit to at least one of . . ." which is unclear. Should this read "air unit according to at least one of"?

Claims dependent upon those listed above are likewise rejected for incorporating the deficiencies of the parent claims.

Claim Rejections - 35 USC § 103

1. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of pre-AIA 35 U.S.C. 103(c) and potential pre-AIA 35 U.S.C. 102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. 103(a).

Claims 13, 14, 15, 16, 17, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi.

Claim 13.

Urbain teaches

A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground (abstract),

the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet (5) for ambient air and an air outlet (7) for connection to the parked aircraft (Abstract, Fig. 1),

a blower (10) connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20)

at least one compressor, (17, Fig. 4)

at least one condenser, (18)

at least one expansion valve, (20)

at least one evaporator connected in a flow circuit containing a refrigerant, (12)

wherein the at least one evaporator interacts with the air flow in the flow duct (Fig. 1),

Kobayashi teaches:

and at least one variable frequency driver for power supply of the at least one compressor **(inverter that inverts commercial power into a variable-frequency AC - abstract)**

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems. (Kobayashi abstract, Urbain, par. 92)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

Claim 14 and 15

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan (21) positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems. (Fig. 4). Urbain does not teach that the condenser fan has a vfd.

However, it would have been obvious to one of ordinary skill in the art, at the time

of the invention, to modify Urbain to include such a feature, in view of Urbain's teachings that the evaporator fan/blower can be variable speed, the motivation being to provide greater control over the operation of the condenser according to the heat loss needs of the system.

Claim 16.

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower. (par. 49)

Claim 17. (see claim 1 and 112 rejection)

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

Claim 23.

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit to at least one of: The selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit. (par. 38).

Claim 28.

Urbain as modified teaches a preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker. (par. 100-105)

Claim 29.

Urbain as modified teaches a preconditioned air unit according to claim 13, further comprising a heater in the flow duct. (par. 35)

Claim 16 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 20080314064 to Al-Eidan.

Claim 16.

Urbain as modified a preconditioned air unit according to claim 13 including a housing and the use of inverters (i.e., variable frequency driver).

Al-Eidan teaches, a variable speed counter rotating condenser blower.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Al-Eidan, the motivation being to utilize a condenser fan arrangement that can provide variable airflow and is more efficient (Al-Eidan par. 76).

Claims 18 and 19 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 4514991 to Zinsmeyer.

Claim 18.

Urbain teaches a preconditioned air unit according to claim 17.

Typical mains supply is widely known as 50 Hz for Europe and 60 Hz for US.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Zinsmeyer for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit, the motivation being to provide the system with the ability to respond to a wider range of system demands.

Claim 19.

Urbain teaches a preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller. (par. 19)

Claim 20 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of "Understanding of Variable Speed Drives (Part 2)" (hereafter VSD Part 2")

Claim 20.

Urbain teaches a preconditioned air unit according to claim 13.

VSD Part 2 teaches that "Actually, torque can be thought of as "OOUMPH". The motor has to develop enough "OOUMPH" to get the load moving and keep it moving under all the conditions that may apply."

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of VSD 2, to provide at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range, the motivation being to provide the torque needed to start and move the load throughout the entire frequency operating range.

Claim 21 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 20070035263 to Rastogi.

Claim 21.

Urbain teaches a preconditioned air unit according to claim 17.

Rastogi teaches wherein the central controller (12) is connected to at least one controller (16) of the at least one voltage frequency driver (par. 2).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Rastogi, the motivation being to facilitate placement of two local vfd drives in the event the system needs more power than can be delivered by one drive. (see Rastogi par. 6).

Claim 22 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kabayashi and further in view of US 7685838 to Hutton.

Claim 22.

Urbain teaches as modified teaches a preconditioned air unit according to claim 13 including a central controller.

Hutton teaches that the power demands of the air conditioner can impact the power available for other uses at peak demands, such as interior lights and auto-leveling of the aircraft. (col. 1, 60 to col. 2, 5). A thermal storage unit is used to offset some of the cooling power needed by the AC system during peak demand, so that energy consumption by the AC unit can be reduced. (col. 12, 15-30.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Hutton, so that the AC will use less power so

such power can shared with other devices, the motivation being to allow more power to go to the interior lights and auto leveling devices.

Claims 24 and 25 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 6446447 to Goth.

Claims 24 and 25.

Urbain as modified teaches a preconditioned air unit according to claim 13.

Goth teaches redundant refrigeration systems to ensure continued cooling in the event one of the systems fails (see Goth claim 20). A local controller refrigeration system controller notifies a main/cage controller of a failure in the local system *(the failing refrigeration system transmits a failure signal to the central controller) s*o that the main/cage controller can switch operation to the other refrigeration system *(controller . . . automatically adjust the required amount of cooling among the remaining . . . remaining systems . . . . in response to the failure signal.)*

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Goth, the motivation being to provide automatic system back-up so as to preserve the comfort of passengers in the even one of the AC systems fails.

Claims 26 and 27 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 6600278 to Bretzius.

Claims 26 and 27

Urbain as modified teaches a preconditioned air unit according to claim 13. Bretzius teaches a variable frequency drive with a 12 pulse rectifier. (col. 3, 10-25).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Bretzius, the motivation being to provide a means for converting AC to DC and to provide rectification that cancels many of the characteristic harmonics a six-pulse bridges produce.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY CRENSHAW whose telephone number is (571)270-1550. The examiner can normally be reached on Monday-Friday 8:30am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Alexandra Elve can be reached on (571) 272-1173. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/HENRY CRENSHAW/
Examiner, Art Unit 3744

/M. Alexandra Elve/
Supervisory Patent Examiner, Art Unit 3744

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 09:47
L3	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:01
L4	1899	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:45
L5	120	l4 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:49
L6	0	yd2t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
L7	334	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S1	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:21
S2	7	"2010031676".pn.	US-PGPUB;	OR	ON	2014/03/04

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			15:25
S3	1	(12/301357).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/04 15:26
S4	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:22
S5	110	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:26
S6	28	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:28
S7	86	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:30
S8	43	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:32
S9	0	(scroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:33
S10	8	(schroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:34
S11	14	("20080250903" | "20100031676" | "4272967" | "5107685").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:08
S12	0	62/228.4.ccls. and b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:24
S13	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:10
S14	3	S13 and (vfd or inverter or (variable adj speed))	US-PGPUB; USPAT;	OR	ON	2014/03/04 18:11

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S15	4	"4272967".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:12
S16	386	(variable adj speed) near5 condenser near5 (fan or blower)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:44
S17	8	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/04 19:45
S18	0	S16 and S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:45
S19	0	S13 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:46
S20	601771	inverter ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S21	609	inverter near5 ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S22	306	(inverter near5 ("60" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:39
S23	40	(inverter near5 ("60" adj hz) near5	US-PGPUB;	OR	ON	2014/03/05

		("50" adj hz)) and (motor or compressor)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			08:41
S24	0	wo2007061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S25	0	wo20070061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S26	2	"7461516".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 09:00
S27	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 09:13
S28	1	(12/741437).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/05 09:35
S29	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:42
S30	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S31	28	S30 and (range near5 (hz or hertz))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2014/03/05 10:44

			IBM_TDB			
S32	3153	(output near3 voltage) near10 frequency near10 ratio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S33	1	S30 and "l24"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S34	9	S30 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:16
S35	11	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$ or US-20080314064-$ or US-20030168862-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/07 14:57
S36	9	S35 and controller	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 14:57
S37	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S38	871	S37 near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S39	4931033	(main or central or system) near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S40	372	S38 and S39	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2014/03/07 15:08

			EPO; JPO; DERWENT; IBM_TDB			
S41	30143	(independent or separate or redundant or backup) near20 (system or compressor or generator) near20 (fail$4 or malfunction)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:24
S42	143400	"62"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S43	277	S41 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S44	122	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 14:58
S45	47	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or	US-PGPUB; USPAT	OR	OFF	2014/03/08 14:58

		("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.				
S46	50	(("3640256") or ("3929285") or ("3929628") or ("4049395") or ("4060393") or ("4249655") or ("4259970") or ("4272499") or ("4274371") or ("4281522") or ("4296809") or ("4299285") or ("4300447") or ("4313499") or ("4343348") or ("4347708") or ("4357860") or ("4399742") or ("4442817") or ("4463022") or ("4519324") or ("4526090") or ("4539793") or ("4543677") or ("4554933") or ("4612096") or ("4615176") or ("4621504") or ("4764348") or ("4775627") or ("4781729") or ("4786301") or ("4829885") or ("4838345") or ("4842620") or ("4860642") or ("4866839") or ("4872397") or ("4884366") or ("4891892") or ("4921604") or ("4955372") or ("4967769") or ("5001346") or ("5015365") or ("5318099") or ("5540757") or ("5547421") or ("5740846") or ("5958346")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 15:04
S47	0	("(12-pulseor18-pulseor24-pulse)near10rectifier").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 16:07
S48	322	(12-pulse or 18-pulse or 24-pulse) near10 rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:07
S49	10	S48 and ((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2014/03/08 16:09

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(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL et al.
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4272967	A1	1981-06-16	WHITE et al.	
	2	5107685	A	1992-04-28	KOBAYASHI et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100031676	A1	2010-02-11	URBAIN	
	2	20080250903	A1	2008-10-16	HSIEH	

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	1	0431563	EP	A2	1991-06-12	KABUSHIKI KAISHA TOSHIBA	Corresponds to US Patent No. 5107685 A	☒

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.C

Receipt date: 09/20/2011	Application Number	13257669 - GAU: 3744
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2011-09-20
	First Named Inventor	Soren Risgaard DAHL et al.
	Art Unit	
	Examiner Name	
	Attorney Docket Number	713-2354 (22664)

	2	2150278	GB	A	1985-06-26	TELEDYNE INDUSTRIES INC.		☒
	3	10257796	JP	A	1998-09-25	MITSUBISHI ELECTRIC CORP		☒
	4	2007135103	WO	A2	2007-11-29	LEBRUN-NIMY EN ABREGE LEBRUN SA	Corresponds to US Publication No. 2010031676 A1	☒
	5	2007061622	WO	A1	2007-05-31	ILLINOIS TOOL WORKS INC.	Corresponds to US Publication No. 2008250803 A1	☒

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	1	Search Report results for Danish Patent Application No. PA 2009 00392 dated November 3, 2009	☒
	2	ISR for PCT/IB2010/051189 dated January 11, 2011	☒

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Examiner Signature	/Henry Crenshaw/	Date Considered	03/08/2014

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.C

Receipt date: 09/20/2011	Application Number	13257669 - GAU: 3744
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)	Filing Date	2011-09-20
	First Named Inventor	Soren Risgaard DAHL et al.
	Art Unit	
	Examiner Name	
	Attorney Docket Number	713-2354 (22664)

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2011-09-20
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

Courtesy Reminder for
Application Serial No: 13/257,669

Attorney Docket No: 713-2354 (22664)
Customer Number: 33712
Date of Electronic Notification: 05/09/2014

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (previously presented) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
a plurality of refrigeration systems, each of which includes
at least one compressor,
at least one condenser,
at least one expansion valve,
at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the
at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of the at least one compressor, and
a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condensor fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

Dabico
Exhibit 1002
Page 212

16. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (previously presented) A preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (currently amended) A preconditioned air unit according to claim 17, wherein the central controller is connected to at least one controller of ~~the~~ at least one voltage frequency driver.

22. (currently amended) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of **the preconditioned** air unit power consumption.

23. (currently amended) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit **according**

to at least one of: **[[The]]** **the** selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (currently amended) A preconditioned air unit according to claim 13, further comprising at least one of: ~~**A user**~~ **a user** interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

AMENDMENTS TO THE SPECIFICATION

- Please replace the specification with the attached substitute specification. A track-changes version is submitted with this paper showing the changes made.

Dabico
Exhibit 1002
Page 215

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
	:	
Soren Risgaard DAHL et al.	:	Confirmation No. 3744
	:	
U.S. Patent Application No. 13/257,669	:	Group: 3744
	:	
Filed: September 20, 2011	:	Examiner: Henry T. CRENSHAW

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action of May 9, 2014, Applicant submits the following:

REMARKS

In response to the Office Action mailed May 9, 2014, Applicant respectfully requests reconsideration. Based upon the above Amendment and following Remarks, Applicant respectfully requests that all outstanding objections and rejections be reconsidered, and that they be withdrawn.

Specification Objections

The specification is objected to. In response, Applicant has amended the specification as seen above. Reconsideration is requested.

Claim Objections

Claims 23 and 28 are objected to as containing informalities. In response, in order to advance prosecution, and without prejudice or disclaimer, Applicant hereby amends claims 23 and 28 as seen above, and requests reconsideration in view of the amendments.

Claim Rejection Under §112, First Paragraph

The Office Action has rejected claim 20 under 35 U.S.C. §112, first paragraph, as allegedly not being enabled. In response, Applicant traverses this rejection.

Specifically, the Examiner asserts the following: there is no enablement to

> make and/or use the invention. Specifically, there is no information on how to build a variable frequency driver that keeps the ratio between the output voltage and the frequency substantially constant throughout the over the entire output frequency range, with a resultant "high torque". (see subsequent 112 rejection of this claim)

(Office Action, page 4, bottom.)

Enabling support is not limited to the four corners of the specification and is not measured by the perceptions of an individual examiner. Rather, the standard is that of the ordinarily skilled artisan, and the source of enabling information includes that which the skilled artisan presumably knows. That is, the correct test for enablement is whether the skilled person could make and use the claimed invention "from the disclosures in the [application, including the specification and drawings,] coupled with information known in the art without undue experimentation." *United States v. Telectronics*, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) (emphasis added); *see* MPEP §2164.01. The need for the skilled artisan to conduct experimentation *per se* is not necessarily problematic. The test of enablement is not whether any experimentation is needed. Rather, if experimentation is necessary, the test is whether the amount of experimentation is undue. MPEP §2164.01 (citation omitted). The fact that experimentation may be complex does not necessarily make it undue if the art typically engages in such experimentation. MPEP §2164.01 (citation omitted).

In order to make a proper rejection for lack of enablement, an examiner has the initial burden to establish a reasonable basis to question enablement. (MPEP §2164.04.) It has long been the rule that an examiner must provide a reasonable explanation as to why the scope of protection provided by a claim is not adequately enabled. *In re Wright*, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). Here, however, the Office Action does not articulate any rationale as to why the skilled artisan would have suffered an undue amount of experimentation to make the recited variable frequency driver of claim 20. Rather, the Office Action broadly asserts that the disclosure is lacking information as to how to build the driver of claim 20, and then jumps to an

unsupported conclusion that there is lack of enablement It is respectfully submitted that the statements in the Office Action do not satisfy the requisite burden.

In summary, Applicant respectfully submits that the Office Action is applying an incorrect standard for enablement. It is further respectfully submitted that the skilled artisan – given the present application (including the specification and drawings) – would have been able to make the recited driver of claim 20. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

Claim Rejection Under §112, Second Paragraph

The Office Action has rejected claims 13-29 are rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failure to particularly point out and distinctly claim the subject matter which application regards as the invention. In response, Applicant points to the above-proffered amendments to the claims, and respectfully requests reconsideration in view of these amendments with respect to the pertinent claims.

Applicant hereby traverses the rejections of the non-amended claims for the reasons that follow:

With respect to claim 13, it is clear that the respective vfd for the compressors correspond to the vfds of the plurality of refrigeration systems. Each refrigeration system includes a vfd for the compressor, thus the plurality of refrigeration systems have respective vfds.

With respect to claim 17, the controller of claim 17 can be the same as the central controller or it can be a different controller. As long as there is a controller, the claim requirements are met.

With respect to claim 18, whatever the frequency of the mains supply is for a given unit, that is the frequency of the mains supply. If the unit has a controller configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply, whatever that is, of the preconditioned air unit, then it falls within the scope of claim 18. If not, then it does not fall within the scope of claim 18.

With respect to claim 20, Applicant relies on MPEP 2173.05(B), entitled "Relative Terminology," which specifically states that the "fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite." No cases are cited in the MPEP where the term "high motor torque" was held to render a claim indefinite.

Moreover, there are at least 135 issued U.S. patents with claims that recite "high motor torque," consistent with the fact that relative terminology is permitted.

Thus, because there is no basis other than a conclusory assertion based on the perceptions of an individual examiner for rejecting claim 20 as indefinite, and the very language asserted to render the claim indefinite present in 135 issued U.S. patents, and thus presumptively acceptable, a case of indefiniteness against claim 20 has not been established.

Claim Rejections Under 35 U.S.C. §103

The Office Action has rejected claims 13-17, 23, 28 and 29 as obvious under 35 U.S.C. 103 in view of U.S. Patent Application Publication No. 20100031676 to Urbain in view of U.S. Patent No. 5,107,785 to Kobayashi. In response, Applicant traverses the rejections for at least the reasons that follow.

Claim 13 recites a ***plurality*** of refrigeration systems, ***each of which includes***:

1) at least one compressor,
2) at least one condenser,
3) at least one expansion valve,

4) at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
5) at least one variable frequency driver for power supply of the at least one compressor.

(Claim 13, enumeration added.) That is, "each" refrigeration system includes these five elements. Thus, if there are three refrigeration systems, there are three of each element.

The Office Action asserts that Urbain teaches a plurality of refrigeration systems based on the disclosure of Urbain of three circuits 19:

> a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20)

(PDF Snapshot of Office Action, page 8, bottom.) Yet the circuits 19 of Urbain do not ***each*** have a compressor, a condenser, at least one evaporator. Instead, Urbain discloses that all three circuits 19 share those elements.

To be clear, below is a PDF snapshot of the asserted components of Urbain:

> at least one compressor, (17, Fig. 4)
>
> at least one condenser, (18)
>
> Application/Control Number: 13/257,669 Page
> Art Unit: 3744
>
> at least one expansion valve, (20)
>
> at least one evaporator connected in a flow circuit containing a refrigerant, (12)

(PDF snapshot of Office Action, pages 8-9.) Below is a reproduction of FIG. 4 of Urbain, depicting elements 17, 18, and FIG. 2 of Urbaindepicting element 12:

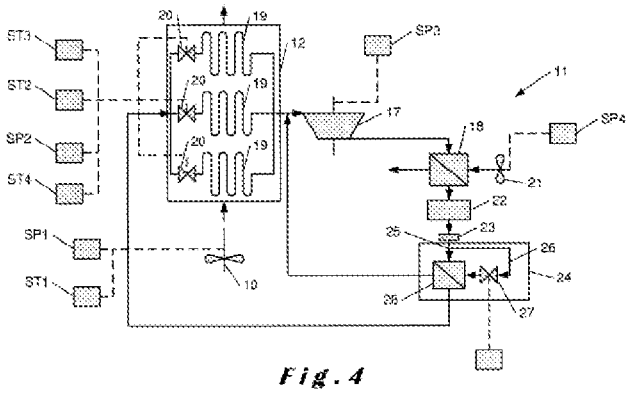


Fig. 4

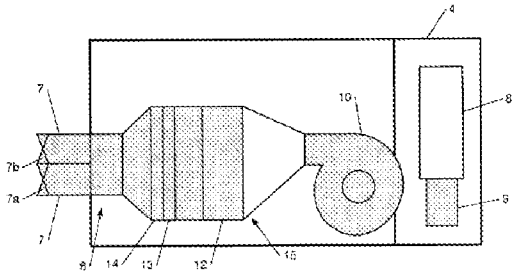


Fig. 2

FIGs. 4 and 2 of Urbain

As can be seen, for the three circuits 19, there is only one compressor 17 and one condenser 18. FIG. 2 only depicts one evaporator 12.

Accordingly, because the scope and content of the prior art has been misapprehended, all of the *Graham v. John Deere* factors have not been met, and, therefore, a *prima facie* case of obviousness has not been established for at least this reason, but there is more.

The Office Action correctly recognizes that Urbain teaches neither at least one variable frequency driver for power supply of the at least one compressor nor a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems. The Office Action turns to Kobayashi, and asserts that Kobayashi can remedy the deficiencies of Urbain. (Office Action, page 9, upper-middle.) However, the rationale to modify Urbain is not sufficient to establish a *prima facie* case of obviousness.

Specifically, the Office Action asserts that:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(Office Action, page 9, middle.) Yet there is no evidence or rationale that such would have been seen by the person of ordinary skill in the art as enabling adjustment of compressor operation without the need of an unloader valve. In this regard, the rationale to modify Urbain is illusory.

Applicant hereby notes that the record is devoid of any evidence that the device of Urbain needs an unloader valve, and that the proffered modification would eliminate such if such was needed, or even that such a modification would not have a deleterious effect on the performance of Urbain. It appears that the Office Action relies on common knowledge in the art, as is discussed and permitted in MPEP § 2144.03, regarding the alleged predictability. This means that the Office Action is taking *official notice* of certain facts allegedly known to the ordinary artisan. However, there are explicit guidelines that must be followed when taking official notice. The "technical line of reasoning underlying a decision to take such notice must be clear and unmistakable." (MPEP § 2144.03(B).) These guidelines are not followed in the Office Action. Indeed, consider the title of § 2144.03(B): "If Official Notice Is Taken of a Fact, Unsupported by Documentary Evidence, the Technical Line of Reasoning Underlying a Decision To Take Such Notice Must Be Clear and Unmistakable." No technical line of reasoning is proffered whatsoever. Thus, a case of obviousness has not been established in this regard.

Further, Applicant notes that § 2144.03(C) allows an applicant to traverse such an assertion. Specifically, § 2144.03(C) is entitled "If Applicant Challenges a Factual Assertion as Not Properly Officially Noticed or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding With Adequate Evidence." That section states that when an applicant traverses the assertion, "the examiner must provide documentary evidence in the next Office Action if the rejection is to be maintained." (MPEP § 2144.03(C).) Absent a citation by the PTO of a reference that can be evaluated for all its teachings, Applicant hereby traverse the assertion that it would have been common knowledge in the art that the device of Urbain needs an unloader valve, and that the proffered modification would eliminate such if such was needed,

and that such a modification would not have a deleterious effect on the performance of Urbain. **Applicant thus request, relying on § 2144.03, that the PTO cite a reference and exactly identify where such a reference teaches the alleged knowledge in the art, or else allow the claims**.

* * * * *

Additionally, the components used in Kobayashi alleged to be obvious to incorporate into Urbain are used for invention of commercial power into a variable-frequency AC. (Kobayashi, Abstract.) However, Urbain uses an on-board diesel generator, consistent with the fact that it is a portable and mobile air-conditioning unit. (Urbain,

> **[0049]** The unit **1** also comprises, inside the body **4**, a diesel engine **8** coupled to an electrical generator **9** in order to provide the supply of electricity to the various elements of the unit **1**, a variable-speed centrifugal fan **10** to distribute air to the aircraft, a refrigerant circuit **11** (depicted in FIG. **4**) with an exchanger/evaporator **12** for cooling the air, electric heating means **13** with a plurality of electric elements, and a complementary heat exchanger **14** connected to the cooling circuit of the diesel engine **8**.

(Urbain, paragraph 0049.) Thus, there is no need for the components of Kobayashi in Urbain. This is no trivial matter, as Urbain is used to provide air-conditioning to parked aircraft on tarmacs remote from power sources.

Thus, claim 13 is not obvious for this additional reason.

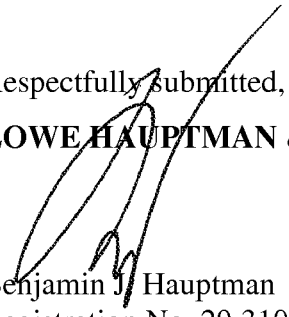
In summary, no claim is obvious because claim 13 is not obvious. Withdrawal of all rejections is warranted.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & HAM, LLP



Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111 BJH:MJC/tal
Facsimile: (703) 518-5499
Date: August 11, 2014

RELATED APPLICATIONS

The present application is national phase of PCT/IB2010/051189 filed on March 18, 2010 and claims priority from Danish Application Number PA 2009 00392 filed March 20, 2009.

BACKGROUND

[0001] The present invention related to a preconditioned air unit supplying preconditioned air, i.e. heated air or cooled air, to an aircraft parked on the ground.

[0002] On the ground, an aircraft typically uses the auxiliary power unit engine (APU) to drive air-conditioning equipment to cool or heat the aircraft cabin to a temperature that is comfortable for passengers. However, operation of the APU has a high cost in terms of jet fuel consumption, generated acoustic noise, CO.sub.2 emissions, etc. For example, the APU of an A320 aircraft consumes app. 160 l fuel per hour. In addition to the general air pollution, the consumption of one litre of jet fuel leads to emission of 2.5 kg CO.sub.2 into the atmosphere and thus, the APU emits app. 400 kg CO.sub.2 per operational hour.

[0003] In order to avoid running the APU on the ground, preconditioned air units have been provided for supplying the required preconditioned air to the parked aircraft. The preconditioned air units are powered from the mains supply made available at the airport in question.

[0004] Cost, efficiency, flexibility, and serviceability remain an issue in known preconditioned air units.

SUMMARY OF THE INVENTION

[0005] A new preconditioned air unit is provided for supplying preconditioned air to an aircraft parked on the ground. The new preconditioned air unit has a housing with walls defining a flow duct with an air inlet for intake of ambient air to be conditioned to a low temperature, typically a temperature in the range from -5.degree. C. to +5.degree. C., and an air outlet for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. To prevent cooling losses, the outer walls of the flow duct may be provided with a layer of heat insulation material.

[0006] The preconditioned air unit further comprises a blower accommodated in the housing and connected with the flow duct for generation of an air flow from the air inlet toward the air outlet. The blower is preferably a highly efficient centrifugal fan. The blower is preferably mounted with vibration dampers and attached with flexible connections to the flow duct.

[0007] The new preconditioned air unit further comprises at least one refrigeration system, each of

which comprises at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a refrigerant flow circuit containing a refrigerant.

[0008] At least one compressor of the at least one refrigeration system may be powered from a variable frequency driver. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the maximum capacity of the compressor is determined by the frequency of the mains supply. Advantageously, the output voltage and frequency of the variable frequency driver in the new preconditioned air unit are varied to control the at least one compressor in accordance with the current cooling requirement. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. In this way, each of the at least one refrigeration systems may operate continuously, i.e. the output voltage and frequency of the variable frequency driver may be adjusted to levels required by the at least one compressor in order for it to cool the airflow interacting with the respective at least one evaporator in accordance with a control setting. This increases the life time and decreases power consumption of the at least one refrigeration system as compared to conventional on/off control.

[0009] Further, the maximum capacity of a compressor driven by a variable frequency driver may be increased as compared to the same compressor supplied directly from the mains supply. For example, supplying a compressor with a supply voltage with a 75 Hz output frequency increases the cooling capacity of the compressor by 50% over the same compressor supplied directly from the mains supply in Europe.

[0010] Preferably, the controller of the variable frequency driver (in the following denoted "VFD-controller") is capable of controlling the variable frequency driver to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rating of the compressor whereby the one or more compressors supplied from the variable frequency driver may be controlled for provision of variable cooling capacity, e.g. in response to the temperature and flow rate of the air flow in the flow duct.

[0011] A plurality of variable frequency drivers may be provided for power supply of respective compressors, e.g. each of the compressors may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective compressor.

[0012] Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more compressors.

[0013] The preconditioned air unit may further comprise at least one condenser fan for generation of a condenser airflow interacting with the at least one condenser of the at least one refrigeration system thereby increasing the heat removal capacity of the at least one condenser.

[0014] Each of the at least one condenser fan may be located in any suitable position in the housing for provision of a condenser air flow within the housing. Each of the at least one condenser fan may be

located adjacent an air outlet in the housing for generation of a condenser air flow out through the outlet, and each of the at least one condenser may be located adjacent an air inlet for interaction with the generated condenser airflow at ambient temperature. Obviously, the direction of the condenser air flow may be reversed although in this case the condenser air flow may be heated by internal components within the housing before interacting with the at least one condenser.

[0015] At least one of the at least one condenser fan may be powered from a variable frequency driver. In a conventional preconditioned air unit, the condenser fan is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA, and thus, the condenser fan performance is locked to the frequency of the mains supply. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the at least one condenser fan in accordance with the current operational requirements, such as current pressure within the at least one condenser, efficiency, etc. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the at least one condenser fan. A plurality of variable frequency drivers may be provided for power supply of respective condenser fans, e.g. each of the condenser fans may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective condenser fan by control of the condenser air flow rate generated by the condenser fan.

[0016] Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more condenser fans.

[0017] The preconditioned air unit may further comprise a variable frequency driver connected for electrical power supply of the blower. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the blower.

[0018] The new preconditioned air unit may comprise a main unit and one or more self-contained cooling modules mounted in the main unit. The main unit includes the housing having a plurality of compartments for receiving and holding the self-contained cooling modules. Each of the self-contained cooling modules comprises at least one of the at least one refrigeration systems.

[0019] Each of the at least one refrigeration system operates in accordance with well-known refrigerator principles and with a well-known refrigerant, such as R134a with low global warming potential.

[0020] The at least one evaporator of the at least one refrigeration system is mounted in the housing of

the preconditioned air unit for interaction with the airflow in the flow duct for cooling of the air flow. For example, a cooling surface of the at least one evaporator may be positioned inside the flow duct for direct contact across a large surface area with the airflow in the flow duct.

[0021] One or more VFD-controllers of the at least one refrigeration system may further perform data collection of parameter values sensed by sensors of the at least one refrigeration system, e.g. temperature sensors sensing temperatures in the airflow upstream and downstream of the at least one evaporator and of the at least one condenser, pressure sensors sensing the pressure of the refrigerant in the at least one refrigeration system, etc.

[0022] Preferably, the preconditioned air unit has a central controller that is configured for controlling the operation of the preconditioned air unit. The central controller may be connected to a user interface for reception of user commands from a user and for outputting messages to the user. The preconditioned air unit may comprise at least one of the following: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, a loudspeaker, etc. For example, one of the primary user entries specifies the type of aircraft to be supplied by the preconditioned air unit. This information may be entered using entry keys of the user panel, or, using a remote control from the passenger boarding bridge, or, may be transmitted from the building management system of the airport, etc.

[0023] The central controller may further be connected with some or all of the VFD-controllers of the preconditioned air unit for individual control of the VFD-controllers. For example, if the preconditioned air unit comprises a plurality of refrigeration systems, the central controller may output an individual temperature setting to the VFD-controllers of each of the refrigeration systems, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective at least one compressor to adjust the temperature of the airflow having interacted with the corresponding at least one evaporator as required.

[0024] Further, each of the refrigeration systems may be configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing cooling refrigeration system may transmit a failure signal to the central controller and may shut down if required. In response to the failure signal, the central controller may operate to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the preconditioned air unit.

[0025] The central controller may be interfaced with some or all of the VFD-controllers and possibly other controlled devices, such as an SCR module controlling a heater in the flow duct, with a data and control bus, such as the CAN bus.

[0026] The preconditioned air unit may further have a rectifier connected to the mains supply input of the preconditioned air unit for generation of a power DC voltage supply for supplying the variable frequency drivers.

[0027] In order to suppress distortion and pollution of the mains supply, the rectifier circuit may comprise a 12-pulse rectifier, or a 18-pulse rectifier, or a 24-pulse rectifier, etc.

[0028] The preconditioned air unit may share a mains power outlet with other equipment at the parked aircraft, such as, a ground power unit, a cable coil, vehicle chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit may comprise a power sharing control input for control of preconditioned air unit power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit when the ground power unit draws a high supply current. The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, again, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit.

[0029] The preconditioned air unit may be mounted underneath or on top of a passenger boarding bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit may be provided with pedestal legs for flexibility in preconditioned air unit location at an apron or in a hangar.

[0030] A plurality of the new preconditioned air units may be interconnected for supplying preconditioned air to a parked aircraft in cooperation. Two of the new preconditioned air units may for example be coupled in parallel in a master-slave configuration wherein the outputs of each of the preconditioned air units supply a common hose that is connected to the parked aircraft and possibly split at the aircraft into two or more hoses for supplying possible individual inputs of the aircraft for preconditioned air. The master may control the slave in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft. Other control principles may also be applied. For example, the CAN-bus of the cooperating preconditioned air units may be inter-connected for flexibility of control sharing between cooperating units.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

[0032] FIG. 1 shows a preconditioned air unit from above with the top removed,

[0033] FIG. 2 shows a preconditioned air unit in perspective with two self-contained cooling modules withdrawn from their respective compartments,

[0034] FIG. 3 shows a self-contained cooling module in perspective,

[0035] FIG. 4 illustrates handling of a self-contained cooling module with a fork lift truck,

[0036] FIG. 5 shows a preconditioned air unit in perspective ready for mounting,

[0037] FIG. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit,

[0038] FIG. 7 shows the user interface panel of the preconditioned air unit,

[0039] FIG. 8 shows another preconditioned air unit from above with the top removed, and

[0040] FIG. 9 shows two preconditioned air units coupled in parallel in a master-slave configuration.

DESCRIPTION

[0041] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0042] FIG. 1 shows a top view of an exemplified embodiment of the new preconditioned air unit 10 for supplying preconditioned air to an aircraft parked on the ground. The preconditioned air unit 10 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 16a, 16b, 18, besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters the flow duct 20 through an air inlet 22 in a side wall 24 of the housing 12. The flow duct 20 is folded inside the housing 12 so that walls 16a, 16b separate the flow duct into two parts with air flowing in opposite directions during operation of the preconditioned air unit 10. The side wall also has an air outlet 25 for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, and the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

[0043] A blower 30 is connected with the flow duct 20 for generation of the required air flow from the

air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

[0044] An optional heater 32 is mounted in the flow duct 20 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

[0045] As most clearly shown in FIG. 2, the illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective, identical self-contained cooling modules 36.

[0046] As shown in FIG. 3, each of the self-contained cooling modules 36 comprises a refrigeration system including a compressor 38, a condenser 40, an expansion valve 42, and an evaporator 44 connected in series in a refrigerant flow circuit containing a refrigerant selected in accordance with the expected high end ambient temperature of the airport in question, e.g. R134a selected for operation at high end ambient temperatures around 40.degree. C. The refrigerant flow circuit forms a closed and sealed loop. Each of the self-contained cooling modules 36 operates in accordance with well-known refrigerator principles.

[0047] Each of the self-contained cooling modules 36 can be installed in the housing 12 of the main unit without interfering with the refrigeration system of the module 36 so that assembly and possible disassembly of self-contained cooling modules 36 in the preconditioned air unit housing 12 can be performed by persons without specific skills in the field of refrigeration systems. The self-contained cooling modules 36 may be manufactured at one site particularly suitable for manufacturing of refrigeration systems for subsequent integration with housings 12 of the main unit at a separate site particularly suitable for manufacturing of airport ground equipment in general thereby increasing manufacturing flexibility and decreasing manufacturing cost of the preconditioned air unit 10. Further, the self-contained cooling module 36 may be stored as a spare part including the refrigerant, whereby repair of a preconditioned air unit without having to perform the cumbersome task of emptying the preconditioned air unit for refrigerant is made possible.

[0048] The power supply, control circuitry, and user interface of the preconditioned air unit 10 allows the preconditioned air unit 10 to operate with any number of self-contained cooling modules 36 installed, i.e. the illustrated preconditioned air unit 10 may operate with a single self-contained cooling module 36 installed in an arbitrarily selected compartment 34; or, with two self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or, with three self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or with four self-contained cooling modules 36 installed in respective compartments 34. In this way, a product line of preconditioned air units 10 is provided making four different preconditioned air units 10 available with different cooling capacities based on the same components. This lowers manufacturing cost by lowering purchase cost per component, and storage and handling cost both per component and per finished preconditioned air unit 10. Further, a preconditioned air unit 10 already in use in an airport with less

than four self-contained cooling modules 36 installed may be upgraded on site by installing one or more self-contained cooling modules 36 in empty compartments 34.

[0049] Preferably, the self-contained cooling modules 36 are removably installed in the housing 12 of the main unit facilitating separation of an installed self-contained cooling module from the housing 12, e.g. utilizing screws, nuts and bolts for fastening each of the self-contained cooling modules 36 to the housing 12 and utilizing electrical connectors (not shown) to establish the required electrical interconnections between the cooling module and the housing 12 when the cooling module 36 is inserted in the housing 12 of the main unit 10.

[0050] FIG. 2 shows in perspective the preconditioned air unit of FIG. 1 with two self-contained cooling modules 36 withdrawn from the housing 12 of the main unit 10. FIG. 5 shows in perspective the preconditioned air unit of FIGS. 1 and 2 with the two self-contained cooling modules 36 inserted and installed in the housing 12 of the main unit 10.

[0051] The removability of the modules 36 enhances the serviceability of the preconditioned air unit 10 since a possible malfunctioning self-contained cooling module can be separated from the housing 12 of the main unit 10 and replaced with a functioning module 36 with a minimum of down time of the preconditioned air unit 10. One cooling module 36 can be replaced in approximately 20 minutes. In the event that a functioning cooling module 36 is not available for substitution of the malfunctioning cooling module 36, the preconditioned air unit 10 will continue operation with the remaining cooling modules 36, i.e. the preconditioned air unit 10 remains fully operational, however with a lowered cooling capacity. Further, the malfunctioning module 36 can be moved for repair at a separate site particularly suitable for repair of refrigeration systems. Also, the possible requirement of dismounting and moving the entire preconditioned air unit for repair of a cooling circuit is hereby reduced. Preferably, the self-contained cooling module 36 has physical dimensions suitable for movement by a fork lift truck 47 as illustrated in FIG. 4 facilitating transportation of the module 36, e.g. for storage, assembly into a preconditioned air unit 10, and service. For example, a malfunctioning module 36 can be removed from the housing 12 with a fork lift truck 47 and a properly functioning module 36 can be installed in the housing 12 with a fork lift truck 47.

[0052] In the illustrated preconditioned air unit 10, the evaporator 44 of each self-contained cooling module 36 is positioned inside the flow duct 20 through a slot in the wall 14a, 14b, 14c, 14d when installed in the housing 12 of the main unit for optimum heat exchange with the air flow in the duct 20. The evaporator 44 has a large number of channels for passage of the air flow in the duct 20 providing a large surface of heat exchange between the air flow and the refrigerant flowing inside the evaporator 44 as is well-known in the art of refrigeration systems. The slots in the walls 14a, 14b, 14c, 14d are sealed when the respective self-contained cooling modules 36 are mounted in their operational positions in the compartments 34. In absence of a self-contained cooling module 36, the slot is sealed with a cover plate.

[0053] Cooling in multiple steps as provided by a plurality of self-contained cooling modules 36

efficiently condenses the air humidity and protects the last downstream evaporator 44 from freezing over. A stainless steel condensate pan (not shown) and integrated condensate pump (not shown) ensure that the condensation moisture is removed in a controlled way.

[0054] The cooling air leaves the illustrated preconditioned air unit through one or two 14'' hoses.

[0055] Each of the compressors 38 of the self-contained cooling modules 36 may be powered from a variable frequency driver 46 also located in the respective self-contained cooling module 36. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the capacity of the compressor is limited by the frequency of the mains supply. This limitation does not exist in the new preconditioned air unit 10. Advantageously, the variable frequency driver the VFD-controller is capable of varying the output voltage and frequency of the variable frequency driver 46 in order to control the compressor 38 in accordance with the current cooling requirement. In the illustrated preconditioned air unit, the variable frequency driver 46 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

[0056] The output voltage and frequency supplied by the variable frequency driver 46 is controlled by the VFD-controller in a way well-known in the art of variable frequency drivers. Preferably, the VFD-controller is capable of controlling the variable frequency driver 46 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the compressor 38 whereby each of the compressors 38 supplied from a respective variable frequency driver 46 may be controlled for provision of variable cooling capacity.

[0057] Each of the self-contained cooling modules has temperature sensors (39 in FIG. 6) in electrical connection with the VFD-controller of the module 36 and mounted for sensing temperatures in the air flow up-stream and down-stream of the evaporator 44 and transmitting the sensed temperature values to the VFD-controller, and the VFD-controller controls the cooling capacity of the compressor 38 in response to the sensed temperatures.

[0058] Each of the self-contained cooling modules 36 operates continuously, i.e. the output voltage and frequency of the variable frequency driver 46 are adjusted to levels required by the compressor 38 in order for it to cool the airflow having interacted with the evaporator 44 substantially to the temperature setting. This increases the life time and decreases power consumption of the cooling modules 36 as compared to on/off control of the compressors 38.

[0059] The preconditioned air unit 10 further comprises two condenser fans 48 mounted across apertures in the side wall 50 for generation of condenser airflow causing ambient air to enter the housing 12 through apertures in the self-contained cooling modules 36 covered by the condensers 40 as indicated by arrows 52a-52f for heat removal from the heat exchanging surfaces of the condensers 40.

[0060] The condenser fans 48 are powered from one variable frequency driver 54. Advantageously, the

VFD controller of the variable frequency driver 54 is capable of varying the output voltage and frequency of the variable frequency driver 54 in order to control the condenser fans 48 in accordance with the current operational requirements, such as current pressure within the condenser(s), efficiency, etc. Preferably, the variable frequency driver 54 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the condenser fans. The preconditioned air unit 10 further comprises a variable frequency driver 56 connected for electrical power supply of the blower 30. Advantageously, the VFD controller of the variable frequency driver 56 is capable of varying the output voltage and frequency of the variable frequency driver 56 in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver 56 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. Preferably, the controller of the variable frequency driver 56 is capable of controlling the variable frequency driver 56 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the blower whereby the blower 30 supplied from the variable frequency driver 56 may be controlled for provision of variable flow rate of the air flow in the flow duct 20, e.g. in response to a user control command, e.g. the type of aircraft.

[0061] The preconditioned air unit 10 has a central controller 60 that is configured for controlling the operation of the preconditioned air unit 10. The central controller 60 is connected with the user interface panel 58 for reception of user commands and for outputting messages to the user, e.g. on a display of the user interface panel 58, by a loudspeaker of the user interface, etc.

[0062] The central controller 60 is connected with all of the VFD-controllers of the preconditioned air unit 10 for individual control of the VFD-controllers. For example, the central controller outputs an individual temperature setting to each of the VFD-controllers of the preconditioned air unit 10, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective compressor 38 to adjust the temperature of the airflow having interacted with the corresponding evaporator 44 as required. Further, in the event that one of the installed self-contained cooling modules 36 fails, the failing cooling module transmits a failure signal to the central controller 60 and shuts down if required. In response to the failure signal, the central controller 60 operates to automatically adjust the required amount of cooling among the remaining properly operating self-contained cooling modules 36 of the preconditioned air unit 10.

[0063] FIG. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit 10.

[0064] The illustrated preconditioned air unit 10 has a 12-pulse rectifier 62 connected to a mains supply input 64 of the preconditioned air unit 10 for generation of a power DC voltage supply. Using variable frequency drivers may generate harmonic distortion of the mains input. To minimize distortion of the mains input, the three phases of the mains are transformed into six phases which are rectified in the

non-regulated 12-pulse full bridge rectifier 62. The combination of the 12-pulse rectifier 62, the related transformer 66 and the input filter 68 reduce harmonic feedback into the mains to a minimum. Further, the 12-pulse rectifier 62 includes soft start circuitry that limits the inrush current. Still further, utilization of the 12-pulse rectifier 62 results in a high input power factor, i.e. a power factor that is larger than 0.8; for example 0.96, which in turn results in a reduced input mains current.

[0065] The filtered power DC voltage supply is routed to each of the compartments 34 for power supply of each of the variable frequency drivers 46 of the self-contained modules 36 when installed in the respective compartments 34.

[0066] The filtered power DC voltage supply is further routed to variable frequency driver 56 for power supply of the blower 30 and to variable frequency driver 54 for power supply of the two condenser fans 48.

[0067] The central controller 60 is based on a micro-controller and a digital signal processor that cooperate to regulate, supervise and diagnose possible external and internal failures. In addition, each variable frequency driver 46, 54, 56 comprises a micro-controller to perform individual control of devices connected to the variable frequency driver in question. Further, the VFD-controller of each of the self-containing cooling modules 36 monitors the respective refrigeration system and decreases the cooling capacity or stops cooling if the refrigerant pressure is too low or too high.

[0068] The central controller 60 automatically adjusts the cooling performed by the preconditioned air unit 10 to the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, the outgoing airflow from the preconditioned air unit 10, etc.

[0069] The central controller 60 and the variable frequency drivers 46, 54, 56, and the SCR module 70 controlling the heater 32 are interfaced with a data and control bus, which in the illustrated example is the CAN bus.

[0070] The preconditioned air unit 10 may share a mains power outlet with other equipment at the parked aircraft, such as a ground power unit, a cable coil, vehicle battery chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit 10 comprises a power sharing control input (not shown) for control of preconditioned air unit 10 power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit 10 power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit 10 during high load ground power unit operation The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit 10. In general, lowering the cooling capacity for short periods of time does not seriously diminish

the overall performance of the preconditioned air unit 10.

[0071] FIG. 7 shows the user interface panel 58 of the preconditioned air unit 10. The user interface panel 58 includes an LCD display 72 viewable in all weather conditions and displaying all relevant operational data. The display provides information at different levels: In a default mode, the display shows the status of the preconditioned air unit 10, such as aircraft type, cabin temperature, etc. In an alarm mode, the display shows type of alarm and alarm history. In a setup mode, the display shows various parameters that may be adjusted.

[0072] The preconditioned air unit includes digital input/output ports, such as galvanic isolated RS485 port, TCP/IP Ethernet port, etc, for remote control of the preconditioned air unit 10 and monitoring including data dump for service tasks.

[0073] The preconditioned air unit 10 may be mounted underneath or on top of an apron drive bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit 10 may be provided with pedestal legs for flexibility in preconditioned air unit location for fixed bridge and hangar applications.

[0074] Other preconditioned air units may be provided within the scope of the appended claims. For example, other preconditioned air units may be provided that are not modular. Also, preconditioned air units may be provided with different numbers of refrigeration systems, such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., refrigeration systems.

[0075] In the example illustrated in FIGS. 1, 2, 4, 5, and 6, the refrigeration systems operate in a series. Other preconditioned air units may be provided with refrigeration systems operating in parallel; or with refrigeration systems operating both in parallel and in series.

[0076] For example, FIG. 8 shows a top view of a new preconditioned air unit 10 with two sets of self-contained cooling modules 36a, 36b, and 36c, 36d. Within each set, the self-contained cooling modules operate in parallel, and the two sets of self-contained cooling modules operate in series for supplying preconditioned air to an aircraft parked on the ground.

[0077] The preconditioned air unit 10 shown in FIG. 8 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 18a, 18b besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters through an air inlet 22 in a side wall 24 of the housing 12. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. An optional heater 32 is mounted at the air inlet 22 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

[0078] A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with

flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

[0079] The flow duct 20 has a manifold 21 for expanding the airflow for passage of the condensers 40 operating in parallel. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, 18a, 18b including the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

[0080] The illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective self-contained cooling modules 36. It should be noted that parallel self-contained cooling modules to the left and right in FIG. 8 have different lay-outs with corresponding components positioned differently with respect to each other in order to obtain the resulting configuration illustrated in FIG. 8. Evaporator geometries of parallel operating self-contained modules also differ since the air flow passes the respective evaporators in opposite directions with respect to the refrigeration circuit.

[0081] The remaining components and the operation of the preconditioned air unit 10 illustrated in FIG. 8 are already explained in connection with the preconditioned air unit illustrated in the previous Figures and are not repeated here.

[0082] FIG. 9 shows two of the new preconditioned air units 10a, 10b coupled in parallel in a master-slave configuration. The air outlets 25a, 25b of each of the preconditioned air units 10a, 10b are connected with a common hose 74. Proximate the parked aircraft, the common hose 74 is split into two hoses 76, 78 for supplying corresponding individual inputs of the aircraft for preconditioned air. The master 10a may control the slave 10b in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft.

Electronic Acknowledgement Receipt

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2014-08-11-Response.pdf	203529 333d52f4d3b94d39be8317f42f65f284842c efc1	yes	14

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	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	2
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Warnings:					
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2	Specification	2014-08-11-SubSpecMarkedUp.pdf	95969 a2e0d6392cd9b0d3105f6631f81eaaea2bd857fe	no	13
Warnings:					
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3	Specification	2014-08-11-SubSpecClean.pdf	95866 41bc60eb6fd2d422a869456daa07962c8e8f90c5	no	13
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

RELATED APPLICATIONS

The present application is national phase of PCT/IB2010/051189 filed on March 18, 2010 and claims priority from Danish Application Number PA 2009 00392 filed March 20, 2009.

BACKGROUND

[0001] The present invention related to a preconditioned air unit supplying preconditioned air, i.e. heated air or cooled air, to an aircraft parked on the ground.

[0002] On the ground, an aircraft typically uses the auxiliary power unit engine (APU) to drive air-conditioning equipment to cool or heat the aircraft cabin to a temperature that is comfortable for passengers. However, operation of the APU has a high cost in terms of jet fuel consumption, generated acoustic noise, CO.sub.2 emissions, etc. For example, the APU of an A320 aircraft consumes app. 160 l fuel per hour. In addition to the general air pollution, the consumption of one litre of jet fuel leads to emission of 2.5 kg CO.sub.2 into the atmosphere and thus, the APU emits app. 400 kg CO.sub.2 per operational hour.

[0003] In order to avoid running the APU on the ground, preconditioned air units have been provided for supplying the required preconditioned air to the parked aircraft. The preconditioned air units are powered from the mains supply made available at the airport in question.

[0004] Cost, efficiency, flexibility, and serviceability remain an issue in known preconditioned air units.

SUMMARY OF THE INVENTION

[0005] A new preconditioned air unit is provided for supplying preconditioned air to an aircraft parked on the ground. The new preconditioned air unit has a housing with walls defining a flow duct with an air inlet for intake of ambient air to be conditioned to a low temperature, typically a temperature in the range from -5.degree. C. to +5.degree. C., and an air outlet for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. To prevent cooling losses, the outer walls of the flow duct may be provided with a layer of heat insulation material.

[0006] The preconditioned air unit further comprises a blower accommodated in the housing and connected with the flow duct for generation of an air flow from the air inlet toward the air outlet. The blower is preferably a highly efficient centrifugal fan. The blower is preferably mounted with vibration dampers and attached with flexible connections to the flow duct.

[0007] The new preconditioned air unit further comprises at least one refrigeration system, each of

which comprises at least one compressor, at least one condenser, at least one expansion valve, and at least one evaporator connected in a refrigerant flow circuit containing a refrigerant.

[0008] At least one compressor of the at least one refrigeration system may be powered from a variable frequency driver. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the maximum capacity of the compressor is determined by the frequency of the mains supply. Advantageously, the output voltage and frequency of the variable frequency driver in the new preconditioned air unit are varied to control the at least one compressor in accordance with the current cooling requirement. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. In this way, each of the at least one refrigeration systems may operate continuously, i.e. the output voltage and frequency of the variable frequency driver may be adjusted to levels required by the at least one compressor in order for it to cool the airflow interacting with the respective at least one evaporator in accordance with a control setting. This increases the life time and decreases power consumption of the at least one refrigeration system as compared to conventional on/off control.

[0009] Further, the maximum capacity of a compressor driven by a variable frequency driver may be increased as compared to the same compressor supplied directly from the mains supply. For example, supplying a compressor with a supply voltage with a 75 Hz output frequency increases the cooling capacity of the compressor by 50% over the same compressor supplied directly from the mains supply in Europe.

[0010] Preferably, the controller of the variable frequency driver (in the following denoted "VFD-controller") is capable of controlling the variable frequency driver to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rating of the compressor whereby the one or more compressors supplied from the variable frequency driver may be controlled for provision of variable cooling capacity, e.g. in response to the temperature and flow rate of the air flow in the flow duct.

[0011] A plurality of variable frequency drivers may be provided for power supply of respective compressors, e.g. each of the compressors may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective compressor.

[0012] Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more compressors.

[0013] The preconditioned air unit may further comprise at least one condenser fan for generation of a condenser airflow interacting with the at least one condenser of the at least one refrigeration system thereby increasing the heat removal capacity of the at least one condenser.

[0014] Each of the at least one condenser fan may be located in any suitable position in the housing for provision of a condenser air flow within the housing. Each of the at least one condenser fan may be

located adjacent an air outlet in the housing for generation of a condenser air flow out through the outlet, and each of the at least one condenser may be located adjacent an air inlet for interaction with the generated condenser airflow at ambient temperature. Obviously, the direction of the condenser air flow may be reversed although in this case the condenser air flow may be heated by internal components within the housing before interacting with the at least one condenser.

[0015] At least one of the at least one condenser fan may be powered from a variable frequency driver. In a conventional preconditioned air unit, the condenser fan is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA, and thus, the condenser fan performance is locked to the frequency of the mains supply. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the at least one condenser fan in accordance with the current operational requirements, such as current pressure within the at least one condenser, efficiency, etc. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the at least one condenser fan. A plurality of variable frequency drivers may be provided for power supply of respective condenser fans, e.g. each of the condenser fans may be powered from a separate variable frequency driver that may individually control and possibly adjust the cooling capacity of the respective condenser fan by control of the condenser air flow rate generated by the condenser fan.

[0016] Each variable frequency driver may be located in any suitable position in the housing suitably connected for power supply of the required one or more condenser fans.

[0017] The preconditioned air unit may further comprise a variable frequency driver connected for electrical power supply of the blower. Advantageously, the VFD controller is capable of varying the output voltage and frequency of the variable frequency driver in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the blower.

[0018] The new preconditioned air unit may comprise a main unit and one or more self-contained cooling modules mounted in the main unit. The main unit includes the housing having a plurality of compartments for receiving and holding the self-contained cooling modules. Each of the self-contained cooling modules comprises at least one of the at least one refrigeration systems.

[0019] Each of the at least one refrigeration system operates in accordance with well-known refrigerator principles and with a well-known refrigerant, such as R134a with low global warming potential.

[0020] The at least one evaporator of the at least one refrigeration system is mounted in the housing of

the preconditioned air unit for interaction with the airflow in the flow duct for cooling of the air flow. For example, a cooling surface of the at least one evaporator may be positioned inside the flow duct for direct contact across a large surface area with the airflow in the flow duct.

[0021] One or more VFD-controllers of the at least one refrigeration system may further perform data collection of parameter values sensed by sensors of the at least one refrigeration system, e.g. temperature sensors sensing temperatures in the airflow upstream and downstream of the at least one evaporator and of the at least one condenser, pressure sensors sensing the pressure of the refrigerant in the at least one refrigeration system, etc.

[0022] Preferably, the preconditioned air unit has a central controller that is configured for controlling the operation of the preconditioned air unit. The central controller may be connected to a user interface for reception of user commands from a user and for outputting messages to the user. The preconditioned air unit may comprise at least one of the following: A user interface panel with input keys and a display, a remote control, a computer interface, a network interface, a loudspeaker, etc. For example, one of the primary user entries specifies the type of aircraft to be supplied by the preconditioned air unit. This information may be entered using entry keys of the user panel, or, using a remote control from the passenger boarding bridge, or, may be transmitted from the building management system of the airport, etc.

[0023] The central controller may further be connected with some or all of the VFD-controllers of the preconditioned air unit for individual control of the VFD-controllers. For example, if the preconditioned air unit comprises a plurality of refrigeration systems, the central controller may output an individual temperature setting to the VFD-controllers of each of the refrigeration systems, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective at least one compressor to adjust the temperature of the airflow having interacted with the corresponding at least one evaporator as required.

[0024] Further, each of the refrigeration systems may be configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing cooling refrigeration system may transmit a failure signal to the central controller and may shut down if required. In response to the failure signal, the central controller may operate to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the preconditioned air unit.

[0025] The central controller may be interfaced with some or all of the VFD-controllers and possibly other controlled devices, such as an SCR module controlling a heater in the flow duct, with a data and control bus, such as the CAN bus.

[0026] The preconditioned air unit may further have a rectifier connected to the mains supply input of the preconditioned air unit for generation of a power DC voltage supply for supplying the variable frequency drivers.

[0027] In order to suppress distortion and pollution of the mains supply, the rectifier circuit may comprise a 12-pulse rectifier, or a 18-pulse rectifier, or a 24-pulse rectifier, etc.

[0028] The preconditioned air unit may share a mains power outlet with other equipment at the parked aircraft, such as, a ground power unit, a cable coil, vehicle chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit may comprise a power sharing control input for control of preconditioned air unit power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit when the ground power unit draws a high supply current. The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, again, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit. In general, lowering the cooling capacity for short periods of time does not seriously diminish the overall performance of the preconditioned air unit.

[0029] The preconditioned air unit may be mounted underneath or on top of a passenger boarding bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit may be provided with pedestal legs for flexibility in preconditioned air unit location at an apron or in a hangar.

[0030] A plurality of the new preconditioned air units may be interconnected for supplying preconditioned air to a parked aircraft in cooperation. Two of the new preconditioned air units may for example be coupled in parallel in a master-slave configuration wherein the outputs of each of the preconditioned air units supply a common hose that is connected to the parked aircraft and possibly split at the aircraft into two or more hoses for supplying possible individual inputs of the aircraft for preconditioned air. The master may control the slave in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft. Other control principles may also be applied. For example, the CAN-bus of the cooperating preconditioned air units may be inter-connected for flexibility of control sharing between cooperating units.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

[0032] FIG. 1 shows a preconditioned air unit from above with the top removed,

[0033] FIG. 2 shows a preconditioned air unit in perspective with two self-contained cooling modules withdrawn from their respective compartments,

[0034] FIG. 3 shows a self-contained cooling module in perspective,

[0035] FIG. 4 illustrates handling of a self-contained cooling module with a fork lift truck,

[0036] FIG. 5 shows a preconditioned air unit in perspective ready for mounting,

[0037] FIG. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit,

[0038] FIG. 7 shows the user interface panel of the preconditioned air unit,

[0039] FIG. 8 shows another preconditioned air unit from above with the top removed, and

[0040] FIG. 9 shows two preconditioned air units coupled in parallel in a master-slave configuration.

DESCRIPTION

[0041] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0042] FIG. 1 shows a top view of an exemplified embodiment of the new preconditioned air unit 10 for supplying preconditioned air to an aircraft parked on the ground. The preconditioned air unit 10 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 16a, 16b, 18, besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters the flow duct 20 through an air inlet 22 in a side wall 24 of the housing 12. The flow duct 20 is folded inside the housing 12 so that walls 16a, 16b separate the flow duct into two parts with air flowing in opposite directions during operation of the preconditioned air unit 10. The side wall also has an air outlet 25 for connection to the parked aircraft, e.g. with one or more hoses, for supplying the conditioned air to the parked aircraft. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, and the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

[0043] A blower 30 is connected with the flow duct 20 for generation of the required air flow from the

air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

[0044] An optional heater 32 is mounted in the flow duct 20 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

[0045] As most clearly shown in FIG. 2, the illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective, identical self-contained cooling modules 36.

[0046] As shown in FIG. 3, each of the self-contained cooling modules 36 comprises a refrigeration system including a compressor 38, a condenser 40, an expansion valve 42, and an evaporator 44 connected in series in a refrigerant flow circuit containing a refrigerant selected in accordance with the expected high end ambient temperature of the airport in question, e.g. R134a selected for operation at high end ambient temperatures around 40.degree. C. The refrigerant flow circuit forms a closed and sealed loop. Each of the self-contained cooling modules 36 operates in accordance with well-known refrigerator principles.

[0047] Each of the self-contained cooling modules 36 can be installed in the housing 12 of the main unit without interfering with the refrigeration system of the module 36 so that assembly and possible disassembly of self-contained cooling modules 36 in the preconditioned air unit housing 12 can be performed by persons without specific skills in the field of refrigeration systems. The self-contained cooling modules 36 may be manufactured at one site particularly suitable for manufacturing of refrigeration systems for subsequent integration with housings 12 of the main unit at a separate site particularly suitable for manufacturing of airport ground equipment in general thereby increasing manufacturing flexibility and decreasing manufacturing cost of the preconditioned air unit 10. Further, the self-contained cooling module 36 may be stored as a spare part including the refrigerant, whereby repair of a preconditioned air unit without having to perform the cumbersome task of emptying the preconditioned air unit for refrigerant is made possible.

[0048] The power supply, control circuitry, and user interface of the preconditioned air unit 10 allows the preconditioned air unit 10 to operate with any number of self-contained cooling modules 36 installed, i.e. the illustrated preconditioned air unit 10 may operate with a single self-contained cooling module 36 installed in an arbitrarily selected compartment 34; or, with two self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or, with three self-contained cooling modules 36 installed in respective arbitrarily selected compartments 34; or with four self-contained cooling modules 36 installed in respective compartments 34. In this way, a product line of preconditioned air units 10 is provided making four different preconditioned air units 10 available with different cooling capacities based on the same components. This lowers manufacturing cost by lowering purchase cost per component, and storage and handling cost both per component and per finished preconditioned air unit 10. Further, a preconditioned air unit 10 already in use in an airport with less

than four self-contained cooling modules 36 installed may be upgraded on site by installing one or more self-contained cooling modules 36 in empty compartments 34.

[0049] Preferably, the self-contained cooling modules 36 are removably installed in the housing 12 of the main unit facilitating separation of an installed self-contained cooling module from the housing 12, e.g. utilizing screws, nuts and bolts for fastening each of the self-contained cooling modules 36 to the housing 12 and utilizing electrical connectors (not shown) to establish the required electrical interconnections between the cooling module and the housing 12 when the cooling module 36 is inserted in the housing 12 of the main unit 10.

[0050] FIG. 2 shows in perspective the preconditioned air unit of FIG. 1 with two self-contained cooling modules 36 withdrawn from the housing 12 of the main unit 10. FIG. 5 shows in perspective the preconditioned air unit of FIGS. 1 and 2 with the two self-contained cooling modules 36 inserted and installed in the housing 12 of the main unit 10.

[0051] The removability of the modules 36 enhances the serviceability of the preconditioned air unit 10 since a possible malfunctioning self-contained cooling module can be separated from the housing 12 of the main unit 10 and replaced with a functioning module 36 with a minimum of down time of the preconditioned air unit 10. One cooling module 36 can be replaced in approximately 20 minutes. In the event that a functioning cooling module 36 is not available for substitution of the malfunctioning cooling module 36, the preconditioned air unit 10 will continue operation with the remaining cooling modules 36, i.e. the preconditioned air unit 10 remains fully operational, however with a lowered cooling capacity. Further, the malfunctioning module 36 can be moved for repair at a separate site particularly suitable for repair of refrigeration systems. Also, the possible requirement of dismounting and moving the entire preconditioned air unit for repair of a cooling circuit is hereby reduced. Preferably, the self-contained cooling module 36 has physical dimensions suitable for movement by a fork lift truck 47 as illustrated in FIG. 4 facilitating transportation of the module 36, e.g. for storage, assembly into a preconditioned air unit 10, and service. For example, a malfunctioning module 36 can be removed from the housing 12 with a fork lift truck 47 and a properly functioning module 36 can be installed in the housing 12 with a fork lift truck 47.

[0052] In the illustrated preconditioned air unit 10, the evaporator 44 of each self-contained cooling module 36 is positioned inside the flow duct 20 through a slot in the wall 14a, 14b, 14c, 14d when installed in the housing 12 of the main unit for optimum heat exchange with the air flow in the duct 20. The evaporator 44 has a large number of channels for passage of the air flow in the duct 20 providing a large surface of heat exchange between the air flow and the refrigerant flowing inside the evaporator 44 as is well-known in the art of refrigeration systems. The slots in the walls 14a, 14b, 14c, 14d are sealed when the respective self-contained cooling modules 36 are mounted in their operational positions in the compartments 34. In absence of a self-contained cooling module 36, the slot is sealed with a cover plate.

[0053] Cooling in multiple steps as provided by a plurality of self-contained cooling modules 36

efficiently condenses the air humidity and protects the last downstream evaporator 44 from freezing over. A stainless steel condensate pan (not shown) and integrated condensate pump (not shown) ensure that the condensation moisture is removed in a controlled way.

[0054] The cooling air leaves the illustrated preconditioned air unit through one or two 14'' hoses.

[0055] Each of the compressors 38 of the self-contained cooling modules 36 may be powered from a variable frequency driver 46 also located in the respective self-contained cooling module 36. In a conventional preconditioned air unit, the compressor is supplied from the mains supply, i.e. with an AC voltage of 50 Hz in Europe and 60 Hz in USA. Thus, the capacity of the compressor is limited by the frequency of the mains supply. This limitation does not exist in the new preconditioned air unit 10. Advantageously, the variable frequency driver the VFD-controller is capable of varying the output voltage and frequency of the variable frequency driver 46 in order to control the compressor 38 in accordance with the current cooling requirement. In the illustrated preconditioned air unit, the variable frequency driver 46 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

[0056] The output voltage and frequency supplied by the variable frequency driver 46 is controlled by the VFD-controller in a way well-known in the art of variable frequency drivers. Preferably, the VFD-controller is capable of controlling the variable frequency driver 46 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the compressor 38 whereby each of the compressors 38 supplied from a respective variable frequency driver 46 may be controlled for provision of variable cooling capacity.

[0057] Each of the self-contained cooling modules has temperature sensors (39 in FIG. 6) in electrical connection with the VFD-controller of the module 36 and mounted for sensing temperatures in the air flow up-stream and down-stream of the evaporator 44 and transmitting the sensed temperature values to the VFD-controller, and the VFD-controller controls the cooling capacity of the compressor 38 in response to the sensed temperatures.

[0058] Each of the self-contained cooling modules 36 operates continuously, i.e. the output voltage and frequency of the variable frequency driver 46 are adjusted to levels required by the compressor 38 in order for it to cool the airflow having interacted with the evaporator 44 substantially to the temperature setting. This increases the life time and decreases power consumption of the cooling modules 36 as compared to on/off control of the compressors 38.

[0059] The preconditioned air unit 10 further comprises two condenser fans 48 mounted across apertures in the side wall 50 for generation of condenser airflow causing ambient air to enter the housing 12 through apertures in the self-contained cooling modules 36 covered by the condensers 40 as indicated by arrows 52a-52f for heat removal from the heat exchanging surfaces of the condensers 40.

[0060] The condenser fans 48 are powered from one variable frequency driver 54. Advantageously, the

VFD controller of the variable frequency driver 54 is capable of varying the output voltage and frequency of the variable frequency driver 54 in order to control the condenser fans 48 in accordance with the current operational requirements, such as current pressure within the condenser(s), efficiency, etc. Preferably, the variable frequency driver 54 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The output frequency may range from 0 Hz to the maximum rated frequency of the condenser fans. The preconditioned air unit 10 further comprises a variable frequency driver 56 connected for electrical power supply of the blower 30. Advantageously, the VFD controller of the variable frequency driver 56 is capable of varying the output voltage and frequency of the variable frequency driver 56 in order to control the blower in accordance with the current operational requirements, primarily the amount of air allowed to be received in the type of aircraft currently connected to preconditioned air unit. Preferably, the variable frequency driver 56 keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. Preferably, the controller of the variable frequency driver 56 is capable of controlling the variable frequency driver 56 to output a variable output frequency, e.g. ranging from 0 Hz to the maximum rated frequency of the blower whereby the blower 30 supplied from the variable frequency driver 56 may be controlled for provision of variable flow rate of the air flow in the flow duct 20, e.g. in response to a user control command, e.g. the type of aircraft.

[0061] The preconditioned air unit 10 has a central controller 60 that is configured for controlling the operation of the preconditioned air unit 10. The central controller 60 is connected with the user interface panel 58 for reception of user commands and for outputting messages to the user, e.g. on a display of the user interface panel 58, by a loudspeaker of the user interface, etc.

[0062] The central controller 60 is connected with all of the VFD-controllers of the preconditioned air unit 10 for individual control of the VFD-controllers. For example, the central controller outputs an individual temperature setting to each of the VFD-controllers of the preconditioned air unit 10, and, in response to the individual temperature setting, each of the VFD-controllers controls the cooling capacity of the respective compressor 38 to adjust the temperature of the airflow having interacted with the corresponding evaporator 44 as required. Further, in the event that one of the installed self-contained cooling modules 36 fails, the failing cooling module transmits a failure signal to the central controller 60 and shuts down if required. In response to the failure signal, the central controller 60 operates to automatically adjust the required amount of cooling among the remaining properly operating self-contained cooling modules 36 of the preconditioned air unit 10.

[0063] FIG. 6 is a block diagram showing the electrical interconnections of various modules and subassemblies of the preconditioned air unit 10.

[0064] The illustrated preconditioned air unit 10 has a 12-pulse rectifier 62 connected to a mains supply input 64 of the preconditioned air unit 10 for generation of a power DC voltage supply. Using variable frequency drivers may generate harmonic distortion of the mains input. To minimize distortion of the mains input, the three phases of the mains are transformed into six phases which are rectified in the

non-regulated 12-pulse full bridge rectifier 62. The combination of the 12-pulse rectifier 62, the related transformer 66 and the input filter 68 reduce harmonic feedback into the mains to a minimum. Further, the 12-pulse rectifier 62 includes soft start circuitry that limits the inrush current. Still further, utilization of the 12-pulse rectifier 62 results in a high input power factor, i.e. a power factor that is larger than 0.8; for example 0.96, which in turn results in a reduced input mains current.

[0065] The filtered power DC voltage supply is routed to each of the compartments 34 for power supply of each of the variable frequency drivers 46 of the self-contained modules 36 when installed in the respective compartments 34.

[0066] The filtered power DC voltage supply is further routed to variable frequency driver 56 for power supply of the blower 30 and to variable frequency driver 54 for power supply of the two condenser fans 48.

[0067] The central controller 60 is based on a micro-controller and a digital signal processor that cooperate to regulate, supervise and diagnose possible external and internal failures. In addition, each variable frequency driver 46, 54, 56 comprises a micro-controller to perform individual control of devices connected to the variable frequency driver in question. Further, the VFD-controller of each of the self-containing cooling modules 36 monitors the respective refrigeration system and decreases the cooling capacity or stops cooling if the refrigerant pressure is too low or too high.

[0068] The central controller 60 automatically adjusts the cooling performed by the preconditioned air unit 10 to the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, the outgoing airflow from the preconditioned air unit 10, etc.

[0069] The central controller 60 and the variable frequency drivers 46, 54, 56, and the SCR module 70 controlling the heater 32 are interfaced with a data and control bus, which in the illustrated example is the CAN bus.

[0070] The preconditioned air unit 10 may share a mains power outlet with other equipment at the parked aircraft, such as a ground power unit, a cable coil, vehicle battery chargers, etc. In order to lower the peak power requirement of the shared mains power outlet, the preconditioned air unit 10 comprises a power sharing control input (not shown) for control of preconditioned air unit 10 power consumption. The power sharing control input may for example be operated to lower the preconditioned air unit 10 power consumption during high load operation of the ground power unit, e.g. by lowering the cooling capacity provided by the preconditioned air unit 10 during high load ground power unit operation The ground power unit typically only operates at maximum load during a short period of time before push back from the gate until it is disconnected from the air craft at which point in time the aircraft's own air conditioning system takes over. Before then, the passenger cabin of the aircraft has already been cooled for some time and thus, lowering the cooling capacity for a short period of time before push back does not seriously diminish the overall performance of the preconditioned air unit 10. In general, lowering the cooling capacity for short periods of time does not seriously diminish

the overall performance of the preconditioned air unit 10.

[0071] FIG. 7 shows the user interface panel 58 of the preconditioned air unit 10. The user interface panel 58 includes an LCD display 72 viewable in all weather conditions and displaying all relevant operational data. The display provides information at different levels: In a default mode, the display shows the status of the preconditioned air unit 10, such as aircraft type, cabin temperature, etc. In an alarm mode, the display shows type of alarm and alarm history. In a setup mode, the display shows various parameters that may be adjusted.

[0072] The preconditioned air unit includes digital input/output ports, such as galvanic isolated RS485 port, TCP/IP Ethernet port, etc, for remote control of the preconditioned air unit 10 and monitoring including data dump for service tasks.

[0073] The preconditioned air unit 10 may be mounted underneath or on top of an apron drive bridge and move freely with bridge actuation. Alternatively, the preconditioned air unit 10 may be provided with pedestal legs for flexibility in preconditioned air unit location for fixed bridge and hangar applications.

[0074] Other preconditioned air units may be provided within the scope of the appended claims. For example, other preconditioned air units may be provided that are not modular. Also, preconditioned air units may be provided with different numbers of refrigeration systems, such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., refrigeration systems.

[0075] In the example illustrated in FIGS. 1, 2, 4, 5, and 6, the refrigeration systems operate in a series. Other preconditioned air units may be provided with refrigeration systems operating in parallel; or with refrigeration systems operating both in parallel and in series.

[0076] For example, FIG. 8 shows a top view of a new preconditioned air unit 10 with two sets of self-contained cooling modules 36a, 36b, and 36c, 36d. Within each set, the self-contained cooling modules operate in parallel, and the two sets of self-contained cooling modules operate in series for supplying preconditioned air to an aircraft parked on the ground.

[0077] The preconditioned air unit 10 shown in FIG. 8 has a main unit with a housing 12 with walls 14a, 14b, 14c, 14d, 18a, 18b besides top and bottom walls (not shown) defining a flow duct 20. Ambient air enters through an air inlet 22 in a side wall 24 of the housing 12. Air is aspirated through an easily replaceable filter 28 that is mounted across the air inlet 22. An optional heater 32 is mounted at the air inlet 22 allowing the preconditioned air unit 10 to heat ambient air in case of low ambient air temperatures.

[0078] A blower 30 is connected with the flow duct 20 for generation of the required air flow from the air inlet 22 toward the air outlet 25. In the illustrated preconditioned air unit 10, the blower 30 is a highly efficient centrifugal fan. The blower 30 is mounted with vibration dampers and attached with

flexible connections to the flow duct 20. The flow duct 20 is dimensioned for low air speed in order to prevent free moist carry-over.

[0079] The flow duct 20 has a manifold 21 for expanding the airflow for passage of the condensers 40 operating in parallel. The direction of the air flow is illustrated by arrows 26a, 26b, 26c, 26d, 26e. To prevent cooling losses, the outer walls 14a, 14b, 14c, 14d, 18a, 18b including the top wall of the flow duct are provided with a 50 mm thick layer of heat insulation material. At the bottom of the flow duct, heat insulation is provided underneath a plate (not shown) for collection of condensate.

[0080] The illustrated preconditioned air unit 10 has four similar compartments 34 for receiving and holding four respective self-contained cooling modules 36. It should be noted that parallel self-contained cooling modules to the left and right in FIG. 8 have different lay-outs with corresponding components positioned differently with respect to each other in order to obtain the resulting configuration illustrated in FIG. 8. Evaporator geometries of parallel operating self-contained modules also differ since the air flow passes the respective evaporators in opposite directions with respect to the refrigeration circuit.

[0081] The remaining components and the operation of the preconditioned air unit 10 illustrated in FIG. 8 are already explained in connection with the preconditioned air unit illustrated in the previous Figures and are not repeated here.

[0082] FIG. 9 shows two of the new preconditioned air units 10a, 10b coupled in parallel in a master-slave configuration. The air outlets 25a, 25b of each of the preconditioned air units 10a, 10b are connected with a common hose 74. Proximate the parked aircraft, the common hose 74 is split into two hoses 76, 78 for supplying corresponding individual inputs of the aircraft for preconditioned air. The master 10a may control the slave 10b in such a way that the two preconditioned air units deliver substantially the same amounts of preconditioned air at substantially the same temperature to the parked aircraft.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/257,669	Filing Date 09/20/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **08/11/2014**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/DIANE FLOYD/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/08/2014	10/21/2014							
	1	-	-							
	2	-	-							
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	10	-	-							
	11	-	-							
	12	-	-							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
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	22	✓	✓							
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	25	✓	✓							
	26	✓	✓							
	27	✓	✓							
	28	✓	✓							
	29	✓	✓							

Notice of References Cited	Application/Control No. 13/257,669	Applicant(s)/Patent Under Reexamination DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3,784,888 A	01-1974	Geiersbach et al.	318/400.01
*	B	US-4,691,155 A	09-1987	Taylor et al.	318/771
*	C	US-4,859,924 A	08-1989	Chonan, Katsuhiko	318/808
*	D	US-7,479,749 B2	01-2009	Gerding et al.	318/469
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/21 18:59
L2	4	(high adj motor adj torque).clm.	USPAT	OR	ON	2014/10/21 18:59
L3	154	(high adj motor adj torque)	USPAT	OR	ON	2014/10/21 19:03
S1	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:21
S2	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:25
S3	1	(12/301357).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/04 15:26
S4	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:22
S5	110	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:26
S6	28	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:28
S7	86	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:30

S8	43	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:32
S9	0	(scroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:33
S10	8	(schroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:34
S11	14	("20080250903" | "20100031676" | "4272967" | "5107685").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:08
S12	0	62/228.4.ccls. and b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:24
S13	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:10
S14	3	S13 and (vfd or inverter or (variable adj speed))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:11
S15	4	"4272967".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:12
S16	386	(variable adj speed) near5 condenser near5 (fan or blower)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:44
S17	8	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/04 19:45
S18	0	S16 and S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2014/03/04 19:45

			IBM_TDB			
S19	0	S13 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:46
S20	601771	inverter ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S21	609	inverter near5 ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S22	306	(inverter near5 ("60" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:39
S23	40	(inverter near5 ("60" adj hz) near5 ("50" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:41
S24	0	wo2007061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S25	0	wo20070061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S26	2	"7461516".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 09:00
S27	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2014/03/05 09:13

			EPO; JPO; DERWENT; IBM_TDB			
S28	1	(12/741437).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/05 09:35
S29	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:42
S30	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S31	28	S30 and (range near5 (hz or hertz))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S32	3153	(output near3 voltage) near10 frequency near10 ratio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S33	1	S30 and "l24"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S34	9	S30 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:16
S35	11	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$ or US-20080314064-$ or US-20030168862-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/07 14:57
S36	9	S35 and controller	US-PGPUB; USPAT;	OR	ON	2014/03/07 14:57

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S37	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S38	871	S37 near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S39	4931033	(main or central or system) near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S40	372	S38 and S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S41	30143	(independent or separate or redundant or backup) near20 (system or compressor or generator) near20 (fail$4 or malfunction)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:24
S42	143400	"62"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S43	277	S41 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S44	122	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 14:58

		or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.				
S45	47	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 14:58
S46	50	(("3640256") or ("3929285") or ("3929628") or ("4049395") or ("4060393") or ("4249655") or ("4259970") or ("4272499") or ("4274371") or ("4281522") or ("4296809") or ("4299285") or ("4300447") or ("4313499") or ("4343348") or ("4347708") or ("4357860") or ("4399742") or ("4442817") or ("4463022") or ("4519324") or ("4526090") or ("4539793") or ("4543677") or ("4554933") or ("4612096") or ("4615176") or ("4621504") or ("4764348") or ("4775627") or	US-PGPUB; USPAT	OR	OFF	2014/03/08 15:04

		("4781729") or ("4786301") or ("4829885") or ("4838345") or ("4842620") or ("4860642") or ("4866839") or ("4872397") or ("4884366") or ("4891892") or ("4921604") or ("4955372") or ("4967769") or ("5001346") or ("5015365") or ("5318099") or ("5540757") or ("5547421") or ("5740846") or ("5958346")).PN.				
S47	0	("(12-pulseor18-pulseor24-pulse)near10rectifier").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 16:07
S48	322	(12-pulse or 18-pulse or 24-pulse) near10 rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:07
S49	10	S48 and ((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:09
S50	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 09:47
S51	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:01
S52	1899	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:45
S53	120	S52 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:49
S54	0	yd2t50/82.cpc.	US-PGPUB; USPAT;	OR	ON	2014/03/10 10:58

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S55	334	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58

10/21/2014 9:05:59 PM
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

CPC- SEARCHED		
Symbol	Date	Examiner
b64f1/362; g05d	3/10/2014	htc
g05d23/19	3/10/2014	htc
y02t50/82	3/10/2014	htc

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	228.4		

SEARCH NOTES		
Search Notes	Date	Examiner
Plus and claims search. Inventor and continuity search. East searches for US and foreign patents. NPL searches for variable speed drives.	3/10/2014	htc
updated searches	10/21/2014	htc

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 11/04/2014

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	
ART UNIT	**PAPER NUMBER**
3744	

NOTIFICATION DATE	DELIVERY MODE
11/04/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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pair_lhhb@firsttofile.com

Office Action Summary	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *8/11/2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-29* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *13-29* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *9/20/2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

The present application is being examined under the pre-AIA first to invent provisions.

This action is in response to the reply filed 8/11/2014.

Claims 1-12 are cancelled.

Claims 13-29 are pending.

Claim Rejections - 35 USC § 112

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 13-29 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 13

It is unclear if the vfd for the compressor is to be included in the vfds of the plurality of refrigeration systems.

The office suggests rewriting the last line of claim 13 to read “including the at least one variable frequency drivers” to resolve this rejection.

Claim 20.

Recites "variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The meaning of "high motor torque is unclear." The term is a relative term which renders the claim indefinite. The term is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Does the torque remain at the same "high" torque throughout the frequency range?

Claims dependent upon those listed above are likewise rejected for incorporating the deficiencies of the parent claims.

Claim Rejections - 35 USC § 103

Claims 13, 14, 15, 16, 17, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi.

Claim 13.

Urbain teaches

A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground (abstract),

the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet (5) for ambient air and an air outlet (7) for connection to the parked aircraft (Abstract, Fig. 1),

a blower (10) connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20) at least one compressor, (17, Fig. 4) at least one condenser, (18)

at least one expansion valve, (20) at least one evaporator connected in a flow circuit containing a refrigerant, (12)

wherein the at least one evaporator interacts with the air flow in the flow duct (Fig. 1),

Kobayashi teaches:

and at least one variable frequency driver for power supply of the at least one compressor (inverter that inverts commercial power into a variable- frequency AC - abstract)

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems. (Kobayashi abstract, Urbain, par. 92)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the

system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

Claim 14 and 15

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan (21) positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems. (Fig. 4). Urbain does not teach that the condenser fan has a vfd.

However, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain to include such a feature, in view of Urbain's teachings that the evaporator fan/blower can be variable speed, the motivation being to provide greater control over the operation of the condenser according to the heat loss needs of the system.

Claim 16.

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower. (par. 49)

Claim 17.

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

Claim 23.

Urbain as modified teaches a preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit to at least one of: The selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit. (par. 38).

Claim 28.

Urbain as modified teaches a preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker. (par. 100-105)

Claim 29.

Urbain as modified teaches a preconditioned air unit according to claim 13, further comprising a heater in the flow duct. (par. 35)

Claim 16 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 20080314064 to Al-Eidan.

Claim 16.

Urbain as modified a preconditioned air unit according to claim 13 including a housing and the use of inverters (i.e., variable frequency driver).

Al-Eidan teaches, a variable speed counter rotating condenser blower.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Al-Eidan, the motivation being to utilize a condenser fan arrangement that can provide variable airflow and is more efficient (Al-Eidan par. 76).

Claims 18 and 19 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 4514991 to Zinsmeyer.

Claim 18.

Urbain teaches a preconditioned air unit according to claim 17.

Typical mains supply is widely known as 50 Hz for Europe and 60 Hz for US.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Zinsmeyer for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit, the motivation being to provide the system with the ability to respond to a wider range of system demands.

Claim 19.

Urbain teaches a preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller. (par. 19)

Claim 20 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of "Understanding of Variable Speed Drives (Part 2)" (hereafter VSD Part 2")

Claim 20.

Urbain teaches a preconditioned air unit according to claim 13.
VSD Part 2 teaches that "Actuafly, torque can be thought of as "OOUMPH". The motor has to develop enough "OOUMPH" to get the load moving and keep it moving under all the conditions that may apply."

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of VSD 2, to provide at least one variable frequency

driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range, the motivation being to provide the torque needed to start and move the load throughout the entire frequency operating range.

Claim 21 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 20070035263 to Rastogi.

Claim 21.

Urbain teaches a preconditioned air unit according to claim 17.

Rastogi teaches wherein the central controller (12) is connected to at least one controller (16) of the at least one voltage frequency driver (par. 2).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Rastogi, the motivation being to facilitate placement of two local vfd drives in the event the system needs more power than can be delivered by one drive. (see Rastogi par. 6).

Claim 22 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kabayashi and further in view of US 7685838 to Hutton.

Claim 22.

Urbain teaches as modified teaches a preconditioned air unit according to claim 13 including a central controller.

Hutton teaches that the power demands of the air conditioner can impact the power available for other uses at peak demands, such as interior lights and auto-leveling of the aircraft. (col. 1,60 to col. 2, 5). A thermal storage unit is used to offset some of the cooling power needed by the AC system during peak demand, so that energy consumption by the AC unit can be reduced. (col. 12, 15-30.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Hutton, so that the AC will use less power so such power can shared with other devices, the motivation being to allow more power to go to the interior lights and auto leveling devices.

Claims 24 and 25 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 6446447 to Goth.

Claims 24 and 25.

Urbain as modified teaches a preconditioned air unit according to claim 13. Goth teaches redundant refrigeration systems to ensure continued cooling in the event one of the systems fails (see Goth claim 20). A local controller refrigeration system controller notifies a main/cage controller of a failure in the local system (the failing refrigeration system transmits a failure signal to the central controller) so that the main/cage controller can switch operation to the other refrigeration system (controller.. . automatically adjust the required amount of cooling among the remaining... remaining systems .... in response to the failure signal.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Goth, the motivation being to provide automatic system back-up so as to preserve the comfort of passengers in the even one of the AC systems fails.

Claims 26 and 27 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 20100031676 to Urbain in view of US 5107685 to Kobayashi and further in view of US 6600278 to Bretzius.

Claims 26 and 27

Urbain as modified teaches a preconditioned air unit according to claim 13. Bretzius teaches a variable frequency drive with a 12 pulse rectifier. (col. 3, 10-25). It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Bretzius, the motivation being to provide a means for converting AC to DC and to provide rectification that cancels many of the characteristic harmonics a six-pulse bridges produce.

Response to Applicant's Remarks

Applicant's amendments and remarks have been carefully considered but are not deemed persuasive.

35 USC 112 rejections

Claim 20

The fact that the MPEP recognizes that terms of degree are not automatically indefinite is not persuasive. There is not sufficient information in the claim or the specification to ascertain the meaning of "high motor torque". For example, as asked in

in the prior action and this one, does the torque remain at the same "high motor torque" throughout frequency range?

The office can locate 154 issued US patents where the term "high motor torque" is used, as opposed to the 135 patents located by applicant. However, the office can only locate 4 issued US patents where such term is used in the claims, and none of those 4 patents use the term in the same manner as applicant. US 7,479,749 to Gerding uses the term in claim 1, but Gerding teaches a direct current motor so the applicability to applicant's argument, if any, is unclear. US 4,859,924 to Chonan uses the term in claim 3, but it is linked to a "predetermined high torque current". US 4,691,155 to Taylor uses the term in several claims, but the term is described as a "relatively high motor torque" that occurs when the motor's "high torque windings" are active. US 3,784,888 to Geiersbach uses the term in claim 37, but it is referred to in connection with a "predetermined relatively high motor torque angle". Consequently, the office has not located a single issued US patent where the claim language supports applicant's arguments.

35 USC 103 Rejections

The office does not agree with applicant's interpretation of claim 13. Under the broadest reasonable interpretation of the claims, in light of the specification, Urbain's three evaporators can be viewed as part of three refrigeration systems, which share a common compressor, condenser, etc. Furthermore, even if the office were to accept applicant's argument that the claim requires a plurality of evaporators, a plurality of

condensers, a plurality of condensers, etc., the claim would still be obvious as the mere duplication of identical refrigeration systems.

Regarding applicant's arguments about the stated motivation of using a VFD so that an unloader valve is not needed, the office never asserted that Urbain needs an unloader valve, nor did the office take official notice of anything. Anyone wishing to modify the compressor in Urbain to have variable capacity, the motivation being to adjust the compressor for different operating conditions, will have limited options. One of which is an unloader valve, and another of which is the VFD. The benefits of the VFD are noted in "Understanding Variable Speed Drives (Part 2)", which states "the variable frequency drive (VFD) is the most effective motor controller in the industry today", and will "enhance process applications, particularly where flow control is involved." Consequently the office maintains that the rejection is proper.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY CRENSHAW whose telephone number is (571)270-1550. The examiner can normally be reached on Monday-Friday 8:30am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Alexandra Elve can be reached on (571) 272-1173. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENRY CRENSHAW/
Examiner, Art Unit 3744
/M. Alexandra Elve/
Supervisory Patent Examiner, Art Unit 3744

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (previously presented) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
a plurality of refrigeration systems, each of which includes
at least one compressor,
at least one condenser,
at least one expansion valve,
at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the
at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of the at least one compressor, and
a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (**currently amended**) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one ~~**condensor**~~ **condenser** fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

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16. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (previously presented) A preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (previously presented) A preconditioned air unit according to claim 17, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

23. (previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according

to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

Electronic Acknowledgement Receipt

EFS ID:	20990120
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	17-DEC-2014
Filing Date:	20-SEP-2011
Time Stamp:	14:39:03
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2014-12-17-Amendment.pdf	4636241 af075e12f233650184013b6641ba9e2bcf140d45	yes	20

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	20
Warnings:			
Information:			
	Total Files Size (in bytes):	4636241	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
	:	
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
	:	
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
	:	
Filed: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action of November 4, 2014, Applicants submit the following:

REMARKS

In response to the Office Action mailed November 4, 2014, Applicant respectfully requests reconsideration. Based upon the following Remarks, Applicant respectfully requests that all outstanding rejections be reconsidered, and that they be withdrawn.

Request that Examiner Crenshaw Discuss the 103 Rejection with Supervisor Elve Before Issuing Any Next Paper

Applicant details below why the claims are not obvious. However, the below statement taken from the Office Action does more to illustrate Applicant's point that the claims are not being properly examined than any argument Applicant could make.

Briefly, the Examiner asserts that the broadest reasonable interpretation of "a plurality of refrigeration systems, each of which includes" X and Y, encompasses a disclosure of a refrigeration system which shares a common X and Y. Applicant is not making this up. The below statement is a PDF snapshot from the Office Action to address claim 13

> The office does not agree with applicant's interpretation of claim 13. Under the broadest reasonable interpretation of the claims, in light of the specification, Urbain's three evaporators can be viewed as part of three refrigeration systems, which share a common compressor, condenser, etc. Furthermore, even if the office were to accept

(PDF snapshot, Office Action, page 13, bottom, emphasis added.) The language of claim 13 is as follows:

> a plurality of refrigeration systems, ***each of which includes***
>
> at least one compressor,
>
> at least one condenser,
>
> at least one expansion valve,
>
> at least one evaporator . . . .

(Claim 13, emphasis added.)

Of course, there is absolutely no evaluation of how the specification supports that broadest reasonable interpretation.

The Examiner Is Contradicting His Own Assertions Regarding the Rationale to Modify the Primary Reference In a Material Manner, Thus Making Clear That a *Prima Facie* Case Of Obviousness Has Not Been Established

The Examiner asserts that it would have been obvious to modify Urbain to eliminate the need for an unloader valve, and then, when Applicant traverses the assertion that Urbain needs an unloader valve, he asserts that he never asserted that Urban needs an unloader valve. This makes clear that a *prima facie* case of obviosenss has not been esablished, because if Urbain did not need an unloader valve, there is not reason to modify Urbain.

To ensure that there is no question as to how Applicant characterizes the statements in the Office Action, below are PDF snapshots of the very statements of the Examiner:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the
>
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>
> system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(PDF snapshot of Office Action, pages 4-5, emphasis added.) Then, the Office Action states:

> Regarding applicant's arguments about the stated motivation of using a VFD so that an unloader valve is not needed, the office never asserted that Urbain needs an unloader valve, nor did the office take official notice of anything. Anyone wishing to

(PDF snapshot of Office Action, page 14, emphasis added.)

That is, even though Urbain does not need an unloader valve, it would have been obvious to modify Urbain so that it does not need a device such as an unloader valve. This is not quite what the USPTO had in mind in its *KSR* decision.

Clearly, the rationale to modify Urbain is non-existent based on the very words of the Examiner. Accordingly, a *prima facie* case of obviousness has not been established.

Applicant Requests Clarification of Whether The Office Action is Rejecting Claim 13 on The Assertions Pertaining to Duplication of Parts on pages 13-14 - If the Duplication of Parts is Indeed a Grounds for Rejection, this Office Action Should be Reissued as a Non-Final Office Action

The Office Action appears to present the framework of a new grounds of rejection in the sentence spanning pages 13-14.

Specifically, the Office Action states that:

> common compressor, condenser, etc. Furthermore, even if the office were to accept applicant's argument that the claim requires a plurality of evaporators, a plurality of
>
> Application/Control Number: 13/257,669 Page 14
> Art Unit: 3744
>
> condensers, a plurality of condensers, etc., the claim would still be obvious as the mere duplication of identical refrigeration systems.

(PDF snapshot of Office Action, pages 13-14, sentence spanning.) To be clear, nowhere in the last Office Action was this grounds for obviousness made. Nowhere. Also, it is nowhere found in the text of the rejections of claim 13 in the body of the Office Action.

If the USPTO is relying on this as a grounds for rejection, the present Office Action should not be a Final Office Action, because this is a new grounds of rejection of a claim not necessitated by an amendment or by the filing of an IDS.

If the USPTO is relying on the above as a grounds of rejection, the USPTO should reissue this Office Action as a non-final Office Action so that prosecution is no longer closed and Applicant is permitted full freedom of movement.

If the USPTO is not relying on the above as a grounds for rejection, that is entirely appropriate. However, later use of the above in an Examiner's Answer will be a new grounds of rejection, and such will be petitionable to have stricken from the record.

Claim Rejection Under §112, Second Paragraph

The Office Action has rejected claims 13-29 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failure to particularly point out and distinctly claim the subject matter which application regards as the invention. In response, Applicant traverses the rejection for the reasons that follow.

With respect to claim 13, the Office Action asserts the following:

> It is unclear if the vfd for the compressor is to be included in the vfds of the plurality of refrigeration systems.

(Office Action, page 2, bottom.) Stop. There is nothing unclear about claim 13.

First, as a preliminary matter, Applicant does not recite "vfd" anywhere in the claim.

Second, claim 13 is pretty simple. Claim 13 recites a plurality of X, each of which (i.e., each X) has a Y and a Z for Y, where X is the refrigeration system, Y is the at least one compressor, and Z is the variable frequency driver. To be clear, below is a reproduction of the pertinent parts of claim 13, with emphasis added:

> **a plurality of refrigeration systems**, each of which includes
>
> at least one compressor,
>
> at least one condenser,
>
> at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, **and**

a central controller that is configured for controlling the operation of the preconditioned air unit including **variable frequency drivers** of the plurality of refrigeration systems.

(Claim 13, emphasis added).

In view of the above claim recitations, it is clear that a plurality of refrigeration systems and a central controller are listed in parallel as the claimed elements. Further, it is clear that each of the plurality of refrigeration systems has a corresponding variable frequency driver (e.g., at least one variable frequency driver), and therefore the plurality of refrigeration systems have (multiple) variable frequency drivers.

Claim 13 is definite. Withdrawal of the indefiniteness rejection is warranted.

With respect to claim 20, the rejections are based on the individual perceptions of an examiner, which is not the way claim definiteness is evaluated. Applicant hereby incorporates by reference their prior arguments regarding the failure of the USPTO to establish a *prima facie* case of indefiniteness.

With respect to the response to Applicant's prior arguments, the Office Action states that "the MPEP recognizes that terms of degree are not automatically indefinite is not persuasive." (Office Action, page 12, bottom.) The Office Action further asserts that there is not sufficient information in the claim or specification to ascertain the meaning of "high motor torque."

First, the Office Action does not provide any reasoning why MPEP 2173.05, which specifically states that the "fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite," is not persuasive. As with the indefiniteness rejection itself, the response to arguments is conclusory.

Second, the basic requirements for establishing a claim as indefinite have not been followed. The standard for indefiniteness is based on how the person of ordinary skill in the art would interpret the claims in view of the specification. More specifically, MPEP 2173.01 specifically states that

> The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:
> (A)The content of the particular application disclosure;
> (B)The teachings of the prior art; and
> (C)The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

(MPEP 2173.01.) The "essential inquiry" has not been made in rejecting the claims as indefinite. Nowhere in the rejections under 35 U.S.C. 112, second paragraph is there reference to or an evaluation of (A) the content of the specification of the present application, (B) the teachings of the prior art, and (C) the interpretation of the claims that would be given by the person of ordinary skill in the art. The Office Action tries to consider the claimed "high motor torque" in the light of the specification; however, the "essential inquiry" also includes evaluation of the interpretation of the claims that would be given by the person of ordinary skill in the art.

Applicant respectfully submits that the term "high motor torque" is terminology that is clearly definite. As noted in the Office Action, there are 4 issued US patents where such term is used in the claims. Yet the very manner in which the Office Action attempts to discount this fact further underscores the fact that there is a threshold problem on behalf of the USPTO to evaluate the pertinent subject matter.

More specifically, the Office Action asserts that the "high motor torque" in claim 20 of the present application is unclear because none of these 4 patents use the term in the same manner as applicant. (Office Acton, page 13, top.) This is wrong.

For example, the Office Action alleges that "Gerding uses the term in claim 1, but Gerding teaches a direct current motor so the applicability to applicant's argument, if any, is unclear." (Emphasis added). Really, this is what is asserted:

Gerding uses the term in claim 1, but Gerding teaches a direct current motor so the applicability to applicant's argument, if any, is unclear. US 4,859,924 to Chonan uses

(PDF snapshot of Office Action, page 13, top.) What is this? Is the problem that Gerding does not teach an alternating current motor? There are two types of motors, correct? Alternating and direct current motors. Can it truly be said that the person of ordinary skill in the art would find "high torque motor" definite, but only with reference to a direct current motor? Of course not.

Indeed, the conclusions about Gerding are conclusory and are nothing more than a compilation of disparate facts.

The other examples on page 13 of the Office Action are similarly meaningless.

Thus, because there is no basis other than a conclusory assertion based on the perceptions of an individual examiner for rejecting claim 20 as indefinite, and the very language asserted to render the claim indefinite is present in 135 issued U.S. patents, and thus presumptively acceptable, a case of indefiniteness against claim 20 has not been established. Withdrawal of the rejection is warranted.

Claim Rejections Under 35 U.S.C. §103

The Office Action has rejected claims 13-17, 23, 28 and 29 as obvious under 35 U.S.C. 103 in view of U.S. Patent Application Publication No. 20100031676 to Urbain in view of U.S. Patent No. 5,107,785 to Kobayashi. In response, Applicant traverses the rejections for at least the reasons that follow.

Claim 13 recites a ***plurality*** of refrigeration systems, ***each of which includes***:

1) at least one compressor,
2) at least one condenser,
3) at least one expansion valve,

4) at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
5) at least one variable frequency driver for power supply of the at least one compressor.

(Claim 13, enumeration added.) That is, "each" refrigeration system includes these five elements. Thus, if there are three (3) refrigeration systems, there are three (3) of the five elements. If there are ten (10) refrigeration systems, there are ten (10) of the five elements, etc.

The Office Action asserts that Urbain teaches a plurality of refrigeration systems based on the disclosure of Urbain of three circuits 19:

> a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20) at least one compressor, (17, Fig. 4) at least one condenser, (18)
>
> at least one expansion valve, (20) at least one evaporator connected in a flow circuit containing a refrigerant, (12)

(PDF Snapshot of Office Action, page 4, top.) Yet the circuits 19 of Urbain do not ***each*** have a compressor 17, a condenser 18, at least one evaporator 12. Instead, Urbain discloses that all three circuits 19 share those elements.

Below is a reproduction of FIG. 4 of Urbain, depicting elements 17, 18, and FIG. 2 of Urbain depicting element 12:

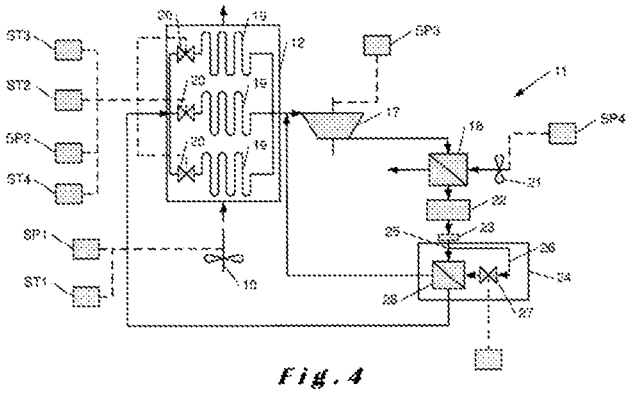


Fig. 4

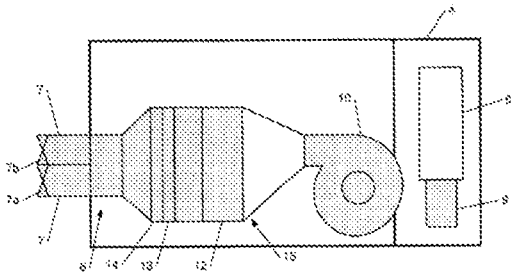


Fig. 2

FIGs. 4 and 2 of Urbain

As can be seen, for the three circuits 19, there is only one compressor 17 and one condenser 18. FIG. 2 only depicts one evaporator 12.

Accordingly, because the scope and content of the prior art has been misapprehended, all of the *Graham v. John Deere* factors have not been met, and, therefore, a *prima facie* case of obviousness has not been established for at least this reason.

* * * * *

Applicant notes the additional arguments at pages 13-14 of Office Action in response to the Applicant's Response of August 11, 2014. The Office asserts the following:

> The office does not agree with applicant's interpretation of claim 13. Under the broadest reasonable interpretation of the claims, in light of the specification, Urbain's three evaporators can be viewed as part of three refrigeration systems, which share a common compressor, condenser, etc. Furthermore, even if the office were to accept

Now the final Office Action is attempting to consider/evaluate the broadest reasonable interpretation of the claims, which was not done in the non-final Office Action of May 9, 2014. Fine, one could argue better late than never. However, when the substance of the Office Action is evaluated, it is clear that we are still in the "never" category.

Specifically, while the words are there, the Office Action still does not follow the MPEP guidelines with respect to claim interpretation, i.e., the broadest reasonable interpretation. MPEP

2111.01(I) states that "under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification" (emphasis added) That is, the Office Action should consider the plain meaning of the words in the claim first, unless the plain meaning is inconsistent with the specification.

Here, the Office Action ignores the plain meaning of the claim – ***each*** refrigeration system has a compressor, a condenser, etc. – and jumps to the specification, BUT NEVER EXPLAINS WHY THE SPECIFICATION SUPPORTS THE INTERPRETATION PROVIDED BY THE EXAMINER. NEVER.

Applicant will now detail the process of proper claim construction, and show why, under the broadest reasonable interpretation, claim 13 means what is clearly written, and not what the Examiner asserts it means.

Specifically, Applicant points to MPEP 2111.01(III) which states that

> [t]he ordinary and customary meaning of a term may be evidenced by a variety of sources, including "**the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art**." *Phillips v. AWH Corp.*, 415 F.3d at 1314, 75 USPQ2d at 1327. If extrinsic reference sources, such as dictionaries, evidence more than one definition for the term, the intrinsic record must be consulted to identify which of the different possible definitions is most consistent with applicant's use of the terms. *Brookhill-Wilk 1*, 334 F. 3d at 1300, 67 USPQ2d at 1137; see also *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250, 48 USPQ2d 1117, 1122 (Fed. Cir. 1998)

(MPEP 2111.01(III), emphasis added.) Applicant now details why (i) the words of the claim, (ii) the specification and (iii) extrinsic evidence prevent the scope given by the following claim recitation: a plurality of refrigeration systems, each of which includes…at least one compressor, at least one condenser, …" from encompassing the disclosed refrigeration system of Urbain.

First, as detailed above, the words of the claim differentiate from Urbain. Applicant recites a plurality of refrigeration systems, each of which includes…at least one compressor, at

least one condenser, etc. Conversely, Urbain discloses a refrigerant system having three circuits 19 sharing a compressor and a condenser.

To be clear, below is how claim 13 must be rewritten to cover Urbain:

> a plurality of refrigeration systems, ~~**each of which includes**~~ **collectively including** … at least one compressor, at least one condenser, …

(Effective rewrite of claim 13 by the USPTO.) Maybe that is in fact a better claim. However, Applicant claimed something else, and that is the claim that must be examined.

The words of the claim do not permit claim 13 to encompass Urbain.

Second, with respect to the specification, the teachings of which are required to be analyzed when construing claim scope, Applicant discloses multiple examples of the plurality of refrigeration systems, including multiple side-views thereof. Indeed, there are at least two different figures depicting the side-view of the plurality of refrigeration systems 36. These are reproduced below.

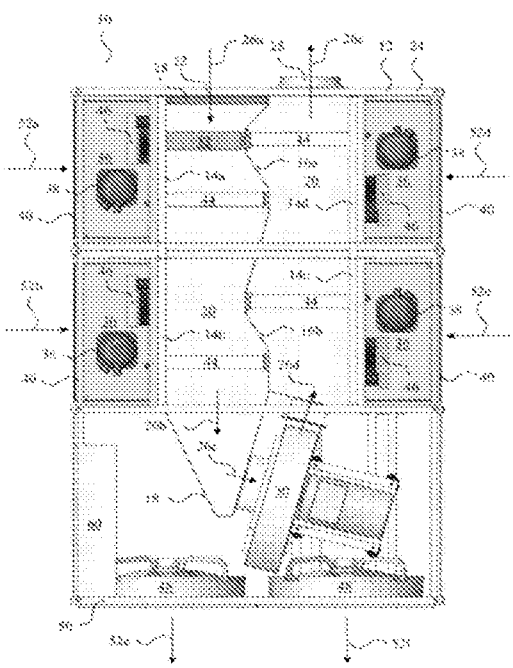


Fig. 1

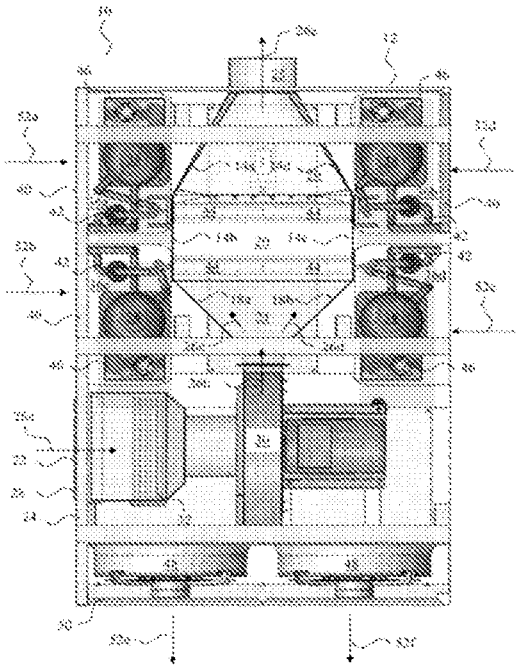


Fig. 8

As may be seen, invariably, each of the side-view in Figs. 1 and 8 depicts a plurality of (i.e., four) refrigerant systems 36 as highlighted in red. And each of the refrigerant systems 36 includes at least a compressor 38 and a condenser 40. That is, four refrigerant systems 36 include four compressors 38 and four condensers 40. This as contrasted to the configuration of the refrigerant system 11 of Urbain as shown in at least Figs. 2 and 4, i.e., the refrigerant system 11 includes three circuits 19 sharing one compressor 17 and one condenser 18. Clearly, the specification depicts a different configuration from that of Urbain.

Third, this different configuration of Applicant's specification is consistent with the dictionary definitions of "each" which Applicant submits is informative to evaluating the scope that would have been given to the term "each" by the person of ordinary skill in the art. Merriam-Webster online Dictionary, defines "each" as "*every one* of two or more people or things considered separately."[1] (Emphasis added.) This definition is consistent with the depictions of the refrigerant system of the figures of Applicant's specification.

All this is in contrast to the configuration of the refrigerant system of Urbain which has 3 circuits sharing one condenser and one compressor. Accordingly, the fundamental assertion on which basically the entire rejection of claim 13 rests is flawed: Urbain does not teach or suggest the recited refrigerant systems. Therefore, all of the *Graham v. John Deere* factors have not been met, and, therefore, a *prima facie* case of obviousness against claim 1 has not been met for this additional reason.

* * * * *

As noted above, the Office Action presents the dichotomy of presenting a rationale to modify Urbain to adjust compressor operation without the need for an unloader device, but then asserts that the Office Action does not assert that Urbain needs an unloader device. Accordingly, the rationale to modify Urbain is flawed based on the very pronouncements in the Office Action.

Yet the Office Action insists on the obviousness of modifying Urbain as follows:

[1] http://www.merriam-webster.com/dictionary/each

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(Rationale to modify Urbain, last Office Action and present Office Action.) Accordingly, Applicant can only proceed on the record established by the USPTO.

Applicant previously traversed the taking of Official Notice above, and the Examiner denies taking such. However, when a fact is asserted by the USPTO without citation to a reference to support that alleged fact, that is Official Notice, whether or not the Examiner calls it official notice, or even whether an Examiner even believes it is Official Notice.

Nowhere on the record is there any evidence that the art recognized that the modification to Urbain would result in the elimination of the need for unloader valves. Nowhere. Granted, the Office Action provides a document that talks about how great variable frequency drives are alleged to be, but the Office Action asserts the obviousness of modifying Urbain "to adjust compressor operation for changing conditions, without need of devices such as unloader valves."

Again, there is no evidence or rationale that such would have been seen by the person of ordinary skill in the art as enabling adjustment of compressor operation without the need of an unloader valve. In this regard, the rationale to modify Urbain is illusory.

Applicant hereby notes that the record is devoid of any evidence that the device of Urbain needs an unloader valve, and that the proffered modification would eliminate such if such was needed, or even that such a modification would not have a deleterious effect on the performance of Urbain. It appears that the Office Action relies on common knowledge in the art, as is discussed and permitted in MPEP § 2144.03, regarding the alleged predictability. This means that the Office Action is taking *official notice* of certain facts allegedly known to the ordinary artisan. However, there are explicit guidelines that must be followed when taking official notice. The "technical line of reasoning underlying a decision to take such notice must be clear and unmistakable." (MPEP § 2144.03(B).) These guidelines are not followed in the Office Action. Indeed, consider the title of § 2144.03(B): "If Official Notice Is Taken of a Fact, Unsupported

by Documentary Evidence, the Technical Line of Reasoning Underlying a Decision To Take Such Notice Must Be Clear and Unmistakable." No technical line of reasoning is proffered whatsoever. Thus, a case of obviousness has not been established in this regard.

Further, Applicant notes that § 2144.03(C) allows an applicant to traverse such an assertion. Specifically, § 2144.03(C) is entitled "If Applicant Challenges a Factual Assertion as Not Properly Officially Noticed or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding With Adequate Evidence." That section states that when an applicant traverses the assertion, "the examiner must provide documentary evidence in the next Office Action if the rejection is to be maintained." (MPEP § 2144.03(C).) Absent a citation by the PTO of a reference that can be evaluated for all its teachings, Applicant hereby traverses the assertion that it would have been common knowledge in the art that the device of Urbain needs an unloader valve, and that the proffered modification would eliminate such if such was needed, and that such a modification would not have a deleterious effect on the performance of Urbain. **Applicant thus requests, relying on § 2144.03, that the PTO cite a reference and exactly identify where such a reference teaches the alleged knowledge in the art, or else allow the claims**.

* * * * *

Also with regard to the rationale to modify Urbain's system with Kobayashi's Variable frequency drivers, the Office Action alleges, in the section of "Response to Applicant's Remarks," at page 14, the following:

> unloader valve, nor did the office take official notice of anything. Anyone wishing to modify the compressor in Urbain to have variable capacity, the motivation being to adjust the compressor for different operating conditions, will have limited options. One of which is an unloader valve, and another of which is the VFD. The benefits of the

As seen above, the Office Action now alleges that "anyone" wishing to modify the compressor in Urbain to have variable capacity, …, will have limited options, one of which is an unloader valve, and another one of which is the VFD. However, the Office Action should evaluate the factual inquires including the level of "a person of ordinary skill" in the pertinent art rather than "anyone."

Additionally, the Office Action relies on the reference "Understanding Variable Speed Drives (Part 2)" (VSD2) to support his rationale applied in the rejection of claim 13, but this cited reference was neither applied nor cited in the rejection of claim 13 in the non-final Office Action. This reference is only applied to the rejection of dependent claim 20, e.g., modifying Urbain in view VSD 2 to provide the features recited in claim 20. The Office Action, in rejecting claim 20, does not even mention that VSD 2 would provide any motivation for one of ordinary skill in the art to modify Urbain with Kobayashi. Therefore, there is a new ground of rejection of claim 13.

Furthermore, the Office Action cites the benefits noted in the VSD 2 reference, e.g., "the variable frequency drive (VFD) is the most effective motor controller in the industry today", and will "enhance process applications, particularly where flow control is involved." However, such benefits are not sufficient to prove that the person of ordinary skill in the art would have the motivation to modify Urbain's refrigerated system to have the VFD of Kobayashi. As discussed in the previous Amendment, the components used in Kobayashi alleged to be obvious to incorporate into Urbain are used for conversion of commercial power into a variable-frequency AC. (Kobayashi, Abstract.) However, Urbain uses an on-board diesel generator, consistent with the fact that it is a portable and mobile air-conditioning unit.

[0049] The unit **1** also comprises, inside the body **4**, a diesel engine **8** coupled to an electrical generator **9** in order to provide the supply of electricity to the various elements of the unit **1**, a variable-speed centrifugal fan **10** to distribute air to the aircraft, a refrigerant circuit **11** (depicted in FIG. **4**) with an exchanger/evaporator **12** for cooling the air, electric heating means **13** with a plurality of electric elements, and a complementary heat exchanger **14** connected to the cooling circuit of the diesel engine **8**.

(Urbain, paragraph 0049.) Thus, there is no need for the components of Kobayashi in Urbain. This is no trivial matter, as Urbain is used to provide air-conditioning to parked aircraft on tarmacs remote from power sources.

Thus, claim 13 is not obvious for this additional reason.

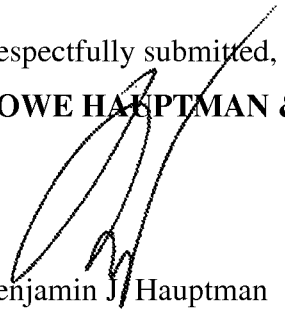
In summary, no claim is obvious because claim 13 is not obvious. Withdrawal of all rejections is warranted.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & HAM, LLP



Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: December 17, 2014
BJH:CHY/tal

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/257,669	Filing Date 09/20/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **12/17/2014**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/LYNNELL JOHNSON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 01/29/2015

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
01/29/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 13/257,669	**Applicant(s)** DAHL ET AL.	
	Examiner HENRY CRENSHAW	**Art Unit** 3744	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 17 December 2014 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☒ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☐ Other: _____.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed: .
    Claim(s) objected to: .
    Claim(s) rejected: 13-29.
    Claim(s) withdrawn from consideration: .

/M. Alexandra Elve/ Supervisory Patent Examiner, Art Unit 3744	/HENRY CRENSHAW/ Examiner, Art Unit 3744

Applicant requested that the examiner discuss this case with his supervisor. Although the office is not required to comply with this request, as a courtesy to applicant, the examiner and his SPE discussed the merits of applicant's after final response on 12/30/2014.
As a result of the discussion, the finality of the rejection is maintained.

The office has correctly construed the limitation "refrigeration systems" and correctly determined that such limitation is taught by Urbain, as described in the final rejection. In response to applicant's comment, "of course there is absolutely no evaluation of how the specification supports that broadest reasonable interpretation", it is noted that the features upon which applicant relies (e.g., a separate compressor for "each" system) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

At page 6 applicant argues the "Examiner Is Contradicting His Own Assertions Regarding the Rationale to Modify the Primary Reference In a Material Manner, Thus Making Clear That a Prima Facie Case Of Obviousness Has Not Been Established". However, Applicant's PDF snapshot of the material found at page 14 of the final rejection is taken out of context and reproduces only a portion of the office's comments.

At page 7 applicant "Requests Clarification of Whether The Office Action is Rejecting Claim 13 on The Assertions Pertaining to Duplication of Parts on pages 13-14 - If the Duplication of Parts is Indeed a Grounds for Rejection - this Office Action Should be Reissued as a Non-Final Office Action". The comments made in the final office action regarding a duplication of parts is not a new grounds of rejection. These comments, made in the response to applicant's remarks section of the final rejection, advise applicant on how the claims would be rejected if applicant's interpretation of the limitation "refrigeration systems" were accepted by the office, which it is not.

At page 8, regarding the rejection of claim 13 under §112, Second Paragraph, applicant's reply reads in part:
"With respect to claim 13, the Office Action asserts the following:
it is unclear if the vfd for the compressor is to be included in the vfds of the
plurality of refrigeration systems.
(Office Action, page 2, bottom.) Stop. There is nothing unclear about claim 13.
First, as a preliminary matter, Applicant does not recite "vfd" anywhere in the claim.
Second, claim 13 is pretty simple. Claim 13 recites a plurality of X, each of which (i.e., each X) has a Y and a Z for Y, where X is the refrigeration system, Y is the at least one compressor, and Z is the variable frequency driver. . . ."

The office acknowledges that the term "vfd" does not appear in the claims. Although not recognized by applicant, the term "vfds" does not appear in the claims either. However, in the interest of advancing prosecution, the final rejection offered a proposed amendment to this claim that might capture applicant's intended meaning. Given (at least), that the proposed amendment includes the literal claim language "variable frequency drivers", the final rejection is clear enough for anyone to understand that vfd and vfds are obviously being used as acronyms in lieu of the literal claim language "variable frequency driver" and "variable frequency drivers" (in a manner analogous to applicant's use of "X" and "Y", in lieu of the literal claim language, when striving to explain its position regarding the meaning of claim 13).
The office can find no authority anywhere stating that a claim's meaning is definite because the claim is "pretty simple".
Applicant's arguments regarding this rejection are not persuasive.

At page 9, regarding the rejection of claim 20 under §112, Second Paragraph, applicants reply reads in part:
"First, the Office Action does not provide any reasoning why MPEP 2173.05, which specifically states that the "fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite," is not persuasive. As with the indefiniteness rejection itself, the response to arguments is conclusory."
Applicant's comment does not address the rejection of claim 20 as stated. The "reasoning" sought by applicant is plainly stated in the rejection in the form of a simple question, namely, does the torque remain at the same "high" torque throughout the frequency range? For example, if 2 ft-lbs is a "high" torque at a low frequency, will 2 ft-lbs also be a "high" torque at relatively a higher frequency? The office is not obligated to query the applicant regarding all possible meanings of an indefinite claim, but additional questions could include, is "high" torque a variable quantity that varies with the frequency? Is "high" torque a specific value that depends on the motor and VFD specifications, or upon the applications for which such device is used?

Applicant next asserts that:
"The "essential inquiry" has not been made in rejecting the claims as indefinite.
Nowhere in the rejections under 35 U.S.C. 112, second paragraph is there reference to or an evaluation of (A) the content of the specification of the present application, (B) the teachings of the prior art, and (C) the interpretation of the claims that would be given by the person of ordinary skill in the art. The Office Action tries to consider the claimed "high motor torque" in the light of the specification; however, the "essential inquiry" also includes evaluation of the interpretation of the claims that would be given by the person of ordinary skill in the art."
The first portion of this argument states that none of the three elements (A), (B) and (C) of the "essential inquiry" are documented by the final rejection, while the remainder of the argument states that only the "person of ordinary skill" element is undocumented. In any event, the office is not aware of any requirement that the three elements be enumerated as line items in a rejection. The claims have been properly construed, and the result is the rejection under 35 USC 112.

At page 10 applicant next returns to its arguments about the use of the term "high motor torque" in US patent applications. This originated in applicant's response to the non-final rejection, where applicant asserted the limitation is used in 135 issued US patents, so its meaning must be well known to those skilled in the art. The office has pointed out that only four of these patents use the term in the claims, and that they are different from applicant's claimed invention because of the motor types and their end uses.
Applicant disputes this assertion with respect to the Gerding reference. However, applicant has not provided any rationale whatsoever establishing why the Gerding patent, entitled "Vehicle Seat Arrangement With an Electric Adjustment Mechanism," and particularly with its teachings on the DC motor control characteristics described therein, bears any relevance at all to applicant's claim for a control scheme

"wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range".

As a final note on this argument, the office's comments on the four patents were made in rebuttal to applicant's position that the term "high motor torque" is well known to those skilled in the art because of its use in issued patents. Even if applicant can establish that there is a generally accepted meaning known in the art, applicant will still need to describe how such meaning would be applied to answer the questions enumerated earlier in this action, which relate to the meaning of the term as used by applicant in the claims.
The applicant dismisses the other three patents as 'similarly meaningless" but fails to say why. The applicant's arguments regarding claim 20 are not persuasive.

35 USC 103 Rejection
Pages 11-16 of the reply provide a comparison of the application with Urbain and discusses MPEP sections setting out the approach to claim construction, then concludes that the office has not correctly construed the limitation "refrigeration system". Some of the arguments are duplicative of those previously addressed above in this action, and the others do not provide any reasons for the office to revise its interpretation of the limitation. Applicant is reminded that the office will not import limitations from the specification into the claims.
Some responses to certain arguments/comments made by applicant are listed below.

"Page 13: Now the final Office Action is attempting to consider/evaluate the broadest reasonable interpretation of the claims, which was not done in the non-final Office Action of May 9, 2014. Fine, one could argue better late than never. However, when the substance of the Office Action is evaluated, it is clear that we are still in the "never" category."
In response to this argument, the office uses the "broadest reasonable interpretation" when construing the claims in all office actions, non-final or final, and believes most applicants are aware of this fact, but on occasion feels it is appropriate to remind applicants of this fact.

Page 14 and 16 – applicant focuses on the meaning of the word "each". In response, "each" refrigeration system in Urbain has a compressor and a condenser. They "each" have the same compressor and condenser. The claims as currently drafted do not exclude the refrigeration systems of Urbain, and the office will not import limitations from the specification into the claims so as to distinguish them from the prior art.

At pages 16-18 the applicant revisits its "unloader valve" argument for a second time, and asserts that the office is taking official notice, which the office denies. As an initial matter, the office notes that applicant has duplicated a portion of the rejection at the top of page 17 of the reply, but the arguments at pages 16-18 of the reply do not address the explanatory comments contained in the remarks section of the final rejection. These omitted comments are duplicated here.

"Regarding applicant's arguments about the stated motivation of using a VFD so that an unloader valve is not needed, the office never asserted that Urbain needs an unloader valve, nor did the office take official notice of anything. Anyone wishing to modify the compressor in Urbain to have variable capacity, the motivation being to adjust the compressor for different operating conditions, will have limited options. One of which is an unloader valve, and another of which is the VFD. The benefits of the VFD are noted in "Understanding Variable Speed Drives (Part 2)", which states "the variable frequency drive (VFD) is the most effective motor controller in the industry today", and will "enhance process applications, particularly where flow control is involved." Consequently the office maintains that the rejection is proper."

Applicant next asserts:
"Nowhere on the record is there any evidence that the art recognized that the modification to Urbain would result in the elimination of the need for unloader valves. Nowhere. Granted, the Office Action provides a document that talks about how great variable frequency drives are alleged to be, but the Office Action asserts the obviousness of modifying Urbain "to adjust compressor operation for changing conditions, without need of devices such as unloader valves."
For a second time in the after final response, applicant has failed to acknowledge and address the comments made by the office in the final rejection. The "evidence" that Urbain does not need an unloader valve is the fact that it has been modified in view of Kobayashi, to achieve variable capacity, by adding a variable frequency driver. Applicant's continued insistence, that a system modified to include a variable frequency driver also needs an unloader valve to perform a duplicate function, is not persuasive.

At pages 18 to 20 applicant argues that it is improper to combine Urbain and Kobayashi.
At page 19 applicant argues:
"As seen above, the Office Action now alleges that "anyone" wishing to modify the compressor in Urbain to have variable capacity ..... will have limited options, one of which is an unloader valve, and another one of which is the VFD. However, the Office Action should evaluate the factual inquires including the level of "a person of ordinary skill" in the pertinent art rather than "anyone."

However, the office used the proper standard when construing the claims and determining obviousness.
At page 19 applicant also argues:
"The Office Action, in rejecting claim 20, does not even mention that VSD 2 would provide any motivation for one of ordinary skill in the art to modify Urbain with Kobayashi. Therefore, there is a new ground of rejection of claim 13."
However, this mischaracterizes the rejection. The motivation for combining Urbain and Kobayashi that is stated in the final rejection is based on the teachings of Kobayashi. The VSD 2 reference was mentioned in the office action remarks, as part of the response to applicant's arguments regarding the unloader valve.

At page 19-20, applicant argues:
"As discussed in the previous Amendment, the components used in Kobayashi alleged to be obvious to incorporate into Urbain are used for conversion of commercial power into a variable-frequency AC. (Kobayashi, Abstract). However, Urbain uses an on-board diesel

generator consistent with the fact that it is a portable and mobile air-conditioning unit. . . . . Thus, there is no need for the components of Kobayashi in Urbain. This is no trivial matter, as Urbain is used to provide air-conditioning to parked aircraft on tarmacs remote from power sources."

However, it is not clear what basis applicant has for asserting that AC power from diesel generator would have to be controlled in a manner different from AC power from a commercial power source. Consequently, this argument is not persuasive.

Do not enter - HTC - 1/2/2014

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (previously presented) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
a plurality of refrigeration systems, each of which includes
at least one compressor,
at least one condenser,
at least one expansion valve,
at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the
at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of the at least one compressor, and
a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (**currently amended**) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one ~~**condensor**~~ **condenser** fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

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16. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (previously presented) A preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (previously presented) A preconditioned air unit according to claim 17, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

23. (previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according

to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
713-2354 (22664-US)	13/257,669	2011-09-20
First Named Inventor:	**Title:**	
Soren Risgaard DAHL	A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:

- Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
- The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
  - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
  - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
    - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
    - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date
/Benjamin J. Hauptman/	2015-04-06
Name (Print/Typed) Benjamin J. Hauptman	**Practitioner Registration No.** 29310

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.*

☐ * Total of _____ forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (currently amended) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the

at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems,

wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;

wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;

wherein at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;

wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and

wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

14. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

16. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (cancelled)

18. (cancelled)

19. (currently amended) A preconditioned air unit according to ~~claim 17~~ claim 13, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (cancelled)

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Exhibit 1002
Page 317

21. (currently amended) A preconditioned air unit according to ~~claim 17~~ claim 13, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (cancelled)

23. (previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (cancelled)

25. (cancelled)

26. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

30. (new) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating

a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,

a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

REMARKS

In response to the Office Action mailed November 4, 2014, and the subsequent Advisory Action, Applicant herby files this amendment, and respectfully requests reconsideration. Based upon the following Remarks, Applicant respectfully requests that all outstanding rejections be reconsidered, and that they be withdrawn.

Interview of March, 2015

Applicant thanks Examiner Krenshaw for extending the courtesy of an interview to Applicant's representative, Martin Cosenza (Reg. No. 48,892), in which various issues were discussed, and the above amendment was discussed.

Examiner Krenshaw is invited to contact Martin Cosenza at 703-535-7341, if it is believed that additional amendments are warranted.

Claim Rejection Under §112, Second Paragraph

The Office Action has rejected claims 13-29 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failure to particularly point out and distinctly claim the subject matter which application regards as the invention. In response, Applicant has amended the claim language with the incorporation of claim 20 into claim 13, but traverses the rejection of claim 13 for the reasons previously articulated, but will amend the claims in the event that the claims are deemed allowable in view of the prior art.

Claim Rejections Under 35 U.S.C. §103

The Office Action has rejected claims 13-17, 23, 28 and 29 as obvious under 35 U.S.C. 103 in view of U.S. Patent Application Publication No. 20100031676 to Urbain in view of U.S. Patent No. 5,107,785 to Kobayashi. In response, Applicant hereby amends the claims as seen above, and requests reconsideration in view of the above.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: April 6, 2015
BJH:MJC/tal/klj

Electronic Acknowledgement Receipt

EFS ID:	21985399
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Kindra Johnson
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	06-APR-2015
Filing Date:	20-SEP-2011
Time Stamp:	20:14:39
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$600
RAM confirmation Number	7148
Deposit Account	071337
Authorized User	HAUPTMAN, BENJAMIN J.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		F-Amendment.pdf	106827 c1f5e4cd9cb59e5e0db0c5193eec05874ded682d	yes	7

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Response After Final Action	1	1
Claims	2	5
Applicant Arguments/Remarks Made in an Amendment	6	7

Warnings:					
Information:					
2	After Final Consideration Program Request	F-AFCP.pdf	226105 a648995336fcddfc875cb973c7ccddcf8ba27806	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31300 7369f0344666c3c6bf029a1c33c82d24c713f41c	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	364232		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	EXPEDITED PROCEDURE
	:	Response under 37 CFR 1.116
Soren Risgaard DAHL et al.	:	
	:	
U.S. Patent Application No. 13/257,669	:	Confirmation No. 9301
	:	Art Unit: 3744
Filed: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

AMENDMENT

MAIL STOP: AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the Final Rejection mailed November 4, 2014, and the subsequent Advisory Action, Applicants submit the following:

Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman/Kindra Johnson
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	1252	1	600	600
Miscellaneous:				
			Total in USD ($)	**600**

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/257,669	Filing Date 09/20/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **04/06/2015**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/BURNELL L. ROSS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 04/06/2015

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
04/06/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	13/257,669	DAHL ET AL.	
	Examiner	Art Unit	
	HENRY CRENSHAW	3744	

All participants (applicant, applicant's representative, PTO personnel):

(1) *HENRY CRENSHAW*. (3)-.

(2) *MARTIN COSENZA*. (4)-.

Date of Interview: *18 March 2015*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *all*.

Identification of prior art discussed: *all*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

See Continuation Sheet.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/HENRY CRENSHAW/ Examiner, Art Unit 3744	/M. Alexandra Elve/ Supervisory Patent Examiner, Art Unit 3744

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Applicant advised that it needed guidance on what types of amendments might be made in order to gain allowance, or to at least consider filing an AFCP 2.0 request, and asked if a formal interview could be scheduled for this purpose. The office offered to review the application and pass along any suggestions as part of this interview summary, to which the applicant agreed in lieu of another interview.
As an initial matter, all 112 rejections must be resolved without broadening the patentable scope of the claims. However, when addressing the rejection of claim 20, applicant should consider whether the phrase "to maintain a high motor torque throughout the entire output frequency range" needs to be retained, since this appears to be a statement of an intended result based on the voltage/frequency ratio rather than a positive structural recitation.
Applicant should consider combining claim 1 with claims 18, 20, 22, 24 and 25. While this will satisfy the AFCP 2.0 requirement for a narrowed claim, the office cannot ensure that this will result in an allowable claim without further searching in view of the new combination of the cited art. Applicant should review the specification for additional limitations that may be added, in particular regarding claims 24 and 25. The proposed amendments will have to be seen in writing before the office can determine if additional searching can be performed in the 3 hours allotted under AFCP 2.0.
Applicant should also consider any art cited in corresponding foreign applications not cited in the US case.
.

Electronic Acknowledgement Receipt

EFS ID:	22238577
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	04-MAY-2015
Filing Date:	20-SEP-2011
Time Stamp:	08:50:31
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1600
RAM confirmation Number	8339
Deposit Account	071337
Authorized User	HAUPTMAN, BENJAMIN J.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notice of Appeal Filed	2015-05-04-NOAppeal.pdf	210721 4c89e43dfaeb6957a4edf90c3f6c00ae11fa39aa	no	2
Warnings:					
Information:					
2	Extension of Time	2015-05-04-EOT.pdf	186677 d44b6833a6d64998f3f04d7520644dcfe6326a74	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	33140 beb1fcd16f84beb94ada6a8b056765b59f222d31	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	430538		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
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PTO/SB/31 (02-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional)
713-2354 (22664-US)

I hereby certify that this correspondence is being facsimile transmitted to the USPTO EFS-Web transmitted to the USPTO, or or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)]

on May 4, 2015

Signature /Tracy A. Luke/

Typed or printed name Tracy A. Luke

In re Application of
Soren Risgaard DAHL

Application Number	Filed
13/257,669	2011-09-20

For PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Art Unit	Examiner
3744	Henry T. CRENSHAW

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 800.00

☐ Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by half, and the resulting fee is: $ _____

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 071337 .

☑ A petition for an extension of time under 37 CFR 1.136(a) (PTO/SB/22) is enclosed.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest.
See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed.
(Form PTO/SB/96)

☑ attorney or agent of record. Registration number 29,310.

☐ attorney or agent acting under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34. _____

/Benjamin J. Hauptman/
Signature

Benjamin J. Hauptman
Typed or printed name

703-684-1111
Telephone number

May 4, 2015
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required.
Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 41.31. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman/Tracy Luke
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Notice of Appeal	1401	1	800	800
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Extension - 3 months with $600 paid	1253	1	800	800
Miscellaneous:				
			Total in USD ($)	**1600**

PTO/SB/22 (03-13)
Approved for use through 3/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 713-2354 (22664-US)

Application Number: 13/257,669

Filed: September 20, 2011

For: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Art Unit: 3744

Examiner: Henry T. CRENSHAW

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 800.00
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 071337.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration number 29310.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Benjamin J. Hauptman/ — Signature

May 4, 2015 — Date

Benjamin J. Hauptman — Typed or printed name

703-684-1111 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	22252765
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	04-MAY-2015
Filing Date:	20-SEP-2011
Time Stamp:	23:55:39
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$240
RAM confirmation Number	7927
Deposit Account	071337
Authorized User	HAUPTMAN, BENJAMIN J.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	31312 e4dcfa8f101c1203d971ca37e00b9c899a261a17	no	2

Warnings:

Information:

Total Files Size (in bytes):	31312

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman/Tracy Luke
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1615	3	80	240
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**240**

REMARKS

Applicant amended the claim set via an AFCP 2.0 on April 7, 2015. As of this writing, Applicant has been given no formal response on the record thereto.

Applicant thus presumes that the amendments filed with the AFCP 2.0 have not been entered. In which case, this paper is superfluous and should be ignored.

However, in the procedural event that the amendments filed with the AFCP 2.0 were entered, Applicant thus retracts the amendments by this paper, and takes the claims to appeal based on their status prior to the AFCP 2.0.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: May 4, 2015
BJH:MJC/tal

Electronic Acknowledgement Receipt

EFS ID:	22252676
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	04-MAY-2015
Filing Date:	20-SEP-2011
Time Stamp:	23:32:48
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2015-05-04-Second_Supplemental_Amendment.pdf	105317 71b5287b5a83e2cc627bbd99d080847c9b8885ba	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Supplemental Response or Supplemental Amendment	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	7
Warnings:			
Information:			
	Total Files Size (in bytes):	105317	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
	:	
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
	:	
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
	:	
Filed: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

SUPPLEMENTAL RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Supplemental to the paper filed on April 7, 2015, Applicant submits the following:

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (Currently amended) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
a plurality of refrigeration systems, each of which includes
at least one compressor,
at least one condenser,
at least one expansion valve,
at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the
at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of the at least one compressor, and
a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems~~,~~

~~wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;~~

~~wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;~~

~~wherein at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;~~

~~wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and~~

~~wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.~~

14. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

16. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (Currently amended) A preconditioned air unit according to ~~claim 13~~ claim 31, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

Dabico
Exhibit 1002
Page 350

20. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (Currently amended) A preconditioned air unit according to ~~claim 17~~ claim 31, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

23. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (Previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

Dabico
Exhibit 1002
Page 351

27. (Previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (Previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (Previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

30. (Cancelled)

31. (New) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

32. (New) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

33. (New) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

34. (New) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

Dabico
Exhibit 1002
Page 352

35. (New) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

36. (New) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

Dabico
Exhibit 1002
Page 353

AFCP 2.0 Decision	Application No.	Applicant(s)
	13/257,669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

This is in response to the After Final Consideration Pilot request filed 06 April 2015.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

   ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.

   ☐ A non-broadening amendment to at least one independent claim was not submitted.

   ☐ A proper AFCP 2.0 request was submitted in response to the most recent final rejection.

   ☐ Other:

2. **Proper Request**

   A. After final amendment submitted with the request will not be treated under AFCP 2.0.
   The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

   ☐ The after final amendment will be treated under pre-pilot procedure.

   B. Updated search and/or completed additional consideration.
   The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

   ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.

   ☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action. See attached interview summary for further details.

   ☒ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.

   ☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.

   ☐ 5. Other:

   Examiner Note: Please attach an interview summary when necessary as described above.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (currently amended) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the

at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems,

wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;

wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;

wherein at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;

wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and

wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

14. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

16. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (cancelled)

18. (cancelled)

19. (currently amended) A preconditioned air unit according to ~~claim 17~~ claim 13, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (cancelled)

21. (currently amended) A preconditioned air unit according to ~~claim 17~~ claim 13, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (cancelled)

23. (previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (cancelled)

25. (cancelled)

26. (previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

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30. (new) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating

a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,

a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	13/257,669	DAHL ET AL.	
	Examiner	Art Unit	
	HENRY CRENSHAW	3744	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Henry Crenshaw*. (3)-.

(2) *Martin Cozenza*. (4)-.

Date of Interview: *24 April 2015*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: *6,414,455*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The office contacted the applicant's attorney to discuss the proposed amendments and the results of the prior art search. The proposed amended claims are rejectable based on the art already cited, except that the reference "Understanding Variable Speed Drives" will be replaced by US 6,414,455 to address the limitation regarding a constant ratio of volatage to frequency..

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/HENRY CRENSHAW/ Examiner, Art Unit 3744	/M. Alexandra Elve/ Supervisory Patent Examiner, Art Unit 3744

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 05/07/2015

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
05/07/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	13/257,669	DAHL ET AL.	
	Examiner	Art Unit	
	HENRY CRENSHAW	3744	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Henry Crenshaw*. (3) -.

(2) *Martin Cozenza*. (4) -.

Date of Interview: *24 April 2015*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: *6,414,455*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The office contacted the applicant's attorney to discuss the proposed amendments and the results of the prior art search. The proposed amended claims are rejectable based on the art already cited, except that the reference "Understanding Variable Speed Drives" will be replaced by US 6,414,455 to address the limitation regarding a constant ratio of volatage to frequency..

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☐ Attachment

/HENRY CRENSHAW/ Examiner, Art Unit 3744	/M. Alexandra Elve/ Supervisory Patent Examiner, Art Unit 3744

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 13/257,669	**Applicant(s)** DAHL ET AL.	
	Examiner HENRY CRENSHAW	**Art Unit** 3744	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 06 April 2015 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☒ Other: PTOL 2323, Interview Summary.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed: .
    Claim(s) objected to: .
    Claim(s) rejected: 13-16, 19, 23, 26-30 .
    Claim(s) withdrawn from consideration: .

/M. Alexandra Elve/ Supervisory Patent Examiner, Art Unit 3744	/HENRY CRENSHAW/ Examiner, Art Unit 3744

Continuation of 3. NOTE: The proposed amended claims are rejectable based on the art already cited, except that the reference "Understanding Variable Speed Drives" will be replaced by US 6,414,455 to address the limitation regarding a constant ratio of volatage to frequency.

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Page 363

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 07/07/2015

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
07/07/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address : COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/257,669	20 September, 2011	DAHL ET AL.	713-2354 (22664)

LOWE HAUPTMAN & HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
HENRY CRENSHAW	
ART UNIT	PAPER
3744	20150615

DATE MAILED: 15 June, 2015

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

In response to the comments filed 5/04/2015 with the Notice of Appeal, the claims filed Dec. 17, 2014 and entered by the advisory action on January 29, 2015, are the claims that will be pending on the appeal.

/M. Alexandra Elve/ Supervisory Patent Examiner, Art Unit 3744	/HENRY CRENSHAW/ Examiner, Art Unit 3744

PTO-90C (Rev.04-03)

Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman/Tracy Luke
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
			Total in USD ($)	**200**

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
	:	
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
	:	
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
	:	
Filed: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Appeal Brief Under 37 C.F.R. §41.37

MS BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

This appeal brief under 37 CFR §41.37 concerns the appeal under 35 U.S.C. §134 of the Final Office Action dated November 04, 2014. It is proper as it was filed with the required fee under BdR 20(b)(2).

The fee for an extension of time for filing this brief accompanies this Appeal Brief.

The Board has jurisdiction under 35 U.S.C. §134(a).

BdR 37(c)(1)(i). Statement of the real party in interest

The real party in interest is AXA POWER APS the assignee of the inventor's entire interest is recorded at Reel/Frame No. 026933-0396.

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BdR 37(c)(1)(ii). Statement of related cases

None.

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BdR 37(c)(1)(iii). Summary of claimed subject matter

Claim 13 is the rejected independent claim that Appellants appeals. The concise summary refers to the specification by page and paragraph and to the drawing, if any, by reference characters as indicated between curly brackets ({…}) per BdR 37(c)(1)(iii).

Claim 13 reads as follows:

13. A preconditioned air unit {Fig. 1, element 10; specification, page 6, last full paragraph} for supplying preconditioned air to an aircraft parked on the ground { specification, page 6, last full paragraph}, the preconditioned air unit comprising a housing {Fig. 1, element 12; specification, page 6, last full paragraph} accommodating

a flow duct {Fig. 1, element 20; specification, page 6, pages 6-7, paragraph spanning } with an air inlet {Fig. 1, element 22; specification, page 6, pages 6-7, paragraph spanning} for ambient air and an air outlet {Fig. 1, element 25; specification, page 6, pages 6-7, paragraph spanning}for connection to the parked aircraft,

a blower {Fig. 1, element 30; specification, pages 6-7, paragraph spanning } connected with the flow duct for generation of an air flow from the air inlet toward the air outlet{specification, pages 6-7, paragraph spanning },

a plurality of refrigeration systems, each of which includes {specification, page 7, third full paragraph}

at least one compressor {Fig. 1, element 38; specification, page 7, third full paragraph},

at least one condenser {Fig. 1, element 40; specification, page 7, third full paragraph},

at least one expansion valve {Fig. 1, element 42; specification, page 7, third full paragraph},

at least one evaporator connected in a flow circuit containing a refrigerant {Fig. 1, element 44; specification, page 7, third full paragraph}, and wherein the at least one

evaporator interacts with the air flow in the flow duct {specification, page 7, third full paragraph}, and

at least one variable frequency driver {Fig. 1, element 46; specification, page 9, third full paragraph} for power supply of the at least one compressor { specification, page 7, third full paragraph}, and

a central controller {Fig. 1, element 60; specification, paragraph spanning page 10-11, third full paragraph} that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

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BdR 37(c)(1)(iv). Argument

I. ARGUMENT - Overview

The Final Office Action of November 4, 2014, rejects claims 13 and 20 as being indefinite, and all claims as being obvious under 35 U.S.C. 103 in view of U.S. Patent Application Publication No. 20100031676 to Urbain in view of U.S. Patent No. 5,107,785 to Kobayashi variously alone and with other references.

The following issues are presented:

1. A prima facie case of obviousness has not been established as a matter of procedure – failure to follow procedures in establishing the broadest reasonable interpretation.
2. A prima facie case of obviousness has not been established as a matter of substance – misapprehension of the teachings of the prior art bars all of the Graham factors from having been met.
3. Substantively, a prima facie case of obviousness has not been established because no reasonable articulated rationale to modify the prior art has been proffered
4. Procedurally, a prima facie case of obviousness has not been established because no reasonable articulated rationale to modify the prior art has been proffered
5. A prima facie case of indefinites has not been established against claim 13 as a matter of procedure.

6. A prima facie case of indefinites has not been established against claim 13 as a matter of substance.

7. A prima facie case of indefinites has not been established against claim 20 as a matter of substance.

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Exhibit 1002
Page 374

II. PRELIMINARY OBSERVATIONS

Appellant appeals this case as a last resort.

Appellant has repeatedly explained the below to the Examiner, and even filed an AFCP 2.0 request with amendments in an attempt to avoid having to waste their money on appeal, all for naught.

Appellant has interviewed the Examiner, with a completely inappropriate result.

There are many errors in the examination of this application, but Appellant focuses on the most clear error (the rest are detailed below). Briefly, the Examiner asserts that the broadest reasonable interpretation of "a plurality of refrigeration systems, ***each of which includes***" X and Y, encompasses a disclosure of refrigeration systems which communally share a common X and Y. To ensure that there is no question as to how Appellant characterizes the position of the examiner, the below statement is a PDF snapshot from the Office Action to address claim 13

> The office does not agree with applicant's interpretation of claim 13. Under the broadest reasonable interpretation of the claims, in light of the specification, Urbain's three evaporators can be viewed as part of three refrigeration systems, which share a common compressor, condenser, etc. Furthermore, even if the office were to accept

(PDF snapshot, Office Action, page 13, bottom, emphasis added.) The language of claim 13 is as follows:

> a plurality of refrigeration systems, ***<u>each</u> of which includes***
>
> at least one compressor,
>
> at least one condenser,
>
> at least one expansion valve,

at least one evaporator . . . .

(Claim 13, emphasis added.) The interpretation of claim 13 is wrong, and is an affront to Applicant.

Of course, there is absolutely no evaluation of how the specification supports that broadest reasonable interpretation.

The rejections are both procedurally and substantively flawed. The above has been repeatedly explained to the Examiner.

III. A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED AGAINST ANY CLAIM AS A MATTER OF PROCEDURE

The denial of a patent to Appellant is founded upon an error that is quite often made by the Examination Corps in that the broadest reasonable interpretation standard is replaced with mere unsubstantiated assertions about the prior art as a substitute for claim evaluation procedure.

More specifically, proper procedures for claim construction are not followed, and thus every rejection is arbitrary and capricious, and, therefore, defective pursuant to the Supreme Court's precedent in *Zurko*.

35 U.S.C. 102 states that "[a] person shall be entitled to a patent, unless." The default is the award of a patent. It is the Examiner's burden to prove / establish "the unless," not Appellant's burden to establish that it is entitled to a patent. That right has been vested in Appellant by two different U.S. Congresses by passage of the 1952 Patent Act and the AIA legislation. Both Acts recited "shall be entitled to a patent."

Nowhere on the record does the Examiner develop the broadest reasonable interpretation of the claim phrases pursuant to proper procedure. Not once. In fact, nowhere does the Examiner even explain the broadest reasonable interpretation of any claim phrase at issue. Instead, there is simply assertions about the teachings in the prior art, followed by a decree that the broadest reasonable interpretation in view of the specification encompasses such art. No analysis of why this is the case is provided. (Below, Appellant explains why the assertions are not correct. This section of the Appeal is dedicated to the procedural defects in the rejections.)

The Examiner has not established the broadest reasonable interpretation of the claims, or even attempted to explain why Appellant's interpretation thereof is wrong, and thus the USPTO

has not established a *prima facie* case of obviousness. The failure to establish the broadest reasonable interpretation per USPTO procedure renders the denial of a patent to Appellant arbitrary and capricious, which is a violation of the Administrative Procedures Act to which the USPTO is bound per the Supreme Court's decision *Zurko*.

A. Proper Procedure at the USPTO For Developing The Broadest Reasonable Interpretation

The USPTO publishes the Manual of Patent Examination Procedure (MPEP), which the Examiner must follow when examining patent applications. Nowhere is the MPEP addressed in the Final Office Action, except to state that he is ignoring Appellant's arguments regarding the MPEP.

Appellant points to MPEP §2111, which states that "[t]he Patent and Trademark Office ('PTO') determines the scope of claims in patent applications **not solely on the basis of the claim language**, but upon giving claims their broadest reasonable construction '**in light of the specification as it would be interpreted by one of ordinary skill in the art**.'" (MPEP §2111.01(II), emphasis added, case citations omitted). Further, the MPEP makes clear that claims "are not to be read in a vacuum, and **limitations therein are to be interpreted in light of the specification** in giving them their 'broadest reasonable interpretation.'" (MPEP §2111.01(II), emphasis added, case citations omitted.) Based on the above, Appellant will now prove that the record does not support a finding that USPTO procedure was followed when it denied Appellant a patent. This is well settled in the case law as well.

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1. Preliminary Matter: Nowhere is the broadest reasonable interpretation identified by Art Unit 3744

Nowhere does Art Unit 3744 identify the broadest reasonable interpretation of any of the claim langue contested by Appellant. Nowhere. This despite the fact that Appellant detailed why specific recitations of the claims prevent the claims from encompassing the cited art.

Appellant challenges Art Unit 3744 to cite the location on the record where it stated the broadest reasonable interpretation.

Granted, there is this statement below, but this is not a statement of the broadest reasonable interpretation. It is simply a restatement of what the art teaches, coupled with an allegation that it corresponds to the claims.

> The office does not agree with applicant's interpretation of claim 13. Under the broadest reasonable interpretation of the claims, in light of the specification, Urbain's three evaporators can be viewed as part of three refrigeration systems, which share a common compressor, condenser, etc. Furthermore, even if the office were to accept

(Office Action, page 13, bottom.)

As seen above, the rejections are based solely on what is taught in the art. Because the rejections sound only in assertions relating to the teachings of the prior art, without any claim construction whatsoever, the rejections are not supported as a matter of procedure.

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2. Use of the forbidden "solely on the basis of the claim language."

The rejections are clearly based "solely on the basis of the claim language." Consider the Response to Arguments in the Final Office Action, presented in PDF snapshot format to ensure that there is no issue as to how Appellant characterizes the Office Action:

> a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20) at least one compressor, (17, Fig. 4) at least one condenser, (18)

(Office Action, page 4.) Now here is Appellant's characterization: "it is because I say it is." This is tantamount to eviscerating this claim phrase "each of which."

Appellant hereby requests that Art Unit 3744 state, on the record, how the claims would be any different if Appellant did not recite "each of which includes."

Art Unit 3744 has essentially rewritten claim 1 (and the other claims) as follows:

> 13. A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
>
> a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
>
> a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
>
> a plurality of refrigeration systems, ~~**each of**~~ **collectively** which includes
>
> at least one compressor,
>
> at least one condenser,
>
> at least one expansion valve,
>
> at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
>
> at least one variable frequency driver for power supply of the at least one compressor, and
>
> a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

(Effective rewrite of claim 13 by Art Unit 3744.)

The record reflects that the rejections are arbitrary and capricious.

3. "In Light of the Specification."

As noted above, the MPEP requires that the Examiner consult Appellant's specification when developing the broadest reasonable interpretation of the claim phrase. Nowhere in the Office Action has this been done. Nowhere. The word "specification" is mouthed, but that is all.

Appellant asks Art Unit 3744 to cite the location on the record where it considered any part of Appellant's specification in a substantive manner (not just repeating the words "in light of the specification").

To be clear, below is a reproduction of the text of the rejection of claim 13, again to ensure that the Board sees the rejection without characterization by Appellant:

> Claim 13.
>
> Urbain teaches
>
> A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground (abstract).

the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet (5) for ambient air and an air outlet (7) for connection to the parked aircraft (Abstract, Fig. 1),

a blower (10) connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20) at least one compressor, (17, Fig. 4) at least one condenser, (18)

at least one expansion valve, (20) at least one evaporator connected in a flow circuit containing a refrigerant, (12)

wherein the at least one evaporator interacts with the air flow in the flow duct (Fig. 1),

(PDF snapshot of Office Action, pages 3-4.) Again, below is the pertinent response to arguments:

The office does not agree with applicant's interpretation of claim 13. Under the broadest reasonable interpretation of the claims, in light of the specification, Urbain's three evaporators can be viewed as part of three refrigeration systems, which share a common compressor, condenser, etc. Furthermore, even if the office were to accept

(Office Action, page 13, bottom.) No reference to the claim interpretation at all, and certainly none to the specification. Instead, there is the forbidden use of pure claim language in a vacuum. The record reflects that the rejections are arbitrary and capricious.

4. "In light of the specification *as it would be interpreted by one of ordinary skill in the art.*"

Nowhere is there any evidence or rationale to support the interpretation by one of ordinary skill in the art. Thus, rejections fail proper procedure for this additional reason.

B. The Above is Important

MPEP 2111, entitled "Claim Interpretation; Broadest Reasonable Interpretation," cites a recent Federal Circuit case, *In re SuitcoSurface, Inc.*, (603 F.3d 1255, 1260 (Fed. Cir. 2010).) In that case, the Federal Circuit reversed a Board of Appeals and Interference ruling, stating that **"[t]he broadest-construction rubric coupled with the term 'comprising' does not give the USPTO an unfettered license to interpret claims to embrace anything remotely related to the claimed invention. Rather, claims should always be read in light of the specification and teachings in the underlying patent**." Appellant respectfully submits that the holding in *SuitcoSurface* is pertinent to the facts at hand in the present application. As will be seen below, the rejections utilize the license taken away from the USPTO by the Federal Circuit. In any event, *SuitcoSurface* underscores the fact that the specification must be considered. Because the specification was not considered, as a matter of procedure, the rejections should be reversed.

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C. The Above Is Applicable to All Claims.

While the above has been articulated using claim 13 as an example, there is no substantive difference in the treatment of Appellant by Art Unit 3744 with respect to claim 1 as compared to any other claim. Thus, as a matter of procedure, a *prima facie* case of obviousness has not been established against any claim.

D. All Obviousness Rejections Should Be Reversed

Because the rejections are procedurally defective, every obviousness rejection under 35 U.S.C. 103 should be reversed.

IV. A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED AGAINST ANY CLAIM AS A MATTER OF SUBSTANCE – MISSAPPREHENSION OF THE PRIOR ART BARS ALL OF THE GRAHAM FACTORS FROM HAVING BEEN MET.

Even if the procedural errors detailed above are ignored (which they should not be), as a matter of substance, no claim is anticipated.

A. Claim 1: Urbain does not disclose a plurality of refrigeration systems, each of which includes at least five different elements – instead, at most, the various refrigeration systems of Urbain share the alleged elements.

Claim 1 recites a ***plurality*** of refrigeration systems, ***each of which includes***:

1) at least one compressor,
2) at least one condenser,
3) at least one expansion valve,
4) at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
5) at least one variable frequency driver for power supply of the at least one compressor.

(Claim 13, enumeration and emphasis added.) That is, "each" refrigeration system includes these five elements. Thus, if there are three (3) refrigeration systems, there are three (3) of the five elements. If there are ten (10) refrigeration systems, there are ten (10) of the five elements, etc.

The Office Action asserts that Urbain teaches a plurality of refrigeration systems based on the disclosure of Urbain of three circuits 19:

a plurality of refrigeration systems, each of which includes (Fig. 4, evaporator 12 has three circuits (19) with expansion valves (20) at least one compressor, (17, Fig. 4) at least one condenser, (18)

at least one expansion valve, (20) at least one evaporator connected in a flow circuit containing a refrigerant, (12)

(PDF Snapshot of Office Action, page 4, top.) Yet the circuits 19 of Urbain do not ***each*** have a compressor 17, a condenser 18, at least one evaporator 12. Instead, Urbain discloses that all three circuits 19 share those elements.

Below is a reproduction of FIG. 4 of Urbain, depicting elements 17, 18, and FIG. 2 of Urbain depicting element 12:

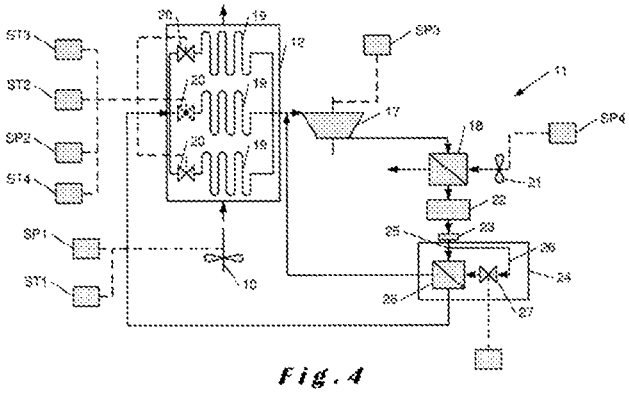

Fig. 4

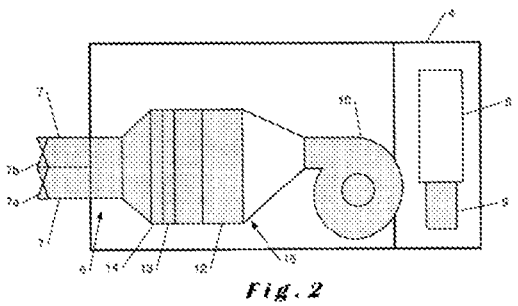

Fig. 2

FIGs. 4 and 2 of Urbain

As can be seen, for the three circuits 19, there is only one compressor 17 and one condenser 18. FIG. 2 only depicts one evaporator 12.

Alas, this comes down to what is meant by "each of which includes." The Examiner proffers a communal concept of each.

In any event, as with all cases on Appeal, this Board has two different entities, Appellant and the USPTO, asserting two different things. What to do? Appellant submits that what to do is to follow the MPEP and the case law.

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B. The Broadest Reasonable Interpretation of "each of which includes" excludes Urbain.

A critical issue here is what, exactly is the broadest reasonable interpretation of "each of which includes." To the end of answering this question, Appellant relies on MPEP §2111, on which the USPTO should have relied, but did not, as proven above, which states that "[t]he Patent and Trademark Office ('PTO') determines the scope of claims in patent applications not solely on the basis of the claim language, but upon giving claims their broadest reasonable construction 'in light of the specification as it would be interpreted by one of ordinary skill in the art.'" (MPEP §2111.01(II), emphasis added, case citations omitted).

As will now be shown, the claim scope Appellant must guess at that was given by the Examiner falls outside the broadest reasonable interpretation when such is determined pursuant to these requirements.

More specifically, the question that Appellant focuses on is whether the person of ordinary skill in the art would construe claim 13 to have such breadth as to encompass the device of Urbain vis-à-vis the cited portions thereof. The Office Action has done so, but the terms of the claim are different than that used in Urbain.

Of course, Appellant recognizes that differences in terminology are not definitive with respect to determining anticipation (but that said, the Examiner has never addressed why the differences in the claim language do not differentiate form the prior art – again, as a matter of procedure, the rejections are not supported). So Appellant points to MPEP 2111.01(I), entitled "The Words Of A Claim Must Be Given Their 'Plain Meaning' Unless Such Meaning Is Inconsistent With The Specification," which states that "[u]nder a broadest reasonable

interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification. MPEP 2111.01(IIII), entitled "'plain meaning refers to the ordinary and customary meaning given to the term by those of ordinary skill in the art," states that

> [t]he ordinary and customary meaning of a term may be evidenced by a variety of sources, including "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Phillips v. AWH Corp.*, 415 F.3d at 1314, 75 USPQ2d at 1327. If extrinsic reference sources, such as dictionaries, evidence more than one definition for the term, the intrinsic record must be consulted to identify which of the different possible definitions is most consistent with applicant's use of the terms. *Brookhill-Wilk 1*, 334 F. 3d at 1300, 67 USPQ2d at 1137; see also *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250, 48 USPQ2d 1117, 1122 (Fed. Cir. 1998)

(MPEP 2111.01(III), emphasis added.) Appellant now details why (i) the words of the claim, (ii) the specification (iii) the prosecution history, and (iv) the extrinsic evidence prevent the scope of claim 1 from encompassing that of Urbain.

1. The claim terms are different.

First, as detailed above, the words of the claim differentiate from Urbain. Appellant recites "a plurality of refrigeration units, each of which includes." Conversely, Urbain merely discloses that between the three refrigeration circuits 19, when added together, there is only one (1) compressor 17 and only one (1) condenser 18.

Also, Urbain clearly knows how to use the term "each," and explicitly uses that term with respect to "regulator valves" 20, but not with respect to any of the compressor 17 and the condenser 18. Indeed, just consider the abstract, which is reproved below:

> The invention relates to an air-conditioning unit (1) comprising an air circuit with an air inlet (5), a main fan (10) and an air outlet (6) designed to be connected to a chamber such as, for example, an aircraft parked on the ground, preferably via one or more flexible ducts, and ***a refrigerant circuit comprising a heat exchanger/evaporator (12) positioned in said air circuit to cool the air by evaporating the refrigerant, a compressor (17) and a condenser (18) for condensing the refrigerant before it is returned to the heat exchanger/evaporator (12). Said heat exchanger/evaporator (12) comprises several parallel circuits (19) each having at least one regulator valve (20).*** Said air circuit also comprises a temperature probe ST3 downstream of the heat exchanger/evaporator (12) and connected to means of controlling said regulator valves (20) to regulate the flow of refrigerant so as to keep the air temperature downstream of the heat exchanger/evaporator (12) within a reference range, and a pressure probe SP1 at the air outlet (6) and connected to means of regulating the speed and/or the power of the main fan (10) so as not to exceed a maximum raised pressure at the air outlet (6).

(Urbain, abstract, emphasis added.) Thus, from the plain language of the claim, it is clear that claim 13 recites a feature that is not present in Urbain. Each "refrigeration system" does not each include an compressor and a condenser. Urbain uses the term "each" with respect to the valve, but nowhere else. Based on a word comparison, it appears that both Urban and Appellant are using the term "each" in the same way, and Urbain never says that each alleged refrigeration system has a compressor, an evaporator and a condenser.

Essentially, and Appellant apologizes for repeating themselves, this is how claim 13 must be rewritten to cover Urbain:

> a plurality of refrigeration systems, ~~**each of which includes**~~ **collectively including** … at least one compressor, at least one condenser, …

(Effective rewrite of claim 13 by the USPTO.) Maybe that is in fact a better claim. However, Appellant claimed something else, and that is the claim that must be examined.

The words of the claim do not permit claim 13 to encompass Urbain.

Accordingly, the words of the claim differentiate from Urbain.

2. The interpretation of the claims in view of the specification results in a difference from Urbain.

Second, with respect to the specification, the teachings of which are required to be analyzed when construing claim scope, Appellant discloses multiple examples of the plurality of refrigeration systems, including multiple side-views thereof. Indeed, there are at least two

different figures depicting the side-view of the plurality of refrigeration systems 36. These are reproduced below.

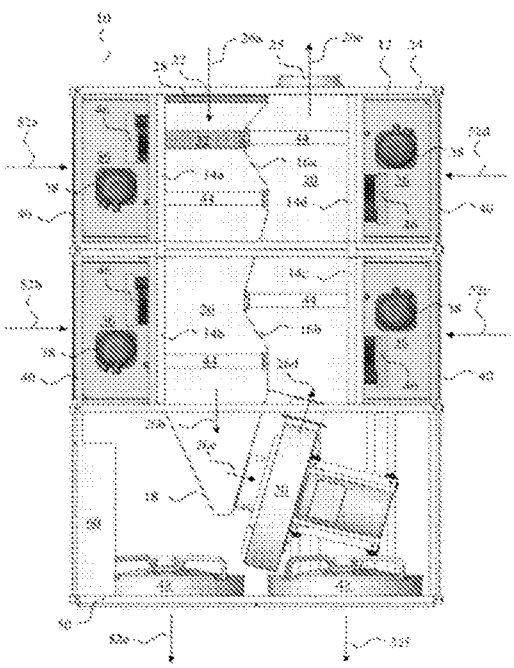

Fig. 1

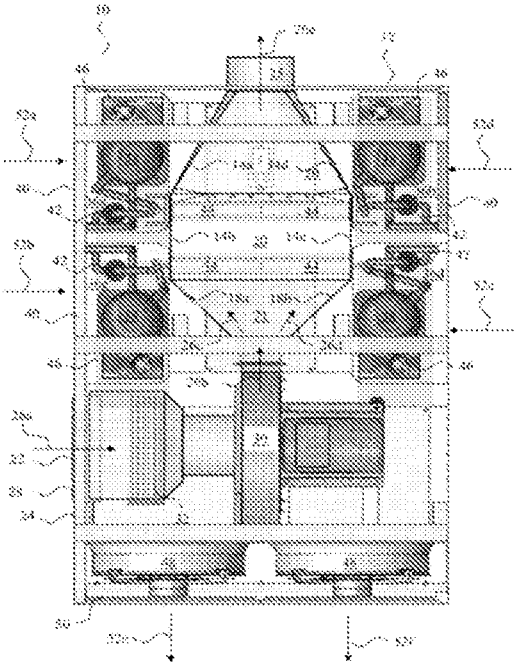

Fig. 8

As may be seen, invariably, each of the side-view in Figs. 1 and 8 depicts a plurality of (i.e., four (4)) refrigerant systems 36 as highlighted in pink-red. And ***each*** of the refrigerant systems 36 includes at least a compressor 38 and a condenser 40. That is, four refrigerant systems 36 include four compressors 38 and four condensers 40. This as contrasted to the configuration of the refrigerant system 11 of Urbain as shown in at least Figs. 2 and 4, above i.e., the refrigerant system 11 includes three circuits 19 sharing one compressor 17 and one condenser 18. Clearly, the specification depicts a different configuration from that of Urbain, a configuration that is completely consistent with Appellant's proffered claim interpretation and a configuration that is

diametrically opposed to the assertions made by the Examiner that Urbain is encompassed by the pertinent portions of claim 13 at issue.

Accordingly, the broadest reasonable interpretation of claim 1, based on the specification, indicates a scope that excludes the teachings of Urbain.

3. The Prosecution History Differentiates from Urbain.

Third, with respect to the prosecution history, to ensure that there is absolutely no question as to whether this prong has been met, Appellant hereby states that the disclosure of Urbain cited by the Examiner does not fall within the broadest reasonable interpretation of claim 13 regarding the plurality of refrigeration systems each including a compressor and a condenser.

4. Extrinsic Evidence in the Form of Dictionary Definitions Differentiates the Claims from Urbain.

Fourth, this different configuration of Appellant's specification is consistent with the dictionary definitions of "each" which Appellant submits is informative to evaluating the scope that would have been given to the term "each" by the person of ordinary skill in the art. Merriam-Webster online Dictionary, defines "each" as "*every one* of two or more people or things considered separately."[1] (Emphasis added.) Webster's Encyclopedic Unabridged Dictuation of the English Language defines "each" as "every one or two or more considered individually or one by one: each stone in a building; a hallway with a door at each end." These definitions are consistent with the depictions of the refrigerant system of the figures of Appellant's specification.

Again, all that the record indicates is that the Examiner has declared the claims to encompass that of Urbain based on a bald assertion that such is the case.

5. Summary: The Broadest Reasonable Interpretation of Claim 13 Forecloses Encompassing Urbain.

In view of the above, the broadest reasonable interpretation of the scope of claim 13 forecloses encompassing the device of Urbain. Because the scope and content of the prior art has been misapprehended, all of the *Graham v. John Deere* factors have not been met. Thus, reversal of the Examiner is warranted.

[1] http://www.merriam-webster.com/dictionary/each

V. SUBSTANTIVELY, A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED AGAINST ANY CLAIM BECAUSE NO REASONABLY ARTICUALTED RATIONALE TO MODIFY THE PRIOR ART HAS BEEN PROFFERED.

A. Request for Clear Record.

There is some dispute as to what the Examiner asserts regarding whether or not an unloader valve is needed in Urbain.

Appellant hereby requests that Art Unit 3744 state, on the record, with a yes or no answer, that prior to modification of Urbain, Urbain needs an unloader valve to have the flexiblity to adjust compressor operation for changing conditions.

Appellant hereby requests that Art Unit 3744 state, on the record, with a yes or no answer, that the rationale to modify Urbain to deny Appellant a patent is to provide a

> system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(PDF snapshot, Office Actoin, page 5, top.)

Yes or no.

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B. Substantively, a case of obviousness has not been established.

1. Circular rationale to modify the proir art.

The Examiner asserted that it would have been obvious to modify Urbain to eliminate the need for an unloader valve, and then, when Appellant traversed the assertion that Urbain needs an unloader valve (see above), he asserted that he never asserted that Urban needs an unloader valve. This makes clear that a *prima facie* case of obviosenss has not been esablished, because if Urbain did not need an unloader valve, there is not reason to modify Urbain so that it would no longer need an unloader valve.

To ensure that there is no question as to how Appellant characterizes the statements by the Examiner, below are PDF snapshots of the very statements of the Examiner:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the
>
> Application/Control Number: 13/257,669 Page 5
> Art Unit: 3744
>
> system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(PDF snapshot of Office Action, pages 4-5, emphasis added.) Then, the Office Action states:

> Regarding applicant's arguments about the stated motivation of using a VFD so that an unloader valve is not needed, the office never asserted that Urbain needs an unloader valve, nor did the office take official notice of anything. Anyone wishing to

(PDF snapshot of Office Action, page 14, emphasis added.)

That is, even though Urbain does not need an unloader valve, it would have been obvious to modify Urbain so that it does not need a device such as an unloader valve so that Urbain has the flexibility to adjust compressor operation for changing conditions? This is not quite what the U.S. Supreme Court had in mind in its *KSR* decision.

Clearly, the rationale to modify Urbain is non-existent based on the very words of the Examiner. Accordingly, a *prima facie* case of obviousness has not been established.

The Examiner creates the dichotomy of presenting a rationale to modify Urbain to adjust compressor operation without the need for an unloader device, but then asserts that he never asserted that Urbain needs an unloader valve to adjust to the changing conditions as alleged. Accordingly, the rationale to modify Urbain is flawed based on the very pronouncements in the Office Action.

Yet the Office Action insists on the obviousness of modifying Urbain as follows:

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It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Kobayashi, the motivation being to provide the

system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(Rationale to modify Urbain, both Office Actions.) Accordingly, Appellant can only proceed on the record established by the USPTO.

Appellant previously traversed the taking of Official Notice above, and the Examiner denies taking such. However, when a fact is asserted by the USPTO without citation to a reference to support that alleged fact, that is Official Notice, whether or not the Examiner calls it official notice, or even whether an Examiner even believes it is Official Notice.

Nowhere on the record is there any evidence that the art recognized that the modification to Urbain would result in the elimination of the need for unloader valves. Nowhere. Granted, the Examiner provides a document that talks about how great variable frequency drives are alleged to be, but the Office Action asserts the obviousness of modifying Urbain "to adjust compressor operation for changing conditions, without need of devices such as unloader valves."

Again, there is no evidence or rationale that such would have been seen by the person of ordinary skill in the art as enabling adjustment of compressor operation without the need of an unloader valve. In this regard, the rationale to modify Urbain is illusory.

In no way can it be said that a prima facie case of obviousness has been established.

2. One would not look to Kobayashi for modification of Urbain.

Components used in Kobayashi alleged to be obvious to incorporate into Urbain are used for conversion of commercial power into a variable-frequency AC. (Kobayashi, Abstract.) However, Urbain uses an on-board diesel generator, consistent with the fact that it is a portable and mobile air-conditioning unit.

> **[0049]** The unit **1** also comprises, inside the body **4**, a diesel engine **8** coupled to an electrical generator **9** in order to provide the supply of electricity to the various elements of the unit **1**, a variable-speed centrifugal fan **10** to distribute air to the aircraft, a refrigerant circuit **11** (depicted in FIG. **4**) with an exchanger/evaporator **12** for cooling the air, electric heating means **13** with a plurality of electric elements, and a complementary heat exchanger **14** connected to the cooling circuit of the diesel engine **8**.

(Urbain, paragraph 0049.) Thus, there is no need for the components of Kobayashi in Urbain. This is no trivial matter, as Urbain is used to provide air-conditioning to parked aircraft on tarmacs remote from power sources, whereas Kobayashi is converting commercial power.

3. The rejection is nothing more than the assertion that because a variable frequency driver for power supply of the at least one compressor exited in analogous art, the claim is obvious.

The rationale to modify Urbain is effectively based on nothing more than an assertion that various elements existed in the analogous art. The assertion to combine the prior art is so broadly stated, and without targeted application to the facts at hand, that it is tantamount to eviscerating the reasonably articulated rationale requirement mandated by the Supreme Court. Kobayashi uses the variable frequency driver for something completely different than in Urbain – something that Urbain does not need because it is not using commercial power, but instead generates its own power using a diesel generator. Further, again, consider the following rationale: to provide a

> system with the flexibility to adjust compressor operation for changing conditions, without need of devices such as unloader valves.

(PDF snapshot, Office Actoin, page 5, top.) This is handwaiving. What are the changing conditions? What compoents are no longer needed? Are those chanign conditions applicable to Urbain?

A prima facie case of obviousness has not been establihsed.

VI. PROCEDURALLY, A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED AGAINST ANY CLAIM BECAUSE NO REASONABLY ARTICUALTED RATIONALE TO MODIFY THE PRIOR ART HAS BEEN PROFFERED.

Appellant traversed the use of Official Notice, per MPEP 2144.03(C), and requested that the Examiner provide the requisite documentary evidence. The Examiner has not, and this bars a prima facie case of obviousness from having been established as a matter of procedure.

More specifically, on pages 16-18 of the Response of December, 2014, Appellant previously noted (and continues to note) that the record is devoid of any evidence that the device of Urbain needs an unloader valve, and that the proffered modification would eliminate such if such was needed, or even that such a modification would not have a deleterious effect on the performance of Urbain. The Examiner clearly uses common knowledge in the art, as is discussed and permitted in MPEP § 2144.03, regarding these alleged facts. This means that the Office Action is taking *official notice* of certain facts allegedly known to the ordinary artisan. However, there are explicit guidelines that must be followed when taking official notice. The "technical line of reasoning underlying a decision to take such notice must be clear and unmistakable." (MPEP § 2144.03(B).) These guidelines are not followed in the Office Action. Indeed, consider the title of § 2144.03(B): "If Official Notice Is Taken of a Fact, Unsupported by Documentary Evidence, the Technical Line of Reasoning Underlying a Decision To Take Such Notice Must Be Clear and Unmistakable." No technical line of reasoning is proffered whatsoever. None. Thus, a case of obviousness has not been established in this regard.

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Further, Appellant detailed on pages 16-18 of the Response of December, 2014, that MPEP § 2144.03(C) allows an applicant to traverse such an assertion. Specifically, § 2144.03(C) is entitled "If Applicant Challenges a Factual Assertion as Not Properly Officially Noticed or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding With Adequate Evidence." That section states that when an applicant traverses the assertion, "the examiner must provide documentary evidence in the next Office Action if the rejection is to be maintained." (MPEP § 2144.03(C).) Relying on MPEP 2144.03(C), Appellant traversed the assertion that that it would have been common knowledge in the art that the device of Urbain needs an unloader valve, and that the proffered modification would eliminate such if such was needed, and that such a modification would not have a deleterious effect on the performance of Urbain, **and requested, relying on § 2144.03, that the USPTO cite a reference and exactly identify where such a reference teaches the alleged knowledge in the art, or else allow the claims**. **Nowhere did the Examiner provide such a reference, let alone identifying where the reference taught the alleged knowledge in the art.** Thus, a prima facie case of obviousness has not been established as a matter of procedure.

1. The Response in the Advisory Action

Appellant noted that they had previously traversed the use of Official Notice, per MPEP 2144.03(C). The Advisory Action contains the below statement, in an apparent believe that this satisfies MPEP 2144.03(C). It does not, and is indicative of a new grounds for rejection, which Appellant will petition against if the below winds its way into any Examiner's Answer – the

rationale to modify Urbain is the 22 words in the paragraph spanning pages 4-5, the below is something new entirely[2]:

"Regarding applicant's arguments about the stated motivation of using a VFD so that an unloader valve is not needed, the office never asserted that Urbain needs an unloader valve, nor did the office take official notice of anything. Anyone wishing to modify the compressor in Urbain to have variable capacity, the motivation being to adjust the compressor for different operating conditions, will have limited options. One of which is an unloader valve, and another of which is the VFD. The benefits of the VFD are noted in "Understanding Variable Speed Drives (Part 2)", which states "the variable frequency drive (VFD) is the most effective motor controller in the industry today", and will "enhance process applications, particularly where flow control is involved." Consequently the office maintains that the rejection is proper."

(Advisory Action, page 3, middle.)

a. Improper Official Notice

To be clear, the above states, as fact, that:

A) "anyone wishing to modify the compressor in Urbain to have variable capacity . . . will have limited options."

B) one of these limited options is an unloader valve.

C) another of these limited options is the VDF.

There is absolutely no evidence or rationale for any of A, B and C. None. These are bald assertions, and thus can only be made based on alleged common knowledge in the art by way of official notice. Yet per MPEP§ 2144.03(B): "If Official Notice Is Taken of a Fact, Unsupported by Documentary Evidence, the Technical Line of Reasoning Underlying a Decision To Take Such Notice Must Be Clear and Unmistakable." No technical line of reasoning is proffered

[2] Appellant adopts a complete defense strategy, and thus treats all potential new grounds of rejections as if they were proper rejections in an abundance of caution, and thus now establishes a record of clear reversible error if indeed the rejections do find their way in front of the Board.

whatsoever in support of any of A, B or C. None. Thus, a case of obviousness has not been established in this regard.

Further, again, MPEP § 2144.03(C) allows an applicant to traverse assertions using official notice. Specifically, § 2144.03(C) is entitled "If Applicant Challenges a Factual Assertion as Not Properly Officially Noticed or Not Properly Based Upon Common Knowledge, the Examiner Must Support the Finding With Adequate Evidence." That section states that when an applicant traverses the assertion, "the examiner must provide documentary evidence in the next Office Action if the rejection is to be maintained." (MPEP § 2144.03(C).) Relying on MPEP 2144.03(C), Appellant traversed the assertion that that it would have been common knowledge in the art alleged facts A, B and C, detailed above, **and requests, relying on § 2144.03, that the USPTO cite a reference and exactly identify where such a reference teaches the alleged knowledge in the art, or else allow the claims**.

2. "Understanding Variable Drives (Part 2)" was never cited against independent claim 13.

As seen above, the Advisory Action relies on the reference "Understanding Variable Speed Drives (Part 2)" (VSD2) to support the rationale to reject 13, but this cited reference has never been cited against claim 13. This reference is only applied to the rejection of dependent claim 20, e.g., modifying Urbain in view VSD 2 to provide the features recited in claim 20. The Office Action, in rejecting claim 20, does not even mention that VSD 2 would provide any motivation for one of ordinary skill in the art to modify Urbain with Kobayashi. Therefore, there is a new ground of rejection of claim 13.

VII. A PRIMA FACIE CASE OF INDEFINITENESS HAS NOT BEEN ESTABLISHED AGAINST ANY CLAIM AS A MATTER OF PROCEDURE AND SUBSTANCE

A. Procedure – Claim 13

The basic requirements for establishing a claim as indefinite have not been followed. The standard for indefiniteness is based on how the person of ordinary skill in the art would interpret the claims in view of the specification. More specifically, MPEP 2173.01 specifically states that

> The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:
> (A)The content of the particular application disclosure;
> (B)The teachings of the prior art; and
> (C)The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

(MPEP 2173.01.) The "essential inquiry" has not been made in rejecting the claims as indefinite. Nowhere in the rejections under 35 U.S.C. 112, second paragraph is there reference to or an evaluation of (A) the content of the specification of the present application, (B) the teachings of the prior art, and (C) the interpretation of the claims that would be given by the person of ordinary skill in the art. Nowhere in the rejection of claim 13 is there any analysis of any of the above. Thus, as a matter of procedure, the rejections are not supported.

B. Substance – Claim 13

With respect to claim 13, the Office Action asserts the following:

> It is unclear if the vfd for the compressor is to be included in the vfds of the plurality of refrigeration systems.

(Office Action, page 2, bottom.) This is wrong.

Claim 13 is pretty simple. Claim 13 recites a plurality of X, each of which (i.e., each X) has a Y and a Z for Y, where X is the refrigeration system, Y is the at least one compressor, and Z is the variable frequency driver (vfd). To be clear, below is a reproduction of the pertinent parts of claim 13, with emphasis added:

> **a plurality of refrigeration systems**, each of which includes
>
> at least one compressor,
>
> at least one condenser,
>
> at least one expansion valve,
>
> at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
>
> **at least one variable frequency driver** for power supply of the at least one compressor, **and**
>
> **a central controller** that is configured for controlling the operation of the preconditioned air unit including **variable frequency drivers** of the plurality of refrigeration systems.

(Claim 13, emphasis added).

In view of the above claim recitations, it is clear that a plurality of refrigeration systems and a central controller are listed in parallel as the claimed elements. Further, it is clear that each of the plurality of refrigeration systems has a corresponding one or more variable frequency driver (e.g., at least one variable frequency driver). The central controller controls the operation of the precondition air unit, which includes variable frequency drivers (plural) of the plurality of refrigeration systems, where the variable frequency drivers are plural because each of the plural refrigeration systems has at least one.

Claim 13 is definite, and the Examiner should be reversed.

C. Procedure – Claim 20

With respect to claim 20, the rejections are based on the individual perceptions of an examiner, which is not the way claim definiteness is evaluated.

1. Specific Procedure on Point – The Examiner Bears the Burden

The rejection of claim 20 is based on the assertion that the recitations thereof constitute a relative term. Yet that is not sufficient to establish a prima facie case of indefiniteness.

Appellant relies on MPEP 2173.05(B), entitled "Relative Terminology," which specifically states that the "fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite." No cases are cited in the MPEP where the term "high motor torque" was held to render a claim indefinite.

Moreover, there are at least 135 issued U.S. patents with claims that recite "high motor torque," consistent with the fact that relative terminology is permitted.

Thus, because there is no basis other than a conclusory assertion based on the perceptions of an individual examiner for rejecting claim 20 as indefinite, and the very language asserted to render the claim indefinite present in 135 issued U.S. patents, and thus presumptively acceptable, a case of indefiniteness against claim 20 has not been established.

2. General Procedure on Point – The Examiner Bears the Burden

As with claim 13, the basic requirements for establishing a claim as indefinite have not been followed. The standard for indefiniteness is based on how the person of ordinary skill in the art would interpret the claims in view of the specification. More specifically, MPEP 2173.01 specifically states that

> The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:
> (A)The content of the particular application disclosure;
> (B)The teachings of the prior art; and
> (C)The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

(MPEP 2173.01.) The "essential inquiry" has not been made in rejecting the claims as indefinite. Nowhere in the rejections under 35 U.S.C. 112, second paragraph is there reference to or an evaluation of (A) the content of the specification of the present application, (B) the teachings of the prior art, and (C) the interpretation of the claims that would be given by the person of ordinary skill in the art. Nowhere are any of these factors addressed. Nowhere.

To ensure that there is no question as to how Appellant characterizes the rejection, below is a PDF snapshot of the rejection:

Claim 20.

Recites "variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The meaning of "high motor torque is unclear." The term is a relative term which renders the claim indefinite. The term is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Does the torque remain at the same "high" torque throughout the frequency range?

(Office Action, page 3, top.) Mere questions and conclusory statements. Yet the MPEP makes clear that the Examiner must consider at least three areas before declaring a claim indefinite.

A prima facie case of obviousness has not been established. Withdrawal of the rejections is warranted.

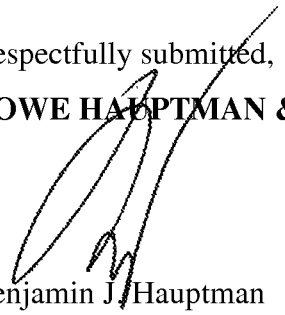
VIII. SUMMARY

The Examiner should be reversed on all counts.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & HAM, LLP



Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: August 4, 2015

IX. Claims Appendix

13. A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating
a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,
a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,
a plurality of refrigeration systems, each of which includes
at least one compressor,
at least one condenser,
at least one expansion valve,
at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and
at least one variable frequency driver for power supply of the at least one compressor, and
a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

16. A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

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Page 413

18. A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. A preconditioned air unit according to claim 17, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. A preconditioned air unit according to claim 17, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

23. A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

Electronic Acknowledgement Receipt

EFS ID:	23116125
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	04-AUG-2015
Filing Date:	20-SEP-2011
Time Stamp:	20:37:47
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$200
RAM confirmation Number	5938
Deposit Account	071337
Authorized User	HAUPTMAN, BENJAMIN J.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Appeal Brief Filed	2015-08-04-Appeal_Brief.pdf	6978433 bc3a114106030a93753e000d824aca35224d7877	no	48
Warnings:					
Information:					
2	Extension of Time	2015-08-04-EOT.pdf	186670 a1b7f6d3b667bb9a9554a38210a93f8d8c445afc	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	31344 53332deba55d7875566d1ab972b05965fd29cf48	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	7196447		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/22 (03-13)
Approved for use through 3/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 713-2354 (22664-US)

Application Number: 13/257,669

Filed: September 20, 2011

For: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

Art Unit: 3744

Examiner: Henry T. CRENSHAW

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☑ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 200.00
☐ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 071337.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration number 29310.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Benjamin J. Hauptman/ — Signature

August 4, 2015 — Date

Benjamin J. Hauptman — Typed or printed name

703-684-1111 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/08/2014	10/21/2014	01/08/2016						
	1	-	-	-						
	2	-	-	-						
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	27	✓	✓	✓						
	28	✓	✓	✓						
	29	✓	✓	✓						
	30			-						
	31			✓						
	32			✓						
	33			✓						
	34			✓						
	35			✓						
	36			✓						

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (Currently amended) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating

a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,

a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the

at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems~~,~~

~~wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;~~

~~wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;~~

~~wherein at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;~~

~~wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and~~

~~wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.~~

14. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

16. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (Currently amended) A preconditioned air unit according to ~~claim 13~~ claim 31, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

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Page 422

20. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (Currently amended) A preconditioned air unit according to ~~claim 17~~ claim 31, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

23. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (Previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (Previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (Previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (Previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

30. (Cancelled)

31. (New) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

32. (New) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

33. (New) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

34. (New) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

35. (New) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

36. (New) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

Notice of References Cited	Application/Control No. 13/257,669	Applicant(s)/Patent Under Reexamination DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-6,414,455 B1	07-2002	Watson; Alvin J.	F04B47/02	318/432
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
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	L	US-				
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

CPC- SEARCHED		
Symbol	Date	Examiner
b64f1/362; g05d	3/10/2014	htc
g05d23/19	3/10/2014	htc
y02t50/82	3/10/2014	htc

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	228.4		

SEARCH NOTES		
Search Notes	Date	Examiner
Plus and claims search. Inventor and continuity search. East searches for US and foreign patents. NPL searches for variable speed drives.	3/10/2014	htc
updated searches	10/21/2014	htc
updated searches	1/8/2016	htc

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 01/15/2016

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
01/15/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Office Action Summary	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *8/4/2015*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-29 and 31-36* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *13-29 and 31-36* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *9/20/2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☒ Other: *Claims filed 5/4/2015 to be entered*.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

This action is in response to the communication filed 8/04/2015.

Claims 1-12 and 30 are cancelled.

Claims 31-36 are new.

Claims 13-29 and 31-36 are pending.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 17, 19, 20, 21, 31 and 32 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 17 and 31 recite, “at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver”. However, claim 13, from which calm 17 depends, already includes a central controller that provides generic control over “the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.” It is not clear if claim 17 is referring to a different controller, or if it is referring to the same controller performing a more specific type of control function than what is recited in claim 13.

Claim 20, recites "variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The meaning of "high motor torque is unclear." The term is a relative term which renders the claim indefinite. The term is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For example, does the torque remain at the same "high" torque throughout the entire range of frequencies, or is there a different “high” torque depending upon the specific frequency? Since the claim language and specification repeatedly state that the “high motor torque” is a result of keeping the ratio between the output voltage and the frequency substantially constant, any device that performs this same function will be viewed as reading on this claim limitation.

Claims dependent upon those listed above are likewise rejected for incorporating the deficiencies of the parent claims.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 2), hereafter "UVSD".

Regarding claim 13, Anderson teaches a preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground *(see abstract),* the preconditioned air unit comprising a housing *(Fig. 1)* accommodating a flow duct *(104, 28, 44, Fig. 1)* with an air inlet for ambient air *(102)* and an air outlet *(46)* for connection to the parked

aircraft *(col. 4, lines 33-36),* a blower *(38)* connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, *(col. 4, lines 25-26)*

a plurality of refrigeration systems, each of which includes *(see col. 4 line 59 to col. 5, line 15, describing two systems)*

at least one compressor, *(58, 72)*

at least one condenser, *(64,76)*

at least one expansion valve, *(60, 81)*

at least one evaporator *(50, 52)* connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct *(apparent from Fig. 1).*

Anderson does not appear to teach,

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

However, UVSD teaches that the variable frequency drive is the most effective motor controller in the industry, are affordable and reliable, and offer significant electrical energy savings through greatly reduced electrical bills. Urbain teaches that an automatic controller manages the functioning of an air condition unit by controlling its constituent elements, such as the fan, compressor, condenser, and pressure reducing valves and evaporator. *(par. 92).*

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, such that a single controller of Urbain can manage all of the functions of the system including the variable frequency driver for power supply of the at least one compressor, in order to advantageously provide the system with the flexibility to adjust compressor and other components operations for changing conditions, and to provide for reduced electric costs by using a variable frequency driver ("VFD").

Regarding claim 14, Anderson as modified teaches a preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems. *(82, 84, col. 5, 10-25).*

Regarding claim 15, Anderson as modified teaches the preconditioned air unit according to claim 13, but does not expressly teach wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

However, Anderson does teach that it is desirable to provide condenser fans with variable air flow rates (col. 3, 20-25), and Urbain teaches that the speed of the cooling fan 21 of the condenser can be modified according to the readings or pressure sensor sp4 (par. 112), and it would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of UVSD, in order to provide

greater control over the operation of the condenser fan according to the heat loss needs of the system and provide for reduced energy costs.

Regarding claim 16, Anderson as modified teaches a preconditioned air unit according to claim 13, including the desirability of providing a blower with an adjustable speed (claim 13), but does not expressly teach the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of UVSD, in order to provide greater control over the operation of the blower to changing operation requirements and provide for reduced energy costs.

Regarding Claim 23, Anderson as modified teaches the unit according to claim 13, but does not appear to expressly teach wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit to at least one of: The selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit. However, Anderson does teach that a problem it seeks to overcome in existing systems is adapting them for use with different types of aircraft (col. 2, 5-17), and Urbain teaches at (par. 14-23) how to control the system so as to accommodate the needs of different aircraft.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to provide a unit with the flexibility of servicing different types of aircraft.

Regarding claim 28, Anderson as modified teaches a preconditioned air unit according to claim 13, but does not appear to expressly teach at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker. However, Urbain teaches these features at par. 100-105).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to provide the operator with the desired degree of control over the system.

Regarding claim 29, Anderson as modified teaches the preconditioned air unit according to claim 13, but does not appear to teach a heater in the flow duct.

However, Urbain teaches this feature at par. 35.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to provide the capability of heating the aircraft cabin.

Claims 17, 31 and 19 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 2), hereafter "UVSD", and further in view of US 5,107,685 to Kobayashi .

Regarding claims 17 and 31, Anderson as modified teaches a preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver. *(the central controller of Urbain controls the system including the compressor, which is powered by the variable frequency drive).*

To the extent applicant argues that the controller is not the central controller of claim 13, Kobayashi teaches that an inverter that converts commercial power to variable frequency, with a controller that controls the output frequency (abstract).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Kobayashi, in order to provide a means for controlling the output frequency.

Regarding claim 19, Anderson as modified teaches a preconditioned air unit according to claim 31, but does not expressly teach the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

However, Urbain teaches at (par. 19) that a pressure sensor is used in the control of the compressor.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to utilize the controller of Urbain in combination with the pressure sensor in order to control the VFD powering the compressor in order to ensure proper operation of the compressor.

Claims 18 and 32 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5383335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 2), hereafter "UVSD", US 5,107,685 to Kobayashi and US 4,514,991 to Zinsmeyer.

Regarding claims 18 and 32, Anderson as modified teaches a preconditioned air unit according to claim 17, but does not expressly teach the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned unit.

However, the typical mains supply is widely known as 50 Hz for Europe and 60 Hz for US, and Zinsmeyer teaches a variable speed drive motor system to drive an output shaft at varying speeds *(abstract).*

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Zinsmeyer for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit, the motivation being to provide the system with the ability to

respond to a wider range of system demands and to be adaptable for power supplies at different locations.

Claims 20 and 33 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5383335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 2), hereafter "UVSD" and US 6,414,455 to Watson.

Regarding claims 20 and 33, Anderson as modified teaches a preconditioned air unit according to claim 13, but does not teach wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

However, Watson, (col. 12, 40-55) teaches that the torque can be held constant by holding constant the ratio between voltage and frequency. Since the instant application does not contain any definition of "high motor torque", other than being the result of keeping the ratio between the voltage and the frequency constant, the office views the teachings of Watson as satisfying this limitation.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Watson, in order to in order to maintain a high/sufficient torque at all frequency ranges.

Claim 21 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed

Drives (Part 2), hereafter "UVSD", US 5,107,685 to Kobayashi and further in view of 2007/0035263 to Rastogi.

Regarding claim 21, Anderson teaches a preconditioned air unit according to claim 31.

Rastogi teaches wherein the central controller (12) is connected to at least one controller (16) of the at least one voltage frequency driver (par. 2). It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Rastogi, the motivation being to facilitate placement of two local vfd drives in the event the system needs more power than can be delivered by one drive. (see Rastogi par. 6).

Claims 22 and 34 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 2), hereafter "UVSD" and further in view of US 2007/0209383 to Hutton.

Regarding claims 22 and 34, Anderson as modified teaches a preconditioned air unit according to claim 13 including a central controller, but does not teach the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

Hutton teaches that the power demands of the air conditioner can impact the power available for other uses at peak demands, such as interior lights and auto-

leveling of the aircraft. (col. 1,60 to col. 2, 5). A thermal storage unit is used to offset some of the cooling power needed by the AC system during peak demand, so that energy consumption by the AC unit can be reduced. (col. 12, 15-30.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Hutton, so that the AC will use less power so such power can shared with other devices, the motivation being to allow more power to go to the interior lights and auto leveling devices.

Claims 24, 25, 35 and 36 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 2), hereafter "UVSD" and further in view of US 6,446,447 to Goth.

Regarding claims 24 and 25, and 35 and 36, Anderson as modified teaches a preconditioned air unit according to claim 13, but does not teach wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller, or wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

Goth teaches redundant refrigeration systems to ensure continued cooling in the event one of the systems fails (see Goth claim 20). A local controller refrigeration

system controller notifies a main/cage controller of a failure in the local system (the failing refrigeration system transmits a failure signal to the central controller) so that the main/cage controller can switch operation to the other refrigeration system (controller... automatically adjust the required amount of cooling among the remaining systems .... in response to the failure signal.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Goth, the motivation being to provide automatic system back-up so as to preserve the comfort of passengers in the even one of the AC systems fails.

Claims 26 and 27 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 2), hereafter "UVSD" and further in view of US 6,600,278 to Bretzius.

Regarding claims 26 and 27, Anderson as modified teaches a preconditioned air unit according to claim 13.

Bretzius teaches a variable frequency drive with a 12 pulse rectifier. (col. 3, 10-25).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Bretzius, the motivation being to provide a means for converting AC to DC and to provide rectification that cancels many of the characteristic harmonics a six-pulse bridges produce.

Response to Applicant's Remarks

Applicant's amendments and remarks have been carefully considered and are deemed partially persuasive, consequently the finality of the last office action is withdrawn, and the claim set filed 5/04/2015, which includes new claims 31-36 has been entered and examined.

Regarding applicant's comments on pages 1-28 pertaining to claim 13's limitation "a plurality of refrigeration systems, each of which includes", this limitation is addressed by the inclusion of Anderson as the new primary reference, and which satisfies the definition of this limitation asserted by applicant.

Regarding applicant's comments on pages 29-33 regarding the "unloader valve", the new grounds of rejection do not recite modifying the compressor of Urbain, but instead recites modifying the compressor of Anderson. Consequently the issues of whether an unloader valve is or isn't needed on Urbain is moot.

Applicant's comments on pages 34-35 pertaining to the motivation to modify Urbain in view of Kobayashi are moot in view of the new grounds of rejection, in which the compressor of Anderson is being modified in view of UVSD.

Applicant's comments on pages 36-39, again referencing the unloader valve, asserting official notice, and the alleged assertion of "variable speed drives" against claim 13 are moot in view of the new grounds of rejection.

Regarding applicant's assertions on page 42-44 regarding claim 20, the office again maintains the limitation is not clear, but based upon the based upon the claim

language and the specifications repeated statements that the high motor torque is achieved by keeping the ratio between the output voltage and the frequency substantially constant, the office will view any device that performs this same function as providing a high motor torque throughout the frequency range.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY CRENSHAW whose telephone number is (571)270-1550. The examiner can normally be reached on Monday-Friday 8:30am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Alexandra Elve can be reached on (571) 272-1173. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENRY CRENSHAW/
Examiner, Art Unit 3744

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:21
S2	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:25
S3	1	(12/301357).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/04 15:26
S5	110	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:26
S6	28	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:28
S7	86	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:30
S8	43	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:32
S9	0	(scroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:33
S10	8	(schroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:34
S11	14	("20080250903" | "20100031676" | "4272967" | "5107685").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:08
S12	0	62/228.4.ccls. and b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2014/03/04 17:24

			EPO; JPO; DERWENT; IBM_TDB			
S13	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:10
S14	3	S13 and (vfd or inverter or (variable adj speed))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:11
S15	4	"4272967".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:12
S16	386	(variable adj speed) near5 condenser near5 (fan or blower)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:44
S17	8	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/04 19:45
S18	0	S16 and S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:45
S19	0	S13 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:46
S20	601771	inverter ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S21	609	inverter near5 ("60" adj hz)	US-PGPUB; USPAT; USOCR;	OR	ON	2014/03/05 08:37

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S22	306	(inverter near5 ("60" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:39
S23	40	(inverter near5 ("60" adj hz) near5 ("50" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:41
S24	0	wo2007061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S25	0	wo20070061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S26	2	"7461516".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 09:00
S28	1	(12/741437).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/05 09:35
S29	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:42
S30	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S31	28	S30 and (range near5 (hz or hertz))	US-PGPUB;	OR	ON	2014/03/05

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			10:44
S32	3153	(output near3 voltage) near10 frequency near10 ratio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S33	1	S30 and "l24"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S34	9	S30 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:16
S35	11	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$ or US-20080314064-$ or US-20030168862-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/07 14:57
S36	9	S35 and controller	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 14:57
S37	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S38	871	S37 near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S39	4931033	(main or central or system) near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2014/03/07 15:08

			IBM_TDB			
S40	372	S38 and S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S41	30143	(independent or separate or redundant or backup) near20 (system or compressor or generator) near20 (fail$4 or malfunction)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:24
S42	143400	"62"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S43	277	S41 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S44	122	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 14:58
S45	47	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383")	US-PGPUB; USPAT	OR	OFF	2014/03/08 14:58

		or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.				
S46	50	(("3640256") or ("3929285") or ("3929628") or ("4049395") or ("4060393") or ("4249655") or ("4259970") or ("4272499") or ("4274371") or ("4281522") or ("4296809") or ("4299285") or ("4300447") or ("4313499") or ("4343348") or ("4347708") or ("4357860") or ("4399742") or ("4442817") or ("4463022") or ("4519324") or ("4526090") or ("4539793") or ("4543677") or ("4554933") or ("4612096") or ("4615176") or ("4621504") or ("4764348") or ("4775627") or ("4781729") or ("4786301") or ("4829885") or ("4838345") or ("4842620") or ("4860642") or ("4866839") or ("4872397") or ("4884366") or ("4891892") or ("4921604") or ("4955372") or ("4967769") or ("5001346") or ("5015365") or ("5318099") or ("5540757") or ("5547421") or ("5740846") or ("5958346")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 15:04
S47	0	("(12-pulseor18-pulseor24-pulse)near10rectifier").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 16:07
S48	322	(12-pulse or 18-pulse or 24-pulse) near10 rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:07
S49	10	S48 and ((variable near2 (frequency or	US-PGPUB;	OR	ON	2014/03/08

		speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			16:09
S50	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 09:47
S51	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:01
S52	1899	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:45
S53	120	S52 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:49
S54	0	yd2t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S55	334	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S56	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/21 18:59
S57	4	(high adj motor adj torque).clm.	USPAT	OR	ON	2014/10/21 18:59
S58	154	(high adj motor adj torque)	USPAT	OR	ON	2014/10/21 19:03
S59	4805	hauptmann	US-PGPUB;	OR	ON	2014/12/29

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			11:27
S60	0	(benjamin near2 hauptmann)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:29
S61	156	(benjamin near2 hauptman)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:30
S62	154	(benjamin near2 hauptman)	US-PGPUB; USPAT	OR	ON	2014/12/29 11:30
S63	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/30 13:41
S64	2468	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S65	163	S64 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S66	0	S65 and (unloader adj valve)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S67	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:31
S68	835	voltage near3 frequency near3 torque	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2015/04/20 11:36

			EPO; JPO; DERWENT; IBM_TDB			
S69	576	voltage near3 frequency near3 torque	US-PGPUB; USPAT	OR	ON	2015/04/20 11:37
S70	291	(ratio near3 voltage near3 frequency near3 constant)	US-PGPUB; USPAT	OR	ON	2015/04/20 11:49
S71	27	S70 near10 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:49
S72	39	(US-20080314064-$ or US-20080141703-$ or US-20140138478-$ or US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20050034468-$ or US-20080238108-$ or US-20140103846-$ or US-20130147410-$ or US-20070209383-$ or US-20030168862-$ or US-20110153237-$ or US-20070024224-$ or US-20090084120-$ or US-20070035263-$ or US-20060086124-$ or US-20050086974-$ or US-20060266054-$ or US-20140354194-$ or US-20100031676-$ or US-20090151879-$).did. or (US-7325410-$ or US-6600278-$ or US-4859924-$ or US-6564571-$ or US-3784888-$ or US-7479749-$ or US-6446447-$ or US-8588983-$ or US-7380588-$ or US-7685838-$ or US-5107685-$ or US-6751979-$ or US-7484377-$ or US-7216492-$ or US-4691155-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2015/04/24 10:44
S73	19	S72 and torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 10:45
S74	285	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 11:04
S75	195	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:05
S76	109	(constant adj torque) near10 (voltage and frequency)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:11
S77	6	("2007135103").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2015/12/09 10:32

			DERWENT; IBM_TDB			
S78	6	("2007061622").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:34
S79	0	("6414455.pn.").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:42
S80	4	"6414455".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 10:42
S81	52	("4047083" | "4249120" | "4661751" | "4785225" | "5272429" | "5710500" | "6154002").PN. OR ("6414455").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/12/09 10:43
S82	3	"20130025303".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 11:22
S83	2714	(refrigeration near2 systems) and compressor and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:45
S84	431	(refrigeration near2 systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:46
S85	409	(refrigeration near2 syst$2) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S86	431	(refrigeration near2 syst$3) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S87	431	(refrigeration near2 system$1) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S88	406	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S89	268	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	OFF	2015/12/28 10:55
S90	81	((plurality or multiple) near2 (refrigeration adj systems)) and (single	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:18

		near2 compressor)				
S91	92	((plurality or multiple) near2 ((refrigerat$4 or cool$4) adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:21
S92	4	"5383355".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:37
S93	4	"5383335".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:38
S94	2	"6446447".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:39
S95	1	"5383335".pn.	US-PGPUB; USPAT	OR	ON	2016/01/06 17:56
S96	3	"20100031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:40
S97	1	"20100031676".pn. and (condenser near3 fan)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:41
S98	1	"6414455".pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 15:14
S99	0	("(dieseladjgenerator)near5inverter").PN.	US-PGPUB; USPAT	OR	OFF	2016/01/07 18:51
S100	72	(diesel adj generator) near5 inverter	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/07 18:52
S101	17	(diesel adj generator) near5 inverter	US-PGPUB; USPAT	OR	ON	2016/01/07 18:54
S102	105	"4835977" "5031690" "4352273" "2585570" "4272967"	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S103	5	("4835977" "5031690" "4352273" "2585570" "4272967").pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S104	1	"6414455".pn.	USPAT	OR	ON	2016/01/07

						20:27

1/ 8/ 2016 5:16:23 PM
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Electronic Acknowledgement Receipt

EFS ID:	25512388
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	15-APR-2016
Filing Date:	20-SEP-2011
Time Stamp:	22:51:18
Application Type:	U.S. National Stage under 35 USC 371

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Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$80
RAM confirmation Number	7471
Deposit Account	071337
Authorized User	HAUPTMAN, BENJAMIN J.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 CFR 1.492 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2016-04-15-Amendment.pdf	2835259 9198351c7e5cf8d905d4c869a5d655039a55e78f	yes	22

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	22

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	31310 4b814903102fce22ea0ef0147ecdc62d43289cc3	no	2

Warnings:

Information:

Total Files Size (in bytes):	2866569

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

In response to the Office Action mailed January 15, 2016, Applicant respectfully requests reconsideration. Based upon the following Remarks, Applicant respectfully requests that all outstanding rejections be reconsidered, and that they be withdrawn.

Claim Rejection Under §112, Second Paragraph

The Office Action has rejected claims 17, 19, 21, and 31-32 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failure to particularly point out and distinctly claim the subject matter which application regards as the invention. In response, Applicant traverses the rejection for the reasons that follow.

With respect to all rejections, Applicant hereby traverses on the procedural grounds detailed below. Simply put, none of the requirements of MPEP 2173 have been addressed in formulating the rejections, and therefore the rejections are arbitrary and capricious under the Administered Procedures Act, which statute the USPTO falls under per the Supreme Court's ruling in *Zurko*. That is, even if all of the following substantive arguments are ignored, as a matter of procedure, a *prima facie* case of indefiniteness has not been established.

With respect to claim 17, there are assertions that claim 17 is indefinite because it is quote, not clear if claim 17 is referring to a different controller than that recited in claim 13. Here is what is clear. Claim 13 recites:

> wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

(Claim 17.) If a device includes one variable frequency driver that has a controller that is configured as recited, it falls within the claim. If it does not, it does not fall in the claim. If the controller of claim 13 "is configured for variation of the output frequency of the at least one variable frequency driver," that can be claim 17. If the controller of claim 13 does not so meet this feature, there must be another controller that meets this feature.

The rejection of claim 31 is flawed for at least this additional reason.

With respect to claim 20, the Office Action asserts "the meaning of 'high motor torque' is unclear." Is it truly the position of Art unit 3744 that the person of ordinary skill in the art would not understand what is meant by "high motor torque"? When answering this question, please keep in mind that it is Art Unit 3744 that forced Applicant to take this application on appeal when he refused to accept the fact that the prior art teaches a plurality of refrigeration systems each of which included the features of claim. Thus, the record indicates that before Art Unit 3744 is going to assert that something cannot be understood by the person of ordinary skill in the art, there must be something more than what currently is on the record. In this regard, there is nothing more than a series of questions such as "does the torque remain at the same 'high' torque depending upon the specific frequency"? Indeed, consider that question in view of the fact that claim 20 recites that the high torque is maintained "throughout the entire output frequency range." Why is Art Unit 3744 interested in the specific frequencies when the claim specifies that it is the entire frequency range?

Also, note that a simple search of the USPTO database for the words "high motor torque" reveals 145 returns of issued patents, and 137 published applications. No doubt there would be even more hits if the phrase was something like "the motor has high torque." Clearly this is a phrase that has meaning in the art.

In any event, these are red herring questions that have nothing to do with whether or not the scope of claim 20 can be understood by the person of ordinary skill in the art in view of the specification. Claim 20 requires that at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The person of ordinary skill in the art would understand claim 20.

Procedurally, with respect to claim 20, Applicant relies on MPEP 2173.05(B), entitled "Relative Terminology," which specifically states that the "fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite." No cases are cited in the MPEP where the term "high motor torque" was held to render a claim indefinite.

Further, the basic requirements for establishing a claim as indefinite have not been followed. The standard for indefiniteness is based on how the person of ordinary skill in the art would interpret the claims in view of the specification. More specifically, MPEP 2173.01 specifically states that

> The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:
> (A)The content of the particular application disclosure;
> (B)The teachings of the prior art; and
> (C)The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

(MPEP 2173.01.) The "essential inquiry" has not been made in rejecting the claims as indefinite. Nowhere in the rejections under 35 U.S.C. §112, second paragraph is there reference, to or an evaluation of (A) the content of the specification of the present application, (B) the teachings of the prior art, and (C) the interpretation of the claims that would be given by the person of ordinary skill in the art. The Office Action at most tries to consider the claimed "high motor torque" in the light of the specification; however, the "essential inquiry" also includes evaluation of the interpretation of the claims that would be given by the person of ordinary skill in the art.

Because there is no basis other than a conclusory assertion based on the perceptions of an individual examiner for rejecting claims 17 and 20 as indefinite, and the requirements of MPEP 2173 have not been met, a case of indefiniteness against claim 17 and claim 20 has not been established. Withdrawal of the rejection is warranted.

Claim Rejections Under 35 U.S.C. §103

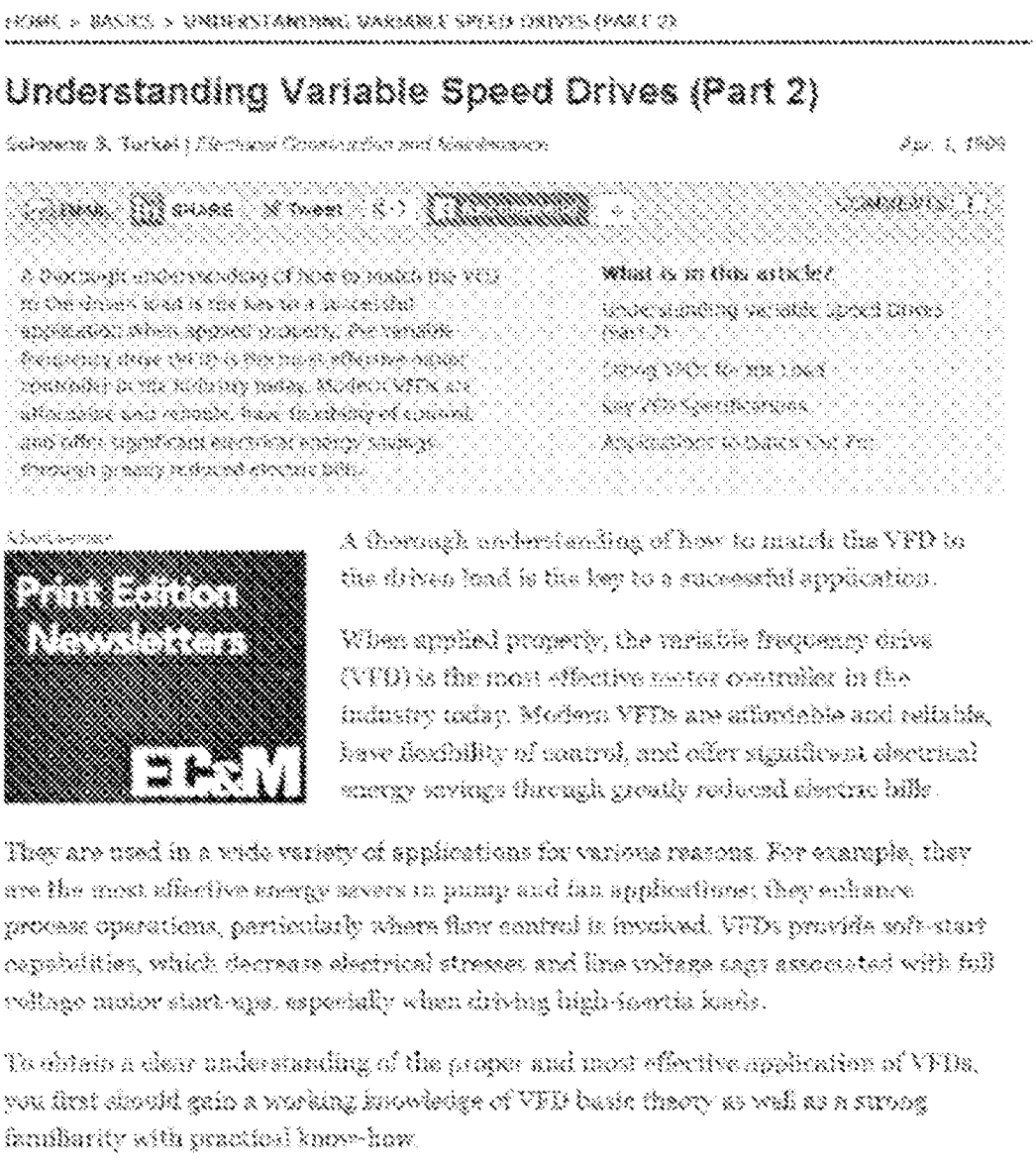
The Office Action has rejected claims 13-16, 23, and 28-29 as obvious under 35 U.S.C. §103 in view of U.S. Patent No. 5,383,335 to Anderson when combined with U.S. Patent Application Publication No. 2010/0031676 to Urbain in view of a paper states the words variable speed drivers are most efficient when used properly. In response, Applicant traverses the rejections for at least the reasons that follow.

The Office Action has found Anderson, which teaches (*arguendo*) two refrigeration systems, but not the innovations of the at least one variable frequency driver for power supply of the at least one compressor, and the central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

The Office Action asserts that the paper renders the feature of the variable frequency driver obvious, and that Urbain renders the controller obvious.

First, Applicant traverses the assertion that the paper is a printed publication meeting the requirements of 35 U.S.C. §102.

To be clear, all that Art Unit 3744 has done is supply an incredibly grainy copy of something that allegedly was printed on paper with something that might have a date thereon. To ensure that there is no question as to how applicant characterizes this document, below is a reproduction of that document in PDF snapshot form:



HOME » BASICS » UNDERSTANDING VARIABLE SPEED DRIVES (PART 2)

Understanding Variable Speed Drives (Part 2)

Solomon S. Turkel | *Electrical Construction and Maintenance* Apr. 1, 1998

Print Edition Newsletters

ECM

A thorough understanding of how to match the VFD to the driven load is the key to a successful application.

When applied properly, the variable frequency drive (VFD) is the most effective motor controller in the industry today. Modern VFDs are affordable and reliable, have flexibility of control, and offer significant electrical energy savings through greatly reduced electric bills.

They are used in a wide variety of applications for various reasons. For example, they are the most effective energy savers in pump and fan applications; they enhance process operations, particularly where flow control is involved. VFDs provide soft-start capabilities, which decrease electrical stresses and line voltage sags associated with full voltage motor start-ups, especially when driving high-inertia loads.

To obtain a clear understanding of the proper and most effective application of VFDs, you first should gain a working knowledge of VFD basic theory as well as a strong familiarity with practical know-how.

The above reproduction is entirely, 100% accurate with respect to what the USPTO provided Applicant, and what is found on PAIR.

Applicant also traverses on procedural grounds that the above document cannot be evaluated for all its teachings due to the poor quality thereof.

To be clear, the USPTO has not established that the paper constitutes a printed publication under 35 U.S.C. §102. This is no trivial matter. 35 U.S.C. §102 states that a "person is entitled to a patent unless." It is the USPTO's burden to prove that Applicant is to be denied its right to a patent. The USPTO has not proved such.

Applicant hereby relies on *In re Cronyn,* 890 F.2d 1158, 13 USPQ2d 1070 (Fed. Cir. 1989), attached in Appendix A, where the Court of Appeals for the Federal Circuit, the court that handles all appeals from the USPTO, reversed the Board of Patent Appeals and Interferences by finding that a doctoral thesis in a library indexed by the student's name was found not to be a publication:

> The sole question in this case is whether the Board of Patent Appeals and Interferences (Board) correctly held that three undergraduate theses were "printed publications" under 35 U.S.C. § 102(b) (1982), which anticipated the invention for which a patent was sought. ***We hold that the theses were <u>not</u> "printed publications," and we therefore reverse the Board.***

(*In re Cronyn*, first and second sentences, emphasis added.)

More specifically, it is first noted that the USPTO does not explain what section of 35 U.S.C. §102 the paper falls under.

Applicant hereby requests that Art Unit 3744 state, on the record, what section of 35 U.S.C. §102 the paper is alleged to fall under, and explain why that is the case.

Assuming *arguendo* that the rejection is based on 35 U.S.C. §102(b) art, this means that the paper must have been "described ***<u>in a printed publication</u>*** in this or a foreign country." (35 U.S.C. §102(b), emphasis added.) There is absolutely no evidence on the record that the paper was available to the public, or even existed, prior to March 18, 2010, and March 20, 2009, the filing dates of the present application and the priority application.

Granted, the document contains what looks like the words "Apr. 1, 1999." However, that is not certain, and even if that text existed on the paper, that does not correspond to a printed publication. Put another way, simply because a document existed in 1999 does not mean that it was a publication under 35 U.S.C. §102(b).

For the purposes of establishing Applicant's case, in the event that this application is again appealed, as of this filing date, Applicant's representative has created a paper with a date thereon that states March 16, 2016, with some text and a picture, signed by Applicant's representative, which paper has been placed in a sealed envelope on that date, which will be first opened in front of the Board, at which point Applicant's representative will ask the Board if that paper constitutes a printed publication simply because it states March 16, 2016, thereon. This is the context that Art Unit 3744 must operate under.

Please prove that the paper was a printed publication, or else withdraw the rejections.

This is no small matter. Again, *In re Cronyn,* 890 F.2d 1158, 13 USPQ2d 1070 (Fed. Cir. 1989) indicates that without additional evidence, the paper is not prior art. The record contains no evidence. The paper is not prior art. Withdrawal of all rejections is warranted for at least this reason, but there is more.

Applicant relies on MPEP §2141.01(a)(I), entitled *TO RELY ON A REFERENCE UNDER 35 U.S.C. 103, IT MUST BE ANALOGOUS PRIOR ART.* That MPEP section states that a

> reference is analogous art to the claimed invention if: **(1)** the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or **(2)** the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

(MPEP 2141.01(a)(I), emphasis added.)

The Office Action does not allege that the paper comes from analogous art. Thus, the paper is not analogous pursuant to scenario number "1" of MPEP 2141.01(a)(I) just quoted. If the USPTO believes that the paper, in fact, is from the same field of endeavor as claim 1, Applicant requests that the USPTO place this on the record and explain why that is the case.

Because scenario number "1" is not applicable – the paper is not from the same field of endeavor as claim 1 - the only way the paper can be analogous art is if scenario number "2" is

applicable. The Office Action nowhere addresses this. Indeed, below is the sum total of the assertions about the paper:

> However, UVSD teaches that the variable frequency drive is the most effective motor controller in the industry, are affordable and reliable, and offer significant electrical energy savings through greatly reduced electrical bills. Urbain teaches that an

(PDF snapshot of Office Action, page 5, bottom.) No alleged problem faced by Applicant is proffered in the Office Action. No alleged problem at all. Accordingly, because the Office Action has not established or even asserted that the paper represents analogous prior art, a *prima facie* case of obviousness has not been established for at least this reason. Thus, the rejections should be withdrawn for at least this additional reason, but there is even more.

The Office Action asserts that:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, such that a single controller of Urbain can manage all of the functions of the system including the variable frequency driver for power supply of the at least one compressor, in order to advantageously provide the system with the flexibility to adjust compressor and other components operations for changing conditions, and to provide for reduced electric costs by using a variable frequency driver ("VFD").

(Office Action, page 6, top.) Yet Urbain only discloses controlling individual elements. As has been previously detailed, which arguments are hereby incorporated by reference in their entirety, Urban does not disclose a plurality of refrigeration systems that have the recited features of claim 13. Further, there is absolutely nothing in Urbain about a central controller that is configured for controlling the operation of the preconditioned air unit ***including variable frequency drivers of the plurality of refrigeration systems***.

The Office Action appears to rely on common knowledge in the art, as is discussed and permitted in MPEP 2144, that the person of ordinary skill in the art would recognize that Urbain discloses a controller as recited vis-à-vis the a precondition air unit in a very the drivers plurality of refrigeration systems. To be clear, there is no variable frequency drive are disclosed in Urban, and the office action does not allege the contrary. Thus, it appears that the office action is taking official notice that the person of ordinary skill in the art would recognize that the controller of Urban meets these recitations of claim 13. However, contrary to the requirements of MPEP 2144, there is absolutely no technical line of reasoning underlying these assertions. There is simply the bald assertion that the person of ordinary skill in the art would have recognized that the alleged controller of Urbain would have "advantageously provided the system [of Anderson] with the flexibility to adjust a compressor and other components operations." This does not mean that there would be advantages associated with a system having the variable frequency drivers. Nothing at all. There is no support for such assertion. Applicant notes that MPEP 2144 permits an applicant to traverse the use of official notice as improper. Embracing the protections of MPEP 2144, applicant hereby traverses the assertion that the person of ordinary skill in the art would have recognized that the system of Urbain can control a preconditioned air unit including variable frequency drivers of a plurality of refrigeration systems. As is Applicant's right per MPEP 2144, Applicant hereby requests that Art Unit 3744 cite a reference that can be evaluated for all its teachings, and explicitly identify where such supports the alleged common knowledge in the art underlying the rejection of claim 13, or otherwise withdraw the rejection.

In summary, a *prima facie* case of obviousness has not been established.

In summary, no claim is obvious because claim 13 is not obvious. Withdrawal of all rejections is warranted.

Applicant also hereby traverses the rejection of claim 16. The Office Action asserts that:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of UVSD, in order to provide greater control over the operation of the blower to changing operation requirements and provide for reduced energy costs.

(OA, page 7.) However, there is absolutely no technical line of reasoning to support this conclusion that the person of ordinary skill the art would have recognized that such would be the case. Applicant hereby traverses that such would have been common knowledge in the art, and hereby traverses these assertions as being improperly officially noticed. There is absolutely no technical line of reasoning to support these conclusions. Pursuant to MPEP 2144, Applicant hereby requests that the USPTO cite a reference and exactly explain where that reference teaches this alleged knowledge in the art, or else withdraw the rejection of claim 16 for this additional reason.

With respect to claim 15, which rejection is also traversed, Applicant hereby traverses the use of improper official notice. The Office Action concludes, without any rationale or technical evaluation, that the teachings of Anderson regarding the desirability to provide condenser fans with variable airflow rates and the teachings of Urbain regarding speed of the cooling fans being modified according to readings or pressure sensors would have rendered it obvious to one of ordinary skill in the art to modify Anderson in view of the paper in order to provide greater control over the operation of the condenser fan according to heat loss needs of the system and provide for reduced energy costs. However, there is absolutely no support for the conclusion that the modification proffered would have been recognized as resulting in the aforementioned greater control and reduced energy costs. Pursuant to the protections of MPEP 2144, Applicant hereby traverses this assertion is being improperly officially noticed, and requests that the USPTO cite a reference and explain exactly where that reference teaches this alleged knowledge in the art, or else withdraw the rejections.

For the record, Applicant hereby traverses as being improperly officially noticed the assertions with respect to claim 19. Specifically, the Office Action asserts that the mere teaching of a pressure sensor in Urbain that is used in the control of the compressor renders it obvious to modify

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Anderson in order to quote, utilize the controller of Urbain in combination with the pressure sensor in order to control the VFD powering the compressor in order to ensure proper operation of the compressor. There is absolutely no technical line of reasoning to support the assertion that the person of ordinary skill in the art would have recognized this as "ensuring proper operation of the compressor. Applicant thus requests, per MPEP 2144, that the USPTO cite a reference that can be evaluated for all its teachings, supporting the assertion that the proffered modification would have been recognized as "ensuring proper operation of the compressor," and explain where such reference teaches such, or else withdraw the rejections.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

HAUPTMAN HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: April 15, 2016
BJH:CHY/tal

890 F.2d 1158

58 USLW 2376, 57 Ed. Law Rep. 405, 13
U.S.P.Q.2d 1070

In re Marshall W. CRONYN.

No. 89-1434.

**United States Court of Appeals,
Federal Circuit.**

Nov. 29, 1989.

Peter J. Dehlinger, Palo Alto, Cal., argued for appellant.

Nancy C. Slutter, Associate Sol., Office of the Sol., Arlington, Va., argued for appellee. With her on the brief was Fred E. McKelvey, Sol., Woodbridge, Va.

Before FRIEDMAN, Senior Circuit Judge,* and ARCHER and MAYER, Circuit Judges.

FRIEDMAN, Senior Circuit Judge.

1

The sole question in this case is whether the Board of Patent Appeals and Interferences (Board) correctly held that three undergraduate theses were "printed publications" under 35 U.S.C. Sec. 102(b) (1982), which anticipated the invention for which a patent was sought. We hold that the theses were not "printed publications," and we therefore reverse the Board.

2

* A. The facts in this case are undisputed. The patent application was for a chemical compound that apparently may be useful in cancer treatment. The appellant, the applicant for the patent, is a professor of chemistry (and Vice President/Provost) at Reed College, a liberal arts college in Portland, Oregon. Reed College is solely an undergraduate institution, and does not have any graduate programs for research or scholarship.

3

As a requirement for graduation with a Bachelor of Arts degree, Reed College requires each of its students to prepare a senior thesis. The student presents the thesis to a Thesis Oral Board, composed of four faculty members including the student's faculty sponsor and another faculty member from the student's department. The appellant states that the "purpose of the thesis requirement is to give the student the opportunity to carry out laboratory or scholarly research and to present the work in a more thorough and formal manner than is normally possible with the usual term paper," and that the "thesis requirement is purely educational and the students are not required by general college policy to produce original or publishable research or scholarship."

4

A copy of each thesis is filed in the main college library and in the library of the particular department in which the student's work was done. The theses are listed on individual cards

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which show the student's name and the title of the thesis. The cards are filed alphabetically by the author's name.

5

The titles of the theses may be descriptive, as were the titles of the three theses involved in this case. One of these is entitled "Synthesis of Cyclic Methanedisulfonate Esters by Silver Salt Method." Other theses on file in the chemistry department library, however, have more fanciful titles, such as "Make My Func. the P-Func"; "Close to the Edge"; "Evolution and Lucifer"; "Easy Come, Easy Go"; "Hunan's Thanatopsis: Haecceity, Tathat, and Doedecahedrane".

6

In the main library, there are approximately 6,000 cards listing theses. In the chemistry department library there are approximately 450 cards contained in a shoebox. At oral argument the appellant stated that both the listing cards and the theses themselves are available for public examination.

7

In neither the main library nor the chemistry department library are the theses generally indexed or cataloged. They are not assigned Library of Congress catalog numbers.

8

The appellant stated that "occasionally a student's thesis is published, in whole or part, in a professional journal." He further stated, however, that although the thesis research projects were carried out in his laboratory, "none of the students involved have presented their senior theses or pertinent parts thereof in any professional journal or to any professional society, or in any other professional setting." The appellant also stated that prior to the filing of the patent application he had not "made any publication in a professional journal, or presentation to a professional society, or any other disclosure or presentation in the fields" involved in or related to the senior theses that "would associate my research interests with the field of the invention."

9

B. The Board affirmed the examiner's rejection of the application under 35 U.S.C. Sec. 102(b) as anticipated by the three student theses. The Board stated that the "sole issue before us is whether" the three theses "are printed publications within the meaning of" 35 U.S.C. Sec. 102(b), since the appellant had "conceded ... that if they are, the subject matter of the claims is unpatentable to him." The Board found that there was "no significant distinction between the facts here and those in" In re Hall, 781 F.2d 897, 228 USPQ 453 (Fed.Cir.1986), discussed in part II below. It concluded that "reasonable diligence" by a researcher in the field "would have uncovered the documents."

II

10

Under 35 U.S.C. Sec. 102(b), a patent cannot be granted if "the invention was ... described in a printed publication in this ... country ... more than one year prior to the date of the application for patent in the United States...."

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11

In cases like the present one, where there are no disputed factual issues, the question whether particular material is a "printed publication" is a question of law. Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1568 & n. 9, 1 USPQ2d 1593, 1597 & n. 9 (Fed.Cir.), cert. denied, 481 U.S. 1052, 107 S.Ct. 2187, 95 L.Ed.2d 843 (1987) (citing In re Hall, 781 F.2d 897, 899, 228 USPQ 453, 455 (Fed.Cir.1986)). See also National Semiconductor Corp. v. Linear Technology Corp., 703 F.Supp. 845, 847, 8 USPQ2d 1359, 1361 (N.D.Cal.1988). "[T]he printed publication provision was designed to prevent withdrawal by an inventor, as the subject matter of a patent, of that which was already in the possession of the public." In re Wyer, 655 F.2d 221, 226, 210 USPQ 790, 794 (CCPA 1981).

12

"The statutory phrase 'printed publication' has been interpreted to mean that before the critical date the reference must have been sufficiently accessible to the public interested in the art; dissemination and public accessibility are the keys to the legal determination whether a prior art reference was 'published.' " Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1568, 7 USPQ2d 1057, 1062 (Fed.Cir.), cert. denied, --- U.S. ----, 109 S.Ct. 228, 102 L.Ed.2d 218 (1988).

13

This court and its predecessor twice recently have considered the status as printed publications of academic papers filed in a university library. In In re Bayer, 568 F.2d 1357, 196 USPQ 670 (CCPA 1978), the Board held that a master's thesis became a printed publication upon its receipt by a university library because the three-member faculty committee that had approved the thesis "could have located his thesis in the library where it was available to them on request," so that the thesis "was capable of providing wide public access to the information it contained." 568 F.2d at 1359, 196 USPQ at 673. On the critical date the library had received the thesis but had not yet cataloged it or placed it on the library shelves in bound form as it ultimately would do.

14

The Court of Customs and Patent Appeals reversed. The court first held that "a printed document may qualify as a 'publication' under 35 U.S.C. Sec. 102(b), notwithstanding that accessibility thereto is restricted to a 'part of the public,' so long as accessibility is sufficient 'to raise a presumption that the public concerned with the art would know of [the invention].' Accessibility to appellant's thesis by the three members of the graduate committee under the circumstances of the present case does not raise such a presumption." 568 F.2d at 1361, 196 USPQ at 674 (citations and footnote omitted) (brackets in original). The court then stated:

15

Moreover, since appellant's thesis could have been located in the university library only by one having been informed of its existence by the faculty committee, and not by means of the customary research aids available in the library, the "probability of public knowledge of the contents of the [thesis]," was virtually nil.

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16

Id. (citation omitted) (brackets in original).

17

The court rejected the Commissioner's argument that the student's defense of his thesis before the faculty committee reflected an intent to make the result of his research available to the public. The court stated: "[W]e are unconvinced that appellant's thesis defense before the graduate committee in its official capacity as arbiter of appellant's entitlement to a master's degree was somehow transmuted into a patent-defeating publication merely by depositing the thesis in the university library where it remained uncatalogued and unshelved as of the critical date in question." 568 F.2d at 1362, 196 USPQ at 675.

18

In re Hall, 781 F.2d 897, 228 USPQ 453 (Fed.Cir.1986), involved a doctoral dissertation filed in the library of a German university. A university official, Dr. Will, submitted letters, which the court described as affidavits, stating that "[o]ur dissertations ... are indexed in a special dissertations catalogue...." 781 F.2d at 898, 228 USPQ at 454. In affirming the Board's ruling that the dissertation was a printed publication, the court rejected the contention that the dissertation "was not shown to be accessible because Dr. Will's affidavits do not say when the thesis was indexed in the library catalog and do not chronicle the procedures for receiving and processing a thesis in the library." 781 F.2d at 899, 228 USPQ at 455. The court stated:

19

The only reasonable interpretation of the affidavits is that Dr. Will was relying on his library's general practice for indexing, cataloging, and shelving theses in estimating the time it would have taken to make the dissertation available to the interested public. Dr. Will's affidavits are competent evidence, and in these circumstances, persuasive evidence that the Foldi dissertation was accessible prior to the critical date.

20

Id.

21

As the opinions in Bayer and Hall indicate, the critical difference between the cases that explains the different results is that on the critical date in Bayer the thesis was "uncatalogued and unshelved" and therefore not accessible to the public, whereas in Hall the "dissertation was accessible" because it had been indexed, cataloged and shelved.

22

We conclude that in the present case, as in Bayer and unlike Hall, the three student theses were not accessible to the public because they had not been either cataloged or indexed in a meaningful way. Although the titles of the theses were listed on 3 out of 450 cards filed alphabetically by author in a shoebox in the chemistry department library, such "availability"

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was not sufficient to make them reasonably accessible to the public. Here, the only research aid was the student's name, which, of course, bears no relationship to the subject of the student's thesis.

23

The decision whether a particular reference is a printed publication "must be approached on a case-by-case basis." In re Hall, 781 F.2d at 899, 228 USPQ at 455. See also In re Wyer, 655 F.2d at 227, 210 USPQ at 795 ("Decision in this field of statutory construction and application must proceed on a case-by-case basis.").

24

Considering all the facts of this case, we hold that the three student theses were not "printed publications" under 35 U.S.C. Sec. 102(b).

CONCLUSION

25

The decision of the Board of Patent Appeals and Interferences is REVERSED.

26

MAYER, Circuit Judge, dissenting.

27

In my view, the papers at issue here were sufficiently available to the public to qualify as "printed publications" within the meaning of 35 U.S.C. Sec. 102(b). The nature and quality of the index in the Reed College chemistry department library are not determinative of whether the theses were publicly available. Neither Bayer nor Hall turned solely on the existence, absence, or character of an index. Indeed, the result in both cases is not inconsistent with the notion that merely shelving a single copy of a work in a publicly accessible area of a library is sufficient for publication under the statute. Earlier decisions of the Patent Office Board of Appeals, interpreting the predecessor to section 102(b), were to the same effect: shelving a thesis in a university library is alone sufficient to render it a "printed publication". Gulliksen v. Halberg v. Edgerton v. Scott, 75 USPQ 252, 257 (Pat.Off.Bd.App.1937); Ex parte Hershberger, 96 USPQ 54, 56 (Pat.Off.Bd.App.1952).

28

Of course, the "shoebox" author index in this case is relevant to the question of publication. When considered together with the shelving of the theses in publicly accessible areas of the Reed College libraries, the presence of even this "noncustomary" index convinces me that these works were published as contemplated by the statute. But the existence or nature of an indexing system is only one factor to be considered in assessing the public availability of a work, In re Wyer, 655 F.2d 221, 226 (CCPA 1981); it is neither a necessary nor a sufficient condition for publication.

*

Judge Friedman took senior status on November 1, 1989

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Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman/Tracy Luke
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1615	1	80	80
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**80**

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of PCT/IB2010/051189	:	FILED: MARCH 18, 2010
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
371c: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the Office Action of January 15, 2016, Applicants submit the following:

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (Previously presented) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

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16. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (Previously presented) A preconditioned air unit according to ~~claim 13~~ claim 31, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (Previously presented) A preconditioned air unit according to claim 31, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

23. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (Previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (Previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (Previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (Previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

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30. (Cancelled)

31. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

32. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

33. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

34. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

35. (Previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

36. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

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37. (New) A preconditioned air unit according to claim 13, wherein:

at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;

the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;

at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;

each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and

the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/257,669	Filing Date 09/20/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **04/15/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 24	Minus	** 20	= 4	X $80 =	320
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	**320**

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/GLORIA ANTHONY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	486	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/04 13:32
L2	139	L1	US-PGPUB; USPAT; EPO	OR	ON	2016/07/04 13:32
S1	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:21
S2	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:25
S3	1	(12/301357).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/04 15:26
S5	110	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:26
S6	28	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:28
S7	86	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:30
S8	43	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:32
S9	0	(scroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:33
S10	8	(schroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:34
S11	14	("20080250903" | "20100031676" |	US-PGPUB;	OR	ON	2014/03/04

		"4272967" | "5107685").PN.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			17:08
S12	0	62/228.4.ccls. and b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:24
S13	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:10
S14	3	S13 and (vfd or inverter or (variable adj speed))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:11
S15	4	"4272967".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:12
S16	386	(variable adj speed) near5 condenser near5 (fan or blower)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:44
S17	8	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/04 19:45
S18	0	S16 and S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:45
S19	0	S13 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:46

S20	601771	inverter ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S21	609	inverter near5 ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S22	306	(inverter near5 ("60" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:39
S23	40	(inverter near5 ("60" adj hz) near5 ("50" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:41
S24	0	wo2007061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S25	0	wo20070061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S26	2	"7461516".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 09:00
S28	1	(12/741437).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/05 09:35
S29	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2014/03/05 10:42

			DERWENT; IBM_TDB			
S30	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S31	28	S30 and (range near5 (hz or hertz))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S32	3153	(output near3 voltage) near10 frequency near10 ratio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S33	1	S30 and "l24"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S34	9	S30 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:16
S35	11	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$ or US-20080314064-$ or US-20030168862-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/07 14:57
S36	9	S35 and controller	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 14:57
S37	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S38	871	S37 near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR;	OR	ON	2014/03/07 15:07

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S39	4931033	(main or central or system) near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S40	372	S38 and S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S41	30143	(independent or separate or redundant or backup) near20 (system or compressor or generator) near20 (fail$4 or malfunction)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:24
S42	143400	"62"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S43	277	S41 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S44	122	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 14:58

		("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.				
S45	47	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 14:58
S46	50	(("3640256") or ("3929285") or ("3929628") or ("4049395") or ("4060393") or ("4249655") or ("4259970") or ("4272499") or ("4274371") or ("4281522") or ("4296809") or ("4299285") or ("4300447") or ("4313499") or ("4343348") or ("4347708") or ("4357860") or ("4399742") or ("4442817") or ("4463022") or ("4519324") or ("4526090") or ("4539793") or ("4543677") or ("4554933") or ("4612096") or ("4615176") or ("4621504") or ("4764348") or ("4775627") or ("4781729") or ("4786301") or ("4829885") or ("4838345") or ("4842620") or ("4860642") or ("4866839") or ("4872397") or ("4884366") or ("4891892") or ("4921604") or ("4955372") or ("4967769") or ("5001346") or ("5015365") or ("5318099") or ("5540757") or ("5547421") or ("5740846") or ("5958346")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 15:04
S47	0	("(12-pulseor18-pulseor24-pulse)near10rectifier").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2014/03/08 16:07

			DERWENT; IBM_TDB			
S48	322	(12-pulse or 18-pulse or 24-pulse) near10 rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:07
S49	10	S48 and ((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:09
S50	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 09:47
S51	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:01
S52	1899	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:45
S53	120	S52 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:49
S54	0	yd2t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S55	334	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S56	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT; USOCR;	OR	ON	2014/10/21 18:59

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S57	4	(high adj motor adj torque).clm.	USPAT	OR	ON	2014/10/21 18:59
S58	154	(high adj motor adj torque)	USPAT	OR	ON	2014/10/21 19:03
S59	4805	hauptmann	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:27
S60	0	(benjamin near2 hauptmann)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:29
S61	156	(benjamin near2 hauptman)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:30
S62	154	(benjamin near2 hauptman)	US-PGPUB; USPAT	OR	ON	2014/12/29 11:30
S63	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/30 13:41
S64	2468	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S65	163	S64 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S66	0	S65 and (unloader adj valve)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S67	3	"20120023985".pn.	US-PGPUB;	OR	ON	2015/04/20

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			11:31
S68	835	voltage near3 frequency near3 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:36
S69	576	voltage near3 frequency near3 torque	US-PGPUB; USPAT	OR	ON	2015/04/20 11:37
S70	291	(ratio near3 voltage near3 frequency near3 constant)	US-PGPUB; USPAT	OR	ON	2015/04/20 11:49
S71	27	S70 near10 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:49
S72	39	(US-20080314064-$ or US-20080141703-$ or US-20140138478-$ or US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20050034468-$ or US-20080238108-$ or US-20140103846-$ or US-20130147410-$ or US-20070209383-$ or US-20030168862-$ or US-20110153237-$ or US-20070024224-$ or US-20090084120-$ or US-20070035263-$ or US-20060086124-$ or US-20050086974-$ or US-20060266054-$ or US-20140354194-$ or US-20100031676-$ or US-20090151879-$).did. or (US-7325410-$ or US-6600278-$ or US-4859924-$ or US-6564571-$ or US-3784888-$ or US-7479749-$ or US-6446447-$ or US-8588983-$ or US-7380588-$ or US-7685838-$ or US-5107685-$ or US-6751979-$ or US-7484377-$ or US-7216492-$ or US-4691155-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2015/04/24 10:44
S73	19	S72 and torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 10:45
S74	285	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 11:04

S75	195	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:05
S76	109	(constant adj torque) near10 (voltage and frequency)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:11
S77	6	("2007135103").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:32
S78	6	("2007061622").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:34
S79	0	("6414455.pn.").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:42
S80	4	"6414455".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 10:42
S81	52	("4047083" | "4249120" | "4661751" | "4785225" | "5272429" | "5710500" | "6154002").PN. OR ("6414455").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/12/09 10:43
S82	3	"20130025303".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 11:22
S83	2714	(refrigeration near2 systems) and compressor and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:45
S84	431	(refrigeration near2 systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:46
S85	409	(refrigeration near2 syst$2) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S86	431	(refrigeration near2 syst$3) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S87	431	(refrigeration near2 system$1) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49

S88	406	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S89	268	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	OFF	2015/12/28 10:55
S90	81	((plurality or multiple) near2 (refrigeration adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:18
S91	92	((plurality or multiple) near2 ((refrigerat$4 or cool$4) adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:21
S92	4	"5383355".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:37
S93	4	"5383335".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:38
S94	2	"6446447".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:39
S95	1	"5383335".pn.	US-PGPUB; USPAT	OR	ON	2016/01/06 17:56
S96	3	"20100031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:40
S97	1	"20100031676".pn. and (condenser near3 fan)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:41
S98	1	"6414455".pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 15:14
S99	0	("(dieseladjgenerator)near5inverter").PN.	US-PGPUB; USPAT	OR	OFF	2016/01/07 18:51
S100	72	(diesel adj generator) near5 inverter	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/07 18:52

S101	17	(diesel adj generator) near5 inverter	US-PGPUB; USPAT	OR	ON	2016/01/07 18:54
S102	105	"4835977" "5031690" "4352273" "2585570" "4272967"	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S103	5	("4835977" "5031690" "4352273" "2585570" "4272967").pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S104	1	"6414455".pn.	USPAT	OR	ON	2016/01/07 20:27
S105	124	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/01 16:19
S106	32	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S107	127	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S108	61	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S109	214	S105 or S106 or S107 or S108	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19

7/4/2016 1:57:07 PM
C:\Users\hcrenshaw\Documents\EAST\Workspaces\13257669.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/08/2014	10/21/2014	01/08/2016	07/04/2016					
	1	-	-	-	-					
	2	-	-	-	-					
	3	-	-	-	-					
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	8	-	-	-	-					
	9	-	-	-	-					
	10	-	-	-	-					
	11	-	-	-	-					
	12	-	-	-	-					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
	15	✓	✓	✓	✓					
	16	✓	✓	✓	✓					
	17	✓	✓	✓	✓					
	18	✓	✓	✓	✓					
	19	✓	✓	✓	✓					
	20	✓	✓	✓	✓					
	21	✓	✓	✓	✓					
	22	✓	✓	✓	✓					
	23	✓	✓	✓	✓					
	24	✓	✓	✓	✓					
	25	✓	✓	✓	✓					
	26	✓	✓	✓	✓					
	27	✓	✓	✓	✓					
	28	✓	✓	✓	✓					
	29	✓	✓	✓	✓					
	30			-	-					
	31			✓	✓					
	32			✓	✓					
	33			✓	✓					
	34			✓	✓					
	35			✓	✓					
	36			✓	✓					

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	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/08/2014	10/21/2014	01/08/2016	07/04/2016					
	37				✓					

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 07/08/2016

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
07/08/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Office Action Summary	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *4/15/2016*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *13-29 and 31-37* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *13-29 and 31-37* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *9/20/2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

2. This action is in response to the reply filed 4/15/2016.

3. Claims 1-12 and 30 are cancelled.

4. Claim 37 is new.

5. Claims 13-29 and 31-37 are pending.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 20 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 20, recites "variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range. The meaning of "high motor torque is unclear." The term is a relative term which renders the claim indefinite. The term is

not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For example, does the torque remain at the same "high" torque throughout the entire range of frequencies, or is there a different “high” torque depending upon the specific frequency? Since the claim language and specification repeatedly state that the “high motor torque” is a result of keeping the ratio between the output voltage and the frequency substantially constant, any device that performs this same function will be viewed as reading on this claim limitation.

Claim Rejections - 35 USC §103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 3), hereafter “UVSD”.

Regarding claim 13, Anderson teaches a preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground (see abstract), the preconditioned air unit comprising a housing (Fig. 1) accommodating a flow duct (104, 28, 44, Fig. 1) with an air inlet for ambient air (102) and an air outlet (46) for connection to the parked aircraft (col. 4, lines 33-36), a blower (38) connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, (col. 4, lines 25-26)

a plurality of refrigeration systems, each of which includes (see col. 4 line 59 to col. 5, line 15, describing two systems) at least one compressor, (58, 72) at least one condenser, (64,76) at least one expansion valve, (60, 81)

at least one evaporator (50, 52) connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct (apparent from Fig. 1).

Anderson does not appear to teach,

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

However, UVSD teaches that the variable frequency drive is the most effective motor controller in the industry, are affordable and reliable, and offer significant electrical energy savings through greatly reduced electrical bills. Urbain teaches that an automatic controller manages the functioning of an air condition unit by controlling its constituent elements, such as the fan, compressor, condenser, and pressure reducing valves and evaporator, (par. 92).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, such that a single controller of Urbain can manage all of the functions of the system including the variable frequency driver for power supply of the at least one compressor, in order to advantageously provide the system with

the flexibility to adjust compressor and other components operations for changing conditions, and to provide for reduced electric costs by using a variable frequency driver ("VFD").

Regarding claim 14, Anderson as modified teaches a preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems. (82, 84, col. 5, 10-25).

Regarding claim 15, Anderson as modified teaches the preconditioned air unit according to claim 13, but does not expressly teach wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

However, Anderson does teach that it is desirable to provide condenser fans with variable air flow rates (col. 3, 20-25), and Urbain teaches that the speed of the cooling fan 21 of the condenser can be modified according to the readings or pressure sensor sp4 (par. 112), and it would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of UVSD, in order to provide greater control over the operation of the condenser fan according to the heat loss needs of the system and provide for reduced energy costs.

Regarding claim 16, Anderson as modified teaches a preconditioned air unit according to claim 13, including the desirability of providing a blower with an adjustable speed (claim 13), but does not expressly teach the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of UVSD, in order to provide greater control over the operation of the blower to changing operation requirements and provide for reduced energy costs.

Regarding Claim 23, Anderson as modified teaches the unit according to claim 13, but does not appear to expressly teach wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit to at least one of: The selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit. However, Anderson does teach that a problem it seeks to overcome in existing systems is adapting them for use with different types of aircraft (col. 2, 5-17), and Urbain teaches at (par. 14-23) how to control the system so as to accommodate the needs of different aircraft.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to provide a unit with the flexibility of servicing different types of aircraft.

Regarding claim 28, Anderson as modified teaches a preconditioned air unit according to claim 13, but does not appear to expressly teach at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker. However, Urbain teaches these features at par. 100-105).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to provide the operator with the desired degree of control over the system.

Regarding claim 29, Anderson as modified teaches the preconditioned air unit according to claim 13, but does not appear to teach a heater in the flow duct.

However, Urbain teaches this feature at par. 35.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to provide the capability of heating the aircraft cabin.

9. Claims 17, 31 and 19 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD", and further in view of US 5,107,685 to Kobayashi .

Regarding claims 17 and 31, Anderson as modified teaches a preconditioned air unit according to claim 13, wherein at least one variable frequency driver has

a controller that is configured for variation of the output frequency of the at least one variable frequency driver, (the central controller of Urbain controls the system including the compressor, which is powered by the variable frequency drive).

To the extent applicant argues that the controller is not the central controller of claim 13, Kobayashi teaches that an inverter that converts commercial power to variable frequency, with a controller that controls the output frequency (abstract).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Kobayashi, in order to provide a means for controlling the output frequency.

Regarding claim 19, Anderson as modified teaches a preconditioned air unit according to claim 31, but does not expressly teach the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

However, Urbain teaches at (par. 19) that a pressure sensor is used in the control of the compressor.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Urbain, in order to utilize the controller of Urbain in combination with the pressure sensor in order to control the VFD powering the compressor in order to ensure proper operation of the compressor.

10. Claims 18 and 32 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5383335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD", US 5,107,685 to Kobayashi and US 4,514,991 to Zinsmeyer.

Regarding claims 18 and 32, Anderson as modified teaches a preconditioned air unit according to claim 17, but does not expressly teach the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned unit.

However, the typical mains supply is widely known as 50 Hz for Europe and 60 Hz for US, and Zinsmeyer teaches a variable speed drive motor system to drive an output shaft at varying speeds (abstract).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Zinsmeyer for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit, the motivation being to provide the system with the ability to respond to a wider range of system demands and to be adaptable for power supplies at different locations.

11. Claims 20 and 33 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5383335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD" and US 6,414,455 to Watson.

Regarding claims 20 and 33, Anderson as modified teaches a preconditioned air unit according to claim 13, but does not teach wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

However, Watson, (col. 12, 40-55) teaches that the torque can be held constant by holding constant the ratio between voltage and frequency. Since the instant application does not contain any definition of "high motor torque", other than being the result of keeping the ratio between the voltage and the frequency constant, the office views the teachings of Watson as satisfying this limitation.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Watson, in order to in order to maintain a high/sufficient torque at all frequency ranges.

12. Claim 21 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD", US 5,107,685 to Kobayashi and further in view of 2007/0035263 to Rastogi.

Regarding claim 21, Anderson teaches a preconditioned air unit according to claim 31.

Rastogi teaches wherein the central controller (12) is connected to at least one controller (16) of the at least one voltage frequency driver (par. 2). It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Rastogi, the motivation being to facilitate placement of two local vfd drives in the event the system needs more power than can be delivered by one drive, (see Rastogi par. 6).

13. Claims 22 and 34 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD" and further in view of US 2007/0209383 to Hutton.

Regarding claims 22 and 34, Anderson as modified teaches a preconditioned air unit according to claim 13 including a central controller, but does not teach the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

Hutton teaches that the power demands of the air conditioner can impact the power available for other uses at peak demands, such as interior lights and auto-leveling of the aircraft, (col. 1, 60 to col. 2, 5). A thermal storage unit is used to offset some of the cooling power needed by the AC system during peak demand, so that energy consumption by the AC unit can be reduced, (col. 12, 15-30.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Hutton, so that the AC will use less power so such power can shared with other devices, the motivation being to allow more power to go to the interior lights and auto leveling devices.

14. Claims 24, 25, 35 and 36 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD" and further in view of US 6,446,447 to Goth.

Regarding claims 24 and 25, and 35 and 36, Anderson as modified teaches a preconditioned air unit according to claim 13, but does not teach wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller, or wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

Goth teaches redundant refrigeration systems to ensure continued cooling in the event one of the systems fails (see Goth claim 20). A local controller refrigeration system controller notifies a main/cage controller of a failure in the local system (the failing refrigeration system transmits a failure signal to the central controller) so that the main/cage controller can switch operation to the other refrigeration system (controller... automatically adjust the required amount of cooling among the remaining systems .... in response to the failure signal.)

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Goth, the motivation being to provide automatic system back-up so as to preserve the comfort of passengers in the even one of the AC systems fails.

15. Claims 26 and 27 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD" and further in view of US 6,600,278 to Bretzius.

Regarding claims 26 and 27, Anderson as modified teaches a preconditioned air unit according to claim 13.

Bretzius teaches a variable frequency drive with a 12 pulse rectifier, (col. 3, lQ-25).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Urbain, in view of Bretzius, the motivation being to provide a

means for converting AC to DC and to provide rectification that cancels many of the characteristic harmonics a six-pulse bridges produce.

16. Claim 37 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5383335 to Anderson, US 2010/0031676 to Urbain, Understanding Variable Speed Drives (Part 3), hereafter "UVSD", US 5,107,685 to Kobayashi and US 4,514,991 to Zinsmeyer, US 6,414,455 to Watson, US 6,446,447 to Goth.

Regarding claim, Andersson as modified teaches a preconditioned air unit according to claim 13, including, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver (Urbain teaches the use of a system controller that controls, among other things, the compressor.

Andersson as modified does not teach,

the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;

at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;

each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and

the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

However, Kobayashi teaches that an inverter that converts commercial power to variable frequency, with a controller that controls the output frequency (abstract).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Kobayashi, in order to provide a means for controlling the output frequency.

The typical mains supply is widely known as 50 Hz for Europe and 60 Hz for US, and Zinsmeyer teaches a variable speed drive motor system to drive an output shaft at varying speeds (abstract).

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Zinsmeyer for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit, the motivation being to provide the system with the ability to respond to a wider range of system demands and to be adaptable for power supplies at different locations.

Watson, (col. 12, 40-55) teaches that the torque can be held constant by holding constant the ratio between voltage and frequency. Since the instant application does not contain any definition of “high motor torque”, other than being the result of keeping the ratio between the voltage and the frequency constant, the office views the teachings of Watson as satisfying this limitation.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Watson, in order to in order to maintain a high/sufficient torque at all frequency ranges.

Response to Applicant's Remarks

17. Applicant's amendments and remarks have been carefully considered but are only deemed partially persuasive. The rejection of claims 17, 19, 21, 31, and 32 under 35 USC 112 is withdrawn.

18. The office maintains that claim 20 is indefinite. Applicant argues that 145 US patents and 137 published US applications recite "high motor torque", and thus the term must be understood by those in the art. A similar argument was made by applicant in the response to the first non-final rejection, and was addressed by the office in the final rejection, which noted that only four of the 145 issued patents used the term in the claims, and each of those four cases are distinguishable from applicant's claimed invention. Thus the office did not locate any patents that support applicant's arguments that their use of "high motor torque" lends clarity to the claims.

19. Applicant further argues,

> . . . there is nothing more than a series of questions such as "does the torque remain at the same 'high' torque depending upon the specific frequency"? Indeed, consider that question in view of the fact that claim 20 recites that the high torque is maintained "throughout the entire output frequency range." Why is Art Unit 3744 interested in the specific frequencies when the claim specifies that it is the entire frequency range?

20. The office asked this specific question because "high motor torque" can be interpreted as (1) a constant such as 20 ft-lb throughout the frequency range, or (2) alternatively a variable, such as 20-ft lb at a low frequency and progressively changing to 10 ft-lb at a higher frequency. Further, for example, if the value is a constant, will 1 ft-lb be considered a high torque? 5 ft-lb? 20 ft lb? In the absence of supporting information in the specification or drawings, virtually any torque might be considered a high torque.

21. Applicant also cites to MPEP sections to argue that just because relative terminology is used does not mean the term is unclear, and also that the office's analysis does not expressly set out the knowledge of one having ordinary skill in the art. However, the possibility that the claims may be clear, despite the use of relative terminology, does not mean that they are clear. Further, the office does not see any information in the application, or in other documents such the 145 patents referred to by the applicant, that will answer the questions posed above.

Claim Rejections Under 35 U.S.C. §103

22. Applicant traverses the rejection on the basis that the VSD paper is a printed publication meeting the requirements of 35 U.S.C. §102, because the copy provided by the office is of poor quality, and that the date appearing on the document does not prove that it was available on the internet or elsewhere on that date.

23. However, although the copy may be of poor quality, the office disputes that the copy of the article cannot be read. Regarding the date, the office has attached the

version of the article that appeared in a printed publication in 1995. Although its title states “Part 3” instead of the previously cited “Part 2”, the text of the two versions is identical.

24. Applicant also alleges that the VSD is non-analogous art. However, the office disputes this argument. VSD Part 3 contains a photo with a caption for variable speed drives powering pumps. The field of endeavor can be defined as devices requiring motive power for fluid handling devices, which includes both pumps and compressors.

25. The reply also states,

> . . . .No alleged problem faced by Applicant is proffered in the Office Action. No alleged problem at all. Accordingly, because the Office Action has not established or even asserted that the paper represents analogous prior art, a prima facie case of obviousness has not been established for at least this reason. Thus, the rejections should be withdrawn for at least this additional reason, but there is even more.

26. The office does not agree that the office action must expressly identify the problems faced by the inventors as a prerequisite to establishing that a prior art reference is analogous. The inventors of the claimed invention presumably believe that their invention, as claimed, overcomes deficiencies or limitations of the prior art, and recognized that the properties of a variable speed drive can be used in overcoming such deficiencies and limitations. Such properties are spelled out in VSD Part 3.

27. Regarding applicant’s arguments,

> Thus, it appears that the office action is taking official notice that the person of ordinary skill in the art would recognize that the controller of Urban meets these recitations of claim 13,

> . . . .it would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of VSD, in order to provide greater control over the operation of the blower to changing operation requirements and provide for reduced energy costs.
>
> . . . However, there is absolutely no technical line of reasoning to support this conclusion that the person of ordinary skill the art would have recognized that such would be the case . . . . and hereby traverses these assertions as being improperly officially noticed.
>
> . . .Applicant hereby traverses as being improperly officially noticed the assertions with respect to claim 19. Specifically, the Office Action asserts that the mere teaching of a pressure sensor in Urbain that is used in the control of the compressor renders it obvious to modify Anderson in order to quote, utilize the controller of Urbain in combination with the pressure sensor in order to control the VFD powering the compressor in order to ensure proper operation of the compressor

28. The office is not taking official notice of anything, and applicant's arguments regarding the combination of Andersson, VSD Part 3 and Urbain are a piecemeal analysis of the references individually and not in combination as stated in the rejection. Andersson teaches the plurality of refrigeration units, VSD Part 3 teaches the desirability of using a variable speed drive, and Urbain teaches that a system controller can control various multiple components in the system. Further, the "technical line of reasoning" asserted to absent is expressly taught by the article VDS Part 3. Also, one having ordinary skill in the art will understand that devices such as pressure sensors are

used in systems to provide feedback for controllers in order to ensure proper operation of the system.

Conclusion

29. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

30. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY CRENSHAW whose telephone number is (571)270-1550. The examiner can normally be reached on Monday-Friday 8:30am to 5:30pm.

32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Alexandra Elve can be reached on (571) 272-1173. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

33. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENRY CRENSHAW/
Examiner, Art Unit 3744

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

CPC- SEARCHED		
Symbol	Date	Examiner
b64f1/362; g05d	3/10/2014	htc
g05d23/19	3/10/2014	htc
y02t50/82	3/10/2014	htc

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	228.4		

SEARCH NOTES		
Search Notes	Date	Examiner
Plus and claims search. Inventor and continuity search. East searches for US and foreign patents. NPL searches for variable speed drives.	3/10/2014	htc
updated searches	10/21/2014	htc
updated searches	1/8/2016	htc
updated searches	7/4/2016	htc

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of PCT/IB2010/051189	:	FILED: MARCH 18, 2010
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
371c: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

RESPONSE

MS AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the Office Action of July 8, 2016, Applicant submits the following:

REMARKS

In response to the Office Action mailed July 8, 2016, Applicant respectfully requests reconsideration. Based upon the following Remarks, Applicant respectfully requests that all outstanding rejections be reconsidered, and that they be withdrawn.

Claim Rejection Under §112, Second Paragraph

The Office Action has rejected claim 20 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failure to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In response, Applicant traverses the rejection for the reasons that follow.

Applicant hereby incorporates by reference the prior scholarly arguments so eloquently articulated in the last response, those arguments remaining righteous. Applicant now concentrates on the "Response to Arguments" section.

The Office Action asserts that:

> 18. The office maintains that claim 20 is indefinite. Applicant argues that 145 US patents and 137 published US applications recite "high motor torque", and thus the term must be understood by those in the art. A similar argument was made by applicant in the response to the first non-final rejection, and was addressed by the office in the final rejection, which noted that only four of the 145 issued patents used the term in the claims, and each of those four cases are distinguishable from applicant's claimed invention. Thus the office did not locate any patents that support applicant's arguments that their use of "high motor torque" lends clarity to the claims.

(Office Action, page 16.)

Art Unit 3744 has never answered Applicant's questions. It continues to proffer hypothetical questions.

Also, why does Art Unit 3744 keep referring to the claims of the 145 issued patents. Why does that control? The Office Action never explains. Never.

Applicant's point is that this claim phrase is utilized in the art, and thus has meaning. There could be tens of thousands of patents to a car, describing wheels in the specification, but not claiming wheels. That does not mean that those patents are irrelevant to ascertaining what the phrase "wheel" means in the art.

Applicant asks Art Unit 3744 to state, with a yes or no answer, that when rejecting a claim under 35 U.S.C. §112, second paragraph, based on the assertion that the person of ordinary skill in the art would not understand what the claim phrase means, it is correct to say that it is permissible to only consider references that explicitly claim that phrase.

Applicant asks Art Unit 3744 to state, with a yes or no answer, that when rejecting a claim under 35 U.S.C. §112, second paragraph, based on the assertion that the person of ordinary skill in the art would not understand what the claim phrase means, it is correct to say that Art Unit 3744 can ignore non-patent literature because there are not claims in non-patent literature.

See how Art Unit 3744's limiting of its scope of the prior art to references that only utilize the words at issue in a claim is completely inconsistent with proper examination procedures on its face?

The record indicates that Art Unit 3744 has not established that claim 20 is indefinite, because its determination is based on procedurally deficient actions which violate any standard of appropriate patent examination practice (again, by the logic of the Office Action, Art Unit 3744 should disregard non-patent literature – that is just wrong).

Again, Art Unit 3744 that forced Applicant to take this application on appeal when he refused to accept the fact that the prior art teaches a plurality of refrigeration systems each of which included the features of claim. Thus, the record indicates that before Art Unit 3744 is going to assert that something cannot be understood by the person of ordinary skill in the art, there must be something more than what currently is on the record. Make no mistake, any

benefit of the doubt that would be afforded this art unit has been eviscerated when it forced applicant to ask for relief from the Patent Trial and Appeal Board based on the meaning of plurality of refrigerator systems each of which include the claimed features.

Also, for the record, Applicant asks Art Unit 3744 to state, with a yes or no answer, that there is any evidence on the record the following:

1) Art Unit 3744 has evaluated the contents of the specification of the present application (requirement A of MPEP 2173.01).
2) Art Unit 3744 has evaluated teachings of the prior art (requirement B of MPEP 2173.01).
3) Art Unit 3744 has evaluated the interpretation of the claims that would become by the person of ordinary skill in the art (requirement C of MPEP 2173.01).

If the answer is yes to any of the above questions, applicant asks Art unit 3744 to identify where the record supports such a yes answer.

With respect to the assertion that

> 20. The office asked this specific question because "high motor torque" can be interpreted as (1) a constant such as 20 ft-lb throughout the frequency range, or (2) alternatively a variable, such as 20-ft lb at a low frequency and progressively changing to 10 ft-lb at a higher frequency. Further, for example, if the value is a constant, will 1 ft-lb be considered a high torque? 5 ft-lb? 20 ft lb? In the absence of supporting information in the specification or drawings, virtually any torque might be considered a high torque.

(OA, page 17.) Where is there any support for these questions? What basis does Art Unit 3744 suggest that high motor torque can be interpreted as either of these two options? There is a bald assertion that such is the case.

Also, assuming *arguendo* that such interpretations are possible, why is it that that would be indefinite? Again, this brings us back to the simple premise that is in the book provided to Art Unit 3744, called the manual of patent examination procedure, that explicitly states that relative terminology is not necessarily indefinite. In fact, the MPEP explicitly states that the fact that the claim language may not be precise does not automatically render the claim indefinite. Applicant is not making this up, as the below evidences:

> **2173.05(b) Relative Terminology [R-07.2015]**
>
> The use of relative terminology in claim language, including terms of degree, does not automatically render the claim indefinite under 35 U.S.C. 112(b) or pre-AIA 35 U.S.C. 112, second paragraph. *Seattle Box Co., Inc. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 221 USPQ 568 (Fed. Cir. 1984). Acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification.

(PDF Snapshot of MPEP.) Thus, assuming *arguendo* that high motor torque can be interpreted as proffered on page 17 of the Office Action, all that means is that this is a relative phrase. Art Unit 3744 has not established that such would render the claims indefinite.

Because there is no basis other than a conclusory assertion based on the perceptions of an individual examiner for rejecting claim 20 as indefinite, with radical examples that are nowhere supported or otherwise explain why such ultimately results in a case of indefiniteness, and the requirements of MPEP 2173 have not been met, a case of indefiniteness against claim 20 has not been established. Withdrawal of the rejection is warranted.

Claim Rejections Under 35 U.S.C. §103

The Office Action has rejected claims 13-16, 23, and 28-29 as obvious under 35 U.S.C. §103 in view of U.S. Patent No. 5,383,335 to Anderson when combined with U.S. Patent Application Publication No. 2010/0031676 to Urbain in view of a new paper alleged to be entitled "Understanding Variable Speed Drives (Part 3). In response, Applicant traverses the rejections for at least the reasons that follow.

Applicant hereby incorporates by reference the prior scholarly arguments so eloquently articulated in the last response, those arguments remaining righteous. Applicant now concentrates on the "Response to Arguments" section.

Applicant previously traversed the assertion that the old paper was a printed publication meeting the requirements of 35 U.S.C. §102. It appears that Art Unit 3744 has acquiesced, and now cites a new document:

> **8. Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 3), hereafter "UVSD".**

(Office Action, page 3.) Previously, the document was entitled Part 2. However, this "Part 3" is nowhere provided on the record. It is not even listed on the Notice of References Cited / Form PTO-892.

Accordingly, Art Unit 3744 has rejected the claims based on a new non-patent literature document, which document was not provided to Applicant. Thus, it is impossible for a *prima facie* case of obviousness to have been established.

Because this new document was not provided to Applicant, a *prima facie* case of obviousness has necessarily not been established.

To be clear, the prior rejection of claim 13 was as follows:

Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 2), hereafter "UVSD".

(Office Action of January, 2016.) The previous PTO-892indicated the following:

NON-PATENT DOCUMENTS		
*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	"Understanding of Variable Speed Drives (Part 2)" , 1999, Solomon S. Turkel, Electrical Construction and Maintenance

(PDF snapshot of PTO-892 issued on May 9, 2014.) As can be seen, the title is different (Part 3 vs. Part 2). Also, the response to arguments indicates that this document was published in 1995.

Thus, because Art Unit 3744 has not provided Applicant with the document relied upon to reject the claims, a *prima facie* case of obviousness has not been established.

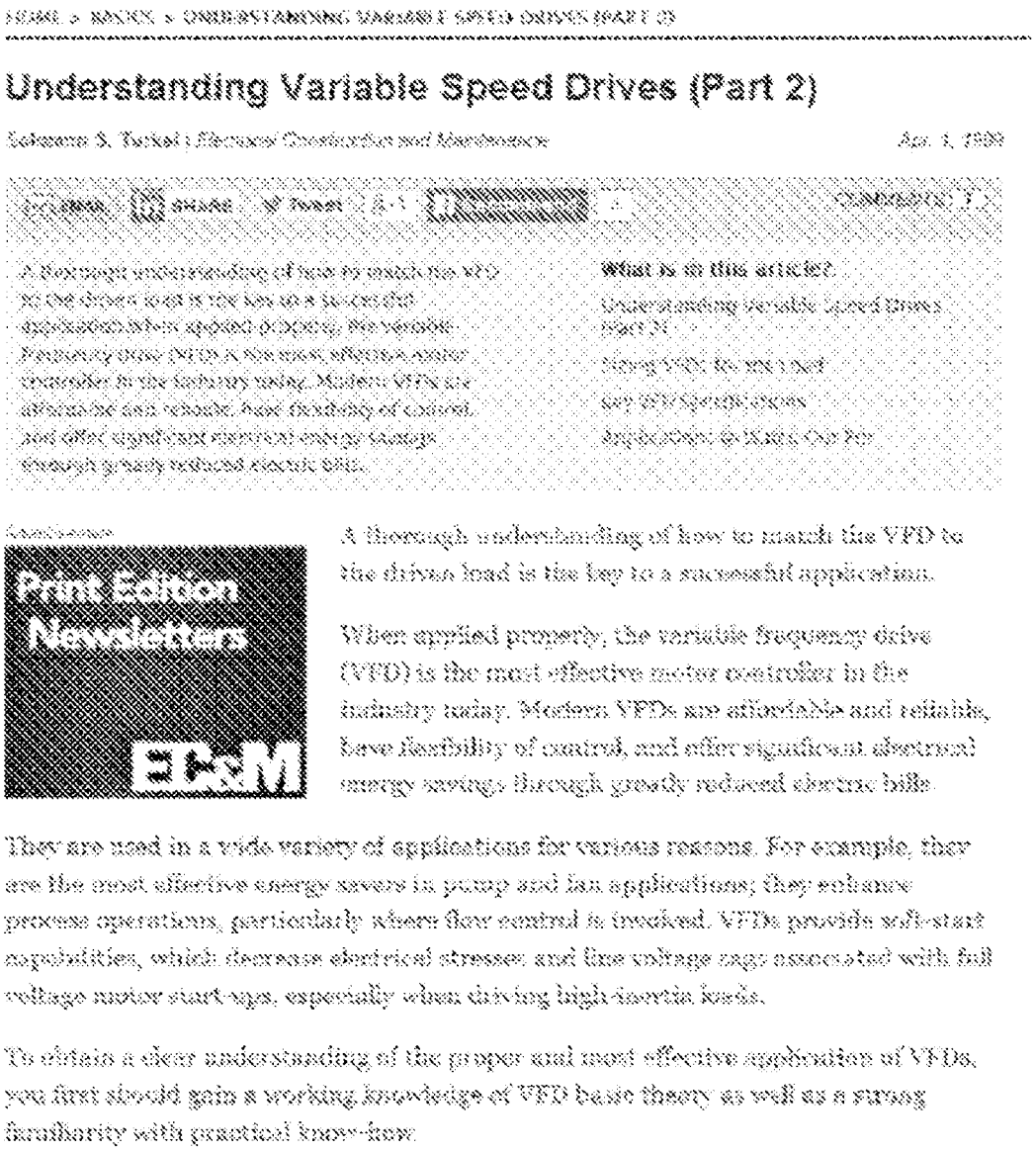
* * * * *

Based on the "Response to Arguments" section, Applicant must glean that this new reference – Understanding Variable Speed Drives (Part 3) – was published in 1995. Thus, this is even further evidence that the USPTO is relying on a new publication, as the old publication was identified by Art Unit 3744 as being published in 1999.

In any event, there is nothing that permits any reasonable fact finder to determine that the text of the new document is the same as the old document.

Again, Art Unit 3744 has not even seen fit to provide this new document to Applicant, and has not seen fit to even list this on a PTO-892. How can anyone determine that this new document is the same as the old document?

Also, make no mistake, the quality of the old document was so poor that even if the new document is provided, there is no way that one can say definitively that the text of the prior document is identical to any new document provided by Art Unit 3744. Again, below is a reproduction of that document in PDF snapshot form:



Understanding Variable Speed Drives (Part 2)

What is in this article?

A thorough understanding of how to match the VFD to the driven load is the key to a successful application.

When applied properly, the variable frequency drive (VFD) is the most effective motor controller in the industry today. Modern VFDs are affordable and reliable, have flexibility of control, and offer significant electrical energy savings through greatly reduced electric bills.

They are used in a wide variety of applications for various reasons. For example, they are the most effective energy savers in pump and fan applications; they enhance process operations, particularly where flow control is involved. VFDs provide soft-start capabilities, which decrease electrical stresses and line voltage sags associated with full voltage motor start-ups, especially when driving high-inertia loads.

To obtain a clear understanding of the proper and most effective application of VFDs, you first should gain a working knowledge of VFD basic theory as well as a strong familiarity with practical know-how.

The above reproduction is entirely, 100% accurate with respect to what the USPTO provided Applicant, and what is found on PAIR.

Applicant continues to traverse on procedural grounds that the above document cannot be evaluated for all its teachings due to the poor quality thereof.

To be clear, the USPTO has not established that there is any paper, regardless of whether it is entitled Understanding Variable Speed Drives (Part 3) or Understanding Variable Speed Drives (Part 2) that constitutes a printed publication under 35 U.S.C. §102. This is no trivial matter. 35 U.S.C. §102 states that a "person is entitled to a patent unless." It is the USPTO's burden to prove that Applicant is to be denied its right to a patent. The USPTO has not proved such.

Applicant continues to rely on *In re Cronyn,* 890 F.2d 1158, 13 USPQ2d 1070 (Fed. Cir. 1989), attached in Appendix A, where the Court of Appeals for the Federal Circuit, the court that handles all appeals from the USPTO, reversed the Board of Patent Appeals and Interferences by finding that a doctoral thesis in a library indexed by the student's name was found not to be a publication:

> The sole question in this case is whether the Board of Patent Appeals and Interferences (Board) correctly held that three undergraduate theses were "printed publications" under 35 U.S.C. § 102(b) (1982), which anticipated the invention for which a patent was sought. ***We hold that the theses were <u>not</u> "printed publications," and we therefore reverse the Board.***

(*In re Cronyn*, first and second sentences, emphasis added.)

More specifically, it is first noted that the USPTO does not explain what section of 35 U.S.C. §102 the paper falls under.

For the second time, Applicant hereby requests that Art Unit 3744 state, on the record, what section of 35 U.S.C. §102 the Understanding Variable Speed Drives (Part 2) is alleged to fall under, and explain why that is the case. Now for the first time, Applicant hereby requests that Art Unit 3744 state, on the record, what section of 35 U.S.C. §102 the Understanding Variable Speed Drives (Part 3) is alleged to fall under, and explain why that is the case.

Assuming *arguendo* that the rejection is based on 35 U.S.C. §102(b) art, this means that the paper must have been "described ***in a printed publication*** in this or a foreign country." (35 U.S.C. §102(b), emphasis added.) There is absolutely no evidence on the record that anything entitled Understanding Variable Speed Drives (Part 3) or Understanding Variable Speed Drives (Part 2) was available to the public, or even existed, prior to March 18, 2010, and March 20, 2009, the filing dates of the present application and the priority application.

Granted, with respect to the document with the words Understanding Variable Speed Drives (Part 2) the document contains what looks like the words "Apr. 1, 1999." However, that is not certain, and even if that text existed on the paper, that does not correspond to a printed publication. Put another way, simply because a document existed in 1999 does not mean that it was a publication under 35 U.S.C. §102(b).

For the purposes of establishing Applicant's case, in the event that this application is again appealed, as of this filing date, Applicant's representative has created a paper with a date thereon that states August 10, 2016, with some text and a picture, signed by Applicant's representative, which paper has been placed in a sealed envelope on that date, which will be first opened in front of the Board, at which point Applicant's representative will ask the Board if that paper constitutes a printed publication simply because it states August 10, 2016, thereon. This is the context that Art Unit 3744 must operate under.

Please prove that any of the documents purported to be entitled Understanding Variable Speed Drives (Part 3) or Understanding Variable Speed Drives (Part 2) was a printed publication, or else withdraw the rejections.

This is no small matter. Again, *In re Cronyn,* 890 F.2d 1158, 13 USPQ2d 1070 (Fed. Cir. 1989) indicates that without additional evidence, the paper is not prior art. The record contains no evidence. The paper is not prior art. Withdrawal of all rejections is warranted for at least this reason, but there is more.

Applicant relies on MPEP §2141.01(a)(I), entitled *TO RELY ON A REFERENCE UNDER 35 U.S.C. 103, IT MUST BE ANALOGOUS PRIOR ART*. That MPEP section states that a

> reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

(MPEP 2141.01(a)(I), emphasis added.)

The Office Action alleges that Understanding Variable Speed Drives (Part 3) has a photo with a caption for variable speed drives powering pumps:

> 24. Applicant also alleges that the VSD is non-analogous art. However, the office disputes this argument. VSD Part 3 contains a photo with a caption for variable speed drives powering pumps. The field of endeavor can be defined as devices requiring

(Office Action, page 18.) No, there is no document on the record called VSD Part 3. Thus, the record does not support what is asserted by the Examiner.

Also, there is this statement:

> drives powering pumps. The field of endeavor can be defined as devices requiring motive power for fluid handling devices, which includes both pumps and compressors.

(Office Action, page 18.) Thus, the USPTO is using the alleged prior art to classify the field of endeavor. This is wrong.

Also, this field of endeavor is overly broad.

In any event, it is impermissible to classify the field of endeavor based on the prior art.

The Response to Arguments states the following:

> 26. The office does not agree that the office action must expressly identify the problems faced by the inventors as a prerequisite to establishing that a prior art reference is analogous. The inventors of the claimed invention presumably believe that their invention, as claimed, overcomes deficiencies or limitations of the prior art, and recognized that the properties of a variable speed drive can be used in overcoming such deficiencies and limitations. Such properties are spelled out in VSD Part 3.

(OA, page 18.) First, because Art Unit 3744 has not placed a copy of VSD Part 3 on the record, there is nothing that supports the assertion that anything is "spelled out" in that document.

Second, the assertion that the USPTO need not identify the problems faced by the inventors is just wrong, at least in the scenario where applicant has traverse the assertion that a document constitutes analogous art. Again, the book called the Manual of Patent Examination Procedure states that there are only two ways that prior art is analogous, and one of them is that "the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention)." In this context, is it truly the position of Tech Center 3700 that when an Applicant traverses a prior art document on the grounds that it is not analogous, an examiner need not explain why the prior art is reasonably pertinent to the problem faced by the inventor. So much for the MPEP.

Again, no alleged problem faced by Applicant is proffered in the Office Action. No alleged problem at all. Accordingly, because the Office Action has not established or even asserted that the paper represents analogous prior art, a *prima facie* case of obviousness has not been established for at least this reason. Thus, the rejections should be withdrawn for at least this additional reason, but there is even more.

The Office Action previously asserted that:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, such that a single controller of Urbain can manage all of the functions of the system including the variable frequency driver for power supply of the at least one compressor, in order to advantageously provide the system with the flexibility to adjust compressor and other components operations for changing conditions, and to provide for reduced electric costs by using a variable frequency driver ("VFD").

(January 2016 Office Action, page 6, top.) This assertion is repeated in the current office action. Applicant make clear that Urbain only discloses controlling individual elements, and the USPTO has not disputed this.

Applicant argued that Art Unit 3744 was taking official notice that the person of ordinary skill in the art would have recognized that the system of Urbain can control a preconditioned air unit including variable frequency drivers of a plurality of refrigeration systems. The Office Action says Art Unit 3744 is not taking official notice. You are, and that will be the easiest procedural reversal on Appeal. Again, we make a righteous traversal, and Art Unit 3744 has responded with no references, in violation of MPEP 2144.

For the record, the Office Action appears to rely on common knowledge in the art, as is discussed and permitted in MPEP 2144, that the person of ordinary skill in the art would recognize that Urbain discloses a controller as recited vis-à-vis the a precondition air unit in a very the drivers plurality of refrigeration systems. To be clear, there is no variable frequency drive are disclosed in Urbain, and the Office Action does not allege the contrary. Thus, it appears that the Office Action is taking official notice that the person of ordinary skill in the art would recognize that the controller of Urbain meets these recitations of claim 13. However, contrary to the requirements of MPEP 2144, there is absolutely no technical line of reasoning underlying these assertions. There is simply the bald assertion that the person of ordinary skill in the art would have recognized that the alleged controller of Urbain would have "advantageously provided the system [of Anderson] with the flexibility to adjust a compressor and other components operations." This does not mean that there would be advantages associated with a

system having the variable frequency drivers. Nothing at all. There is no support for such assertion. Applicant notes that MPEP 2144 permits an applicant to traverse the use of official notice as improper. Embracing the protections of MPEP 2144, applicant hereby traverses the assertion that the person of ordinary skill in the art would have recognized that the system of Urbain can control a preconditioned air unit including variable frequency drivers of a plurality of refrigeration systems. As is Applicant's right per MPEP 2144, Applicant hereby requests that Art Unit 3744 cite a reference that can be evaluated for all its teachings, and explicitly identify where such supports the alleged common knowledge in the art underlying the rejection of claim 13, or otherwise withdraw the rejection.

In summary, a *prima facie* case of obviousness has not been established.

In summary, no claim is obvious because claim 13 is not obvious. Withdrawal of all rejections is warranted.

Applicant also traversed the rejection of claim 16. The Office Action asserts that:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to further modify Anderson in view of UVSD, in order to provide greater control over the operation of the blower to changing operation requirements and provide for reduced energy costs.

(January 2016 OA, page 7.) The current Office Action says the same thing. Applicant previously traversed the use of the above official notice on the grounds that there is absolutely no technical line of reasoning to support this conclusion that the person of ordinary skill the art would have recognized that such would be the case, and the current Office Action ignores this traversal.

For the record, Applicant hereby traverses that such would have been common knowledge in the art, and hereby traverses these assertions as being improperly officially noticed. There is absolutely no technical line of reasoning to support these conclusions. Pursuant to MPEP 2144, Applicant hereby requests that the USPTO cite a reference and exactly explain where that reference

teaches this alleged knowledge in the art, or else withdraw the rejection of claim 16 for this additional reason.

With respect to claim 15, which rejection is also traversed, Applicant previously traversed the use of improper official notice, and the current Office Action addresses this nowhere.

Both the January and July Office Actions conclude, without any rationale or technical evaluation, that the teachings of Anderson regarding the desirability to provide condenser fans with variable airflow rates and the teachings of Urbain regarding speed of the cooling fans being modified according to readings or pressure sensors would have rendered it obvious to one of ordinary skill in the art to modify Anderson in view of the paper in order to provide greater control over the operation of the condenser fan according to heat loss needs of the system and provide for reduced energy costs. However, there is absolutely no support for the conclusion that the modification proffered would have been recognized as resulting in the aforementioned greater control and reduced energy costs. Pursuant to the protections of MPEP 2144, Applicant hereby traverses this assertion is being improperly officially noticed, and requests that the USPTO cite a reference and explain exactly where that reference teaches this alleged knowledge in the art, or else withdraw the rejections.

Applicant also traversed as being improperly officially noticed the assertions with respect to claim 19. Specifically, the January and the July 2016 Office Actions asserts that the mere teaching of a pressure sensor in Urbain that is used in the control of the compressor renders it obvious to modify Anderson in order to quote, utilize the controller of Urbain in combination with the pressure sensor in order to control the VFD powering the compressor in order to ensure proper operation of the compressor. There is absolutely no technical line of reasoning to support the assertion that the person of ordinary skill in the art would have recognized this as "ensuring proper operation of the compressor. Applicant thus requests, per MPEP 2144, that the USPTO cite a reference that can be evaluated for all its teachings, supporting the assertion that the proffered modification would have been recognized as "ensuring proper operation of the compressor," and explain where such reference teaches such, or else withdraw the rejections.

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The Office Action asserts that:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Zinsmeyer for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit, the motivation being to provide the system with the ability to respond to a wider range of system demands and to be adaptable for power supplies at different locations.

(OA, page 15.) This is yet another utilization of official notice without any technical line of reasoning. To be clear, there is absolutely nothing that indicates that any desire to provide a system with the ability to respond to a wider range of system demands and to be adaptable for power supplies at different locations would result in a device that has variation of the output frequency of at least one variable frequency drive or above a frequency of the mains supply of the preconditioned air unit. This is just a conclusory assertion. Accordingly, pursuant to the protections of MPEP 2144, applicant hereby traverses the assertion that this is the case, and that even if it was the case, that the person of ordinary skill in the art would have recognized this. Applicant hereby asks Art unit 3744 to cite a reference that can be evaluated for all its teachings, and identify where such supports this common knowledge in the art or else withdraw the rejection of claim 37.

The Office Action contains this statement:

> It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Anderson, in view of Watson, in order to in order to maintain a high/sufficient torque at all frequency ranges.

(OA, page 16.) This is yet another utilization of official notice without any technical line of reasoning. Pursuant to the protections of MPEP 2144, applicant hereby traverses the assertion that

the person of ordinary skill in the art would recognized that Watson's teachings, when incorporated into the other references, would have resulted in maintenance of a high / sufficient torque at all frequency ranges. Accordingly, pursuant to the protections of MPEP 2144, applicant hereby traverses the assertion that this is the case, and that even if it was the case, that the person of ordinary skill in the art would have recognized this. Applicant hereby asks Art unit 3744 to cite a reference that can be evaluated for all its teachings, and identify where such supports this common knowledge in the art or else withdraw the rejection of claim 37.

In summary, a *prima facie* case of obviousness is not been established against any claim.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

HAUPTMAN HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: August 29, 2016
BJH:MJC/tal

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (Previously presented) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

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16. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (Previously presented) A preconditioned air unit according to ~~claim 13~~ claim 31, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (Previously presented) A preconditioned air unit according to claim 31, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

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23. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the outgoing airflow from the preconditioned air unit.

24. (Previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (Previously presented) A preconditioned air unit according to claim 13, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (Previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (Previously presented) A preconditioned air unit according to claim 13, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, and a loudspeaker.

29. (Previously presented) A preconditioned air unit according to claim 13, further comprising a heater in the flow duct.

30. (Cancelled)

31. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

32. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

33. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

34. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

35. (Previously presented) A preconditioned air unit according to claim 13, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

36. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

37. (Previously Presented) A preconditioned air unit according to claim 13, wherein:

at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;

the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;

at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;

each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and

the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

Electronic Acknowledgement Receipt

EFS ID:	26778100
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	29-AUG-2016
Filing Date:	20-SEP-2011
Time Stamp:	17:27:53
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2016-08-29-Response.pdf	8170024 efeb857b9a4c7d9c3cfe75415a1653c679e27291	yes	22

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	22
Warnings:			
Information:			
	Total Files Size (in bytes):	8170024	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/257,669	Filing Date 09/20/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **08/29/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 24	Minus	** 24	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/LINDA A. WASHINGTON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Notice of References Cited	Application/Control No. 13/257,669	Applicant(s)/Patent Under Reexamination DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A	US-				
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Understanding variable speed drives part 3, April, 1995, "Motor Drive", Solomn S Turkel.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 09/08/2016

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
09/08/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Notice of References Cited	Application/Control No. 13/257,669	Applicant(s)/Patent Under Reexamination DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A	US-				
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Understanding variable speed drives part 3, April, 1995, "Motor Drive", Solomn S Turkel.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 13/257,669	**Applicant(s)** DAHL ET AL.	
	Examiner HENRY CRENSHAW	**Art Unit** 3744	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 29 August 2016 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;

(2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☐ The period for reply expires _____months from the mailing date of the final rejection.

b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☐ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: see continuation sheet .

13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____

14. ☒ Other: PTO-892.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: .
Claim(s) objected to: .
Claim(s) rejected: 13-29, 31-37.
Claim(s) withdrawn from consideration: .

/HENRY CRENSHAW/
Primary Examiner, Art Unit 3744

112 issues
Use of “high motor torque” in the claims vs. in the specification of US patents and publications.
Applicant’s original argument on this topic stated:
“Moreover, there are at least 135 issued U.S. patents with claims that recite high motor torque, consistent with the fact that relative terminology is permitted.” (see applicant arguments 8/11/2014, emphasis added by office).
The office has pointed out that only four of such patents use the term in the claims, not the 135 asserted by applicant. In the four documents where the term appears as a claim limitation, it is presumably clear, based on the written description and figures, and as noted in prior actions, mean different things in each document. If applicant can demonstrate that the US patents, publications, and also non-patent literature consistently use the term in the same manner to mean the same thing, the office will reconsider the rejection. The questions asked by the office demonstrate the lack of clarity.

103 Issues
Claim 13
VSD drives publication - The office has not acquiesced and cited a new document. It has cited an identical document that was published in paper form in 1995 in “Motor Facts,” albeit with a different title. A copy is attached and cited on an 892 form. The photo in the upper right of page 52 has the caption for variable speed drives powering pumps. The office again asserts that if applicant includes a VSD’s in its claims, that art describing the benefits of VSD’s are in the field of endeavor. One of the problems faced by the inventor, whether stated or not, would be how to control the drives.
Urbain reference – the office again asserts that it is not taking official notice. Urbain teaches that a single controller can control multiple components, whether they are located in one unit or identical units, and that applicant is making a piecemeal argument that does not address the combination of references but which attacks them individually. .

Official notice assertions - the office is not taking official notice of anything, and applicant using attacking the references individually in a piecemeal fashion not the combination as a whole.

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of PCT/IB2010/051189	:	FILED: MARCH 18, 2010
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
371c: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

PETITION UNDER RULE 1.181
TO WITHDRAW FINALITY OF OFFICE ACTION AND HAVE TECH CENTER 3744 REISSUE THAT AS A NEW NON-FINAL OFFICE ACTION

MS AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Applicant requests that the finality of the July 08, 2016 Office Action be withdrawn and that that outstanding Office Action be reissued as a new non-final Office Action, and the time period for reply be reset, so that prosecution can be reopened and so that Applicant can amend the claims and add new claims, etc. The USPTO should do this because the Office Action contains new grounds of rejection not necessitated by any amendment to the claim, and an IDS was not filed.

Briefly, after Applicant was forced to appeal claim 13, which was never amended, and Art Unit 3744 withdrew the application from appeal, Art Unit 3744 issued a new non-Final Office Action and rejected all claims based on a non-patent reference. A copy of this reference of deplorable quality was provided to Applicant, and Applicant traversed both the quality and the fact that it was a printed publication. Subsequently, Tech Center 3700 issued a Final Office Action citing a different reference with a different date, asserting that the original reference was legible, and that the text of the new reference was "identical" to the old one. **Tech Center 3700 did not provide a copy of this new reference, or make it of record unit it issued the Advisory Action,**

today (September 8, 2016). Also, the text is not identical. In any event, even if all of the text was present in the new reference, because a rejection under 35 U.S.C. 103 can only be made based on the entire reference, because all portions of the original reference were not legible, even if, arguendo, most of it was, the use of this new reference is a new grounds of rejection. Also, because there is new text in the new reference, because a rejection under 35 U.S.C. 103 can only be made based on the entire reference, the new portions of this new reference not present on the old reference constitutes a new reference.

I. **Summary:** Applicant requests that the finality of the outstanding Office Action (the July 08, 2016 Final Office Action) be withdrawn, because new grounds of rejection were proffered, and claim 13 was not amended, and no IDS was filed since the last Office Action was issued (actually, since the case was last appealed to the Patent Trial and Appeal Board) and that the withdrawal of the finality of the Office Action be done at least in the form of reissuance of the July Office Action as a Non-Final Office Action so that Applicant can amend the claims as a matter of right, etc., as opposed to having to bear the cost of filing an RCE, and suffering the related patent term extension retractions, etc.

II. **The points to be reviewed are:** A) Does the newly cited reference, Understanding Variable Speed Drives (***Part 3***), which document was NOT provided to Applicant by the USPTO with the Office Action of July, 2016, and was not listed on a form 892 until the Advisory Action of today, September 08, 2016, constitute a new reference, and thus a new grounds of rejection where no claims were amended and no IDS was filed since the last Office Action, or B) assuming arguendo that Understanding Variable Speed Drives (***Part 3***) is not a new reference, because the text is different than Understanding Variable Speed Drives (***Part 2***), if only because it has additional text, or because not all of the text of Understanding Variable Speed Drives (***Part 2)*** is legible, even if other portions are, does the fact that the first fully legible copy of Understanding Variable Speed Drives (***Part 2***) was only provided after the issuance of an Advisory Action warrant the reissue of the Final Office Action as a new non-Final Office Action.

III. **Request:** That authority at the USPTO find that the answer to II.A is yes and withdraw the finality of the outstanding Office Action and reissue it as a new non-Final Office Action, or, in the alternative, that authority at the USPTO find that the answer to II.B is yes and reissue the outstanding Office Action as a new Non-Final Office Action.

IV. **Statements of Facts:**

A. This is the fourth (4th) Office Action where claim 13, the only independent claim filed with the preliminary amendment when this case entered the national stage, has been rejected.

B. Claim 13 has never been amended.

C. After forcing Applicant to appeal this application, Technical Center 3700 deemed the rejections insufficient to present to the PTAB, and reopened prosecution.

D. When prosecution was reopened, claim 13 was rejected based on an incredibly grainy copy of something that allegedly was printed on paper with something that might have a date thereon. To ensure that there is no question as to how applicant characterizes this document, below is a reproduction of that document in PDF snapshot form:

HOME > BASICS > UNDERSTANDING VARIABLE SPEED DRIVES (PART 2)

Understanding Variable Speed Drives (Part 2)

Solomon S. Turkel | *Electrical Construction and Maintenance* Apr. 1, 1999

A thorough understanding of how to match the VFD to the driven load is the key to a successful application. When applied properly, the variable frequency drive (VFD) is the most effective motor controller in the industry today. Modern VFDs are affordable and reliable, have flexibility of control, and offer significant electrical energy savings through greatly reduced electric bills.

What is in this article?

Understanding Variable Speed Drives (Part 2)

Using VFD Driven Load

Key VFD Specifications

Applications to Watch Out For

Advertisement

A thorough understanding of how to match the VFD to the driven load is the key to a successful application.

When applied properly, the variable frequency drive (VFD) is the most effective motor controller in the industry today. Modern VFDs are affordable and reliable, have flexibility of control, and offer significant electrical energy savings through greatly reduced electric bills.

They are used in a wide variety of applications for various reasons. For example, they are the most effective energy savers in pump and fan applications; they enhance process operations, particularly where flow control is involved. VFDs provide soft-start capabilities, which decrease electrical stresses and line voltage sags associated with full voltage motor start-ups, especially when driving high-inertia loads.

To obtain a clear understanding of the proper and most effective application of VFDs, you first should gain a working knowledge of VFD basic theory as well as a strong familiarity with practical know-how.

E.

The above reproduction is entirely, 100% accurate with respect to what the USPTO provided Applicant, and what is found on PAIR.

F. Even if some words are legible, it cannot be sad that every word of Understanding of Variable Speed Drives ***(Part 2)***" is legible.

G. The PTO-892 form citing this document was mailed on November 04, 2014. The PDF Snapshot of the pertinent portion of this form is as follows:

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	"Understanding of Variable Speed Drives (Part 2)" , 1999, Solomon S. Turkel, Electrical Construction and Maintenance

(PDF of PTO-892.) Note that this is titled "Understanding of Variable Speed Drives ***(Part 2)***," (emphasis added), and alleged to be dated 1999.

H. It is impossible to state that every word of "Understanding of Variable Speed Drives ***(Part 2)"*** is legible.

I. Applicant objected to the deplorable quality of this document, and that the USPTO had not established that the paper constitutes a printed publication under 35 U.S.C. §102. This is no trivial matter. 35 U.S.C. §102 states that a "person is entitled to a patent unless." It is the USPTO's burden to prove that Applicant is to be denied its right to a patent. The USPTO has not proved such.

J. Applicant cited *In re Cronyn,* 890 F.2d 1158, 13 USPQ2d 1070 (Fed. Cir. 1989), where the Court of Appeals for the Federal Circuit, the court that handles all appeals from the USPTO, reversed the Board of Patent Appeals and Interferences by finding that a doctoral thesis in a library indexed by the student's name was found not to be a publication:

K. The rejection of claim 13 in the non-Final Office Action was as follows:

> **Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 2), hereafter "UVSD".**

L. Yet, in the July 8, 2016 Final Office Action, this is the text of the rejection:

> **8. Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 3), hereafter "UVSD".**

M. Now, the rejection is based on a document entitled "Understanding of Variable Speed Drives ***(Part 3).***"

N. Tech Center 3700 did not provide a copy of this document.

O. Tech Center 3700 did not make this document of record at the time of the issuance of the Final Office Action.

P. However, the Final Office Action states the following:

> 23. However, although the copy may be of poor quality, the office disputes that the copy of the article cannot be read. Regarding the date, the office has attached the
>
> Application/Control Number: 13/257,669 Page 18
> Art Unit: 3744
>
> version of the article that appeared in a printed publication in 1995. Although its title states "Part 3" instead of the previously cited "Part 2", the text of the two versions is identical.

Q. Tech Center 3700 did not provide a copy of "Understanding of Variable Speed Drives ***(Part 3)***".

R. Tech Center 3700 did not explain why the text of a 5 page document, "Understanding of Variable Speed Drives ***(Part 3)***," was identical to a 3 page document (Tech Center 3700 did not provide a copy of "Understanding of Variable Speed Drives ***(Part 2)***".

S. To be clear, the text of "Understanding of Variable Speed Drives ***(Part 3)***" is not identical to Understanding of Variable Speed Drives ***(Part 2)***".

T. Also, in the Response to the non-final Office Action, Applicant noted that the document is illegible. The Examiner does not explain why Applicant is wrong.

U. The Examiner does not explain why the document is not illegible.

V. Applicant, of course, traversed, both on the grounds that this is a new reference because it

has a new title and a new publication date, and on the grounds that, well, the Examiner did not provide the copy.

W. To add insult to injury, the Examiner today, September 8, 2016, issued an Advisory Action, providing for the first time a copy of this new document, and, for the first time, a PTO-892 citing "Understanding of Variable Speed Drives ***(Part 3).***"

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Understanding variable speed drives part 3, April, 1995, "Motor Drive", Solomn S Turkel.

X. "Understanding of Variable Speed Drives ***(Part 3)***" is a different reference than that cited against claim 13 in the non-final Office Action (Understanding of Variable Speed Drives ***(Part 2).***"

Y. Understanding of Variable Speed Drives ***(Part 3)***" was not made of record when the Non-Final Office Action was issued.

Z. Understanding of Variable Speed Drives ***(Part 3)***" was not made of record when the Final Office Action was issued. In fact, Applicant was not even provided a copy.

AA. It is wrong to say that the text of Understanding of Variable Speed Drives ***(Part 3)***" is "identical" to Understanding of Variable Speed Drives ***(Part 2)***.

BB. It is wrong to say that Understanding of Variable Speed Drives ***(Part 3)***" is the same reference as Understanding of Variable Speed Drives ***(Part 2).***"

CC. If Understanding of Variable Speed Drives ***(Part 3)***" was the same reference as Understanding of Variable Speed Drives ***(Part 2),***" such is inconsistent with Tech Center 3700 feeling compelled, for the first time, to issue a PTO 892 with the Advisory Action, citing Understanding of Variable Speed Drives ***(Part 3).***

V. Argument Based On the Facts:

A. The rejections of claim 13 constitutes new grounds of rejections not necessitated by amendment or the filing of an IDS.

B. This is because:

1) Claim 13 was not amended, ever.

2) No IDS was filed after the Non-Final Office Action.

3) Aside from the fact that two respective Office Actions have issued based respectively on a document of deplorable quality and a document that was not provided to Applicant, and even assuming arguendo that Understanding of Variable Speed Drives ***(Part 2)***" was partially legible or otherwise met the standards of the USPTO, and even assuming arguendo that there is congruence between some of the text of Part 2 and Part 3, with respect to 35 U.S.C. 103, Understanding of Variable Speed Drives ***(Part 3)***" is a different reference than Understanding of Variable Speed Drives ***(Part 2)." This is because an analysis under 35 U.S.C. 103 requires the entire document to be considered:*** "PRIOR ART MUST BE CONSIDERED IN ITS ENTIRETY, INCLUDING DISCLOSURES THAT TEACH AWAY FROM THE CLAIMS, and "A prior art reference must be considered in its entirety, i.e., as a whole." (MPEP 2144.02.VI.)

4) Because the text of "Understanding of Variable Speed Drives ***(Part 3)***" is not identical to "Understanding of Variable Speed Drives ***(Part 2)***," "Understanding of Variable Speed Drives ***(Part 3)***" is a different reference than "Understanding of Variable Speed Drives ***(Part 2).***" This extra text was not available to Applicant at the time that the non-final Office Action was issued. It was not even available at the time that the Final Office Action was issued.

5) Applicant cannot be considered to have been able to fairly respond to text not available to it when the non-Final Office Action was issued. Actually, the text relied upon was not available when the Final Office Action was issued.

6) Also, even if it is assumed arguendo that some of the text of "Understanding of Variable Speed Drives ***(Part 2)***" is legible, because the formulation of a rejection under 35 U.S.C. 103 requires an evaluation of the entire document, as noted above in MPEP 2144, every word of "Understanding of Variable Speed Drives ***(Part 2)***" must be legible. It cannot be said that this is the case.

7) In any event, when this goes to appeal, what document will Tech Center 3700 be basing the rejections on? How is Tech Center 3700 going to explain this to the Board? Again, the *Cronyn* arguments will be put forth that "Understanding of Variable Speed Drives ***(Part 2)***" was not proven to be a printed publication, and that it is not legible.

8) In any event, the PTO 892 issued today, September 8, 2016, cites a new reference with a new title and a new publication date. This is a new grounds of rejection because it is a new reference.

9) It was only until after the issuance of the Advisory Action that Applicant was provided with the "Understanding of Variable Speed Drives ***(Part 3)***." That by itself makes clear that the actions of Tech Center 3700 are improper.

10) "Understanding of Variable Speed Drives ***(Part 3)***" was not cited in a PTO 892 until the issuance of an Advisory Action. That by itself makes clear that the actions of Tech Center 3700 are improper.

11) MPEP states that:

> [s]econd or any subsequent actions on the merits shall be final, ***except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims***, nor based on information submitted in an information disclosure statement filed during the period set forth in 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p). (MPEP 706.07(a), first paragraph.)

12) In any event, because of the deplorable quality of Understanding of Variable Speed Drives ***(Part 2)***," and because it cannot be said that Applicant could fairly respond to the assertions of the USPTO, the application of

Understanding of Variable Speed Drives ***(Part 3)***" corresponds to a new grounds of rejection.

VI. Conclusion And Request Based on Facts

Because the July 08, 2016 Office Action contains new grounds of rejection not necessitated by an amendment or the filing of an IDS, because Understanding of Variable Speed Drives ***(Part 3)*** is a new reference not previously cited, Applicant requests that the Finality of the July 08, 2016 Office Action be withdrawn and prosecution be reopened to afford Applicant an opportunity to amend the claims. That is, the Office Action of July 08, 2016 should be reissued as a Non-Final Office Action (actually, it should have never been issued – the Office Action is severely flawed – but that is for the PTAB).

Alternatively, because the July 08, 2016 Office Action contains new grounds of rejection not necessitated by an amendment or the filing of an IDS, because ***the full text*** of Understanding of Variable Speed Drives ***(Part 2)*** could not be evaluated by Applicant until receipt of the Advisory Action of September 8, 2016, and because a section 103 rejection warrants an evaluation of the entire document, which could not be done at the time that the non-Final Office Action was issued, Applicant requests that the Finality of the July 08, 2016 Office Action be withdrawn and prosecution be reopened to afford Applicant an opportunity to amend the claims. That is, the Office Action of July 08, 2016 should be reissued as a Non-Final Office Action (actually, it should have never been issued – the Office Action is severely flawed – but that is for the PTAB).

Dabico
Exhibit 1002
Page 562

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

HAUPTMAN HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: September 8, 2016
BJH:MJC/tal

Electronic Acknowledgement Receipt

EFS ID:	26874776
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	08-SEP-2016
Filing Date:	20-SEP-2011
Time Stamp:	22:16:43
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the Technology Center SPRE	2016-09-08-Petition_Against_Finality.pdf	4189110 5e6c7c53303c39b5368a1f6f690c0a9c88d5ae6d	no	12

Warnings:

Information:	
Total Files Size (in bytes):	4189110

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of PCT/IB2010/051189	:	FILED: MARCH 18, 2010
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
371c: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

PETITION UNDER RULE 1.181
TO HAVE ART UNIT 3744 REISSUE THE JULY 2016 OFFICE ACTION

MS AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Applicant has filed a separate Petition to have the finality of the July 08, 2016 Office Action be withdrawn and that that outstanding Office Action be reissued as a new non-final Office Action, so that prosecution be reopened so that Applicant can amend the claims and add new claims, etc.

This petition is filed for consideration in the event that the above-noted petition is denied (i.e., that Tech Center 3700 incorrectly refuses to withdraw the finality of the July 2016 Office Action and reissues that Office Action as a new non-Final Office Action).

Applicant thus hereby petitions, in the event that the above-noted petition is denied, to have the Office Action of July 08, 2016, reissued and the time period for responding reset to the reissue date.

The USPTO should do this because just today, when issuing the Advisory Action, Tech Center 3700 for the first time provided Applicant with a copy of the reference used to reject every single claim under 35 U.S.C. 103 in the July Office Action.

Briefly, after Applicant was forced to appeal claim 13, which was never amended, and Art Unit 3744 withdrew the application from appeal, Art Unit 3744 issued a new non-Final Office Action and rejected all claims based on a non-patent reference. A copy of this reference of deplorable quality was provided to Applicant, and Applicant traversed both the quality and the fact that it was a printed publication. Subsequently, Tech Center 3700 issued a Final Office Action citing a different reference with a different date, asserting that the original reference was legible, and that the text of the new reference was "identical" to the old one. **Tech Center 3700 did not provide a copy of this new reference, or make it of record unit it issued the Advisory Action, today (September 8, 2016).** Also, the text is not identical. In any event, even if it was, because a rejection under 35 U.S.C. 103 can only be made based on the entire reference, because the rejections in the Final Office Action were based on a document that was not available to Applicant, which document is different than the prior document used to rejection the claims, Applicant cannot be said to have had a fair opportunity to evaluate the entire reference.

I. **Summary:** Applicant requests that the outstanding Office Action (the July 08, 2016 Final Office Action) be reissued and the time period for reply be reset, because the USPTO did not provide Applicant with a copy of the Reference used to reject every claim.

II. **The points to be reviewed are:** A) Can Tech Center 3700 issue an Office Action based on a non-patent reference without giving a copy of that reference to Applicant, and if not, what is the remedy?

III. **Request:** If the petition to withdraw the finality of the July 2016 Office Action is denied, that authority at the USPTO find that the answer to II.A is yes and reissue the Office Action and reset the time period for reply..

IV. **Statements of Facts:**

A. This is the fourth (4th) Office Action where claim 13, the only independent claim filed with the preliminary amendment when this case entered the national stage, has been rejected.

B. Claim 13 has never been amended.

C. After forcing Applicant to appeal this application, Technical Center 3700 deemed the rejections insufficient to present to the PTAB, and reopened prosecution.

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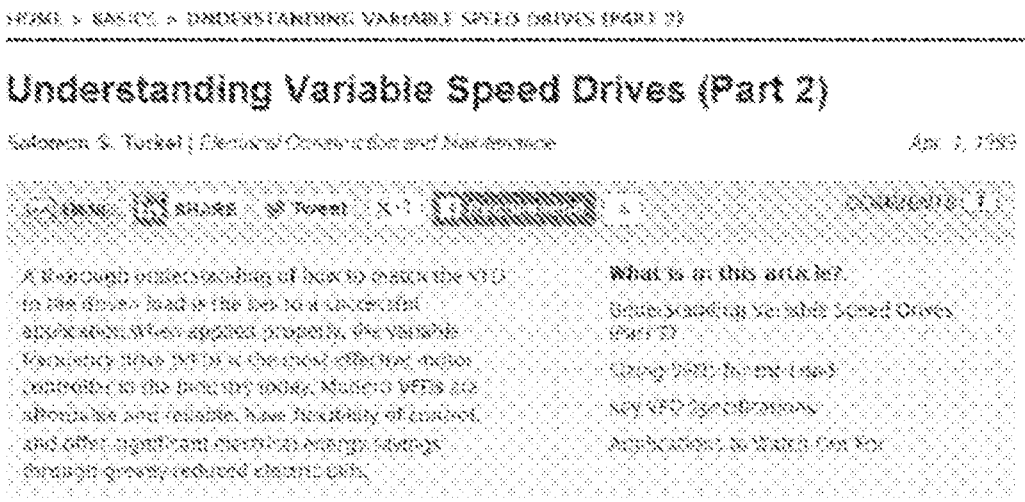

HOME > BASICS > UNDERSTANDING VARIABLE SPEED DRIVES (PART 2)

Understanding Variable Speed Drives (Part 2)

Solomon S. Turkel | *Electrical Construction and Maintenance* Apr. 1, 1999

A thorough understanding of how to match the VFD to the driven load is the key to a successful application. When applied properly, the variable frequency drive (VFD) is the most effective motor controller in the industry today. Modern VFDs are affordable and reliable, have flexibility of control, and offer significant electrical energy savings through greatly reduced electric bills.

What is in this article?

Understanding Variable Speed Drives (Part 2)

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Print Edition Newsletters

EC&M

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	U	"Understanding of Variable Speed Drives (Part 2)" , 1999, Solomon S. Turkel, Electrical Construction and Maintenance

(PDF of PTO-892.) Note that this is titled "Understanding of Variable Speed Drives ***(Part 2)***," (emphasis added), and alleged to be dated 1999.

H. It is impossible to state that every word of "Understanding of Variable Speed Drives ***(Part 2)"*** is legible.

I. Applicant objected to the deplorable quality of this document, and that the USPTO had not established that the paper constitutes a printed publication under 35 U.S.C. §102. This is no trivial matter. 35 U.S.C. §102 states that a "person is entitled to a patent unless." It is the USPTO's burden to prove that Applicant is to be denied its right to a patent. The USPTO has not proved such.

J. Applicant cited *In re Cronyn,* 890 F.2d 1158, 13 USPQ2d 1070 (Fed. Cir. 1989), where the Court of Appeals for the Federal Circuit, the court that handles all appeals from the USPTO, reversed the Board of Patent Appeals and Interferences by finding that a doctoral thesis in a library indexed by the student's name was found not to be a publication:

K. The rejection of claim 13 in the non-Final Office Action was as follows:

> **Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 2), hereafter "UVSD".**

L. Yet, in the July 8, 2016 Final Office Action, this is the text of the rejection:

> **8. Claims 13-16, 23, 28 and 29 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 3), hereafter "UVSD".**

M. Now, the rejection is based on a document entitled "Understanding of Variable Speed Drives ***(Part 3).***"

N. Tech Center 3700 did not provide a copy of this document.

O. Tech Center 3700 did not make this document of record at the time of the issuance of the Final Office Action.

P. However, the Final Office Action states the following:

> 23. However, although the copy may be of poor quality, the office disputes that the copy of the article cannot be read. Regarding the date, the office has attached the
>
> Application/Control Number: 13/257,669 Page 18
> Art Unit: 3744
>
> version of the article that appeared in a printed publication in 1995. Although its title states "Part 3" instead of the previously cited "Part 2", the text of the two versions is identical.

Q. Tech Center 3700 did not provide a copy of "Understanding of Variable Speed Drives ***(Part 3)***".

R. Tech Center 3700 did not explain why the text of a 5 page document, "Understanding of Variable Speed Drives ***(Part 3)***," was identical to a 3 page document (Tech Center 3700 did not provide a copy of "Understanding of Variable Speed Drives ***(Part 2)***".

S. To be clear, the text of "Understanding of Variable Speed Drives ***(Part 3)***" is not identical to Understanding of Variable Speed Drives ***(Part 2)***".

T. Also, in the Response to the non-final Office Action, Applicant noted that the document is illegible. The Examiner does not explain why Applicant is wrong.

U. The Examiner does not explain why the document is not illegible.

V. Applicant, of course, traversed, both on the grounds that this is a new reference because it

has a new title and a new publication date, and on the grounds that, well, the Examiner did not provide the copy.

W. To add insult to injury, the Examiner today, September 8, 2016, issued an Advisory Action, providing for the first time a copy of this new document, and, for the first time, a PTO-892 citing "Understanding of Variable Speed Drives ***(Part 3).***"

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Understanding variable speed drives part 3, April, 1995, "Motor Drive", Solomn S Turkel.

X. "Understanding of Variable Speed Drives ***(Part 3)***" is a different reference than that cited against claim 13 in the non-final Office Action (Understanding of Variable Speed Drives ***(Part 2).***"

Y. Understanding of Variable Speed Drives ***(Part 3)***" was not made of record when the Non-Final Office Action was issued.

Z. Understanding of Variable Speed Drives ***(Part 3)***" was not made of record when the Final Office Action was issued. In fact, Applicant was not even provided a copy.

AA. It is wrong to say that the text of Understanding of Variable Speed Drives ***(Part 3)***" is "identical" to Understanding of Variable Speed Drives ***(Part 2)***.

BB. It is wrong to say that Understanding of Variable Speed Drives ***(Part 3)***" is the same reference as Understanding of Variable Speed Drives ***(Part 2).***"

CC. If Understanding of Variable Speed Drives ***(Part 3)***" was the same reference as Understanding of Variable Speed Drives ***(Part 2),***" such is inconsistent with Tech Center 3700 feeling compelled, for the first time, to issue a PTO 892 with the Advisory Action, citing Understanding of Variable Speed Drives ***(Part 3).***

V. Argument Based On the Facts:

A. The rejection of claim 13 in the Office Action of July, 2016, is incomplete, and if the petition to have the finality of that Office Action withdrawn is denied, the Office Action should be reissued and the time period for reply reset.

B. This is because:

1) Aside from the fact that two respective Office Actions have issued based respectively on a document of deplorable quality and a document that was not provided to Applicant, and even assuming arguendo that Understanding of Variable Speed Drives ***(Part 2)***" was partially legible or otherwise met the standards of the USPTO, and even assuming arguendo that there is congruence between some of the text of Part 2 and Part 3, with respect to 35 U.S.C. 103, Understanding of Variable Speed Drives ***(Part 3)***" is a different reference than Understanding of Variable Speed Drives ***(Part 2)." This is because an analysis under 35 U.S.C. 103 requires the entire document to be considered:*** "PRIOR ART MUST BE CONSIDERED IN ITS ENTIRETY, INCLUDING DISCLOSURES THAT TEACH AWAY FROM THE CLAIMS, and "A prior art reference must be considered in its entirety, i.e., as a whole." (MPEP 2144.02.VI.)

2) The text of "Understanding of Variable Speed Drives ***(Part 3)***" is not identical to "Understanding of Variable Speed Drives ***(Part 2)***," "Understanding of Variable Speed Drives ***(Part 3)***" is a different than "Understanding of Variable Speed Drives ***(Part 2).***" This extra text was not available to Applicant at the time that the non-final Office Action was issued. It was not even available at the time that the Final Office Action was issued.

3) Applicant cannot be considered to have been able to fairly respond to text not available to it when the non-Final Office Action was issued. Actually, the text relied upon was not available when the Final Office Action was issued.

4) It was only until after the issuance of the Advisory Action that Applicant was provided with the "Understanding of Variable Speed Drives ***(Part 3)***." That by itself makes clear that the July Office Action was incomplete.

5) "Understanding of Variable Speed Drives ***(Part 3)***" was not cited in a PTO 892 until the issuance of an Advisory Action. That by itself makes clear that the July Office Action was incomplete.

6) Also, even if its assumed arguendo that some of the text of "Understanding of Variable Speed Drives ***(Part 2)***" is legible, because the formulation of a rejection under 35 U.S.C. 103 requires an evaluation of the entire document, as noted above in MPEP 2144, every word of "Understanding of Variable Speed Drives ***(Part 2)***" must be legible. It cannot be said that this is the case.

7) Thus, even if there was complete congruence between Part 2 and Part 3, it is only today, for the first time, that Applicant had the complete text of Part 2. Applicant could not properly respond until having the complete text of Part 2.

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VI. Conclusion And Request Based on Facts

Because the July 08, 2016 Office Action is based on a document that was not available to Applicant at the time that the Office Action was issued, and because that document is different than the prior document upon which the prior Office Action was based, and because the text of the prior document was not 100% fully legible, in the event that the petition to have the finality of the July Office Action is not withdrawn, the July 2016 Office Action should be reissued and the time period for reply reset.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

HAUPTMAN HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: September 8, 2016
BJH:MJC/tal

Electronic Acknowledgement Receipt

EFS ID:	26874798
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	08-SEP-2016
Filing Date:	20-SEP-2011
Time Stamp:	22:26:10
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the Technology Center SPRE	2016-09-08-Petition_For_Reissuance_of_OA.pdf	4180129 159b387556269558d135857c17b050c323c4b885	no	10
Warnings:					

Information:	
Total Files Size (in bytes):	4180129

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 09/19/2016

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
09/19/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
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Alexandria, VA 22313-1450
www.uspto.gov

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA VA 22314

In re Application of: Dahl et al.
Serial No.: 13/257,669
Filed: September 20, 2011
Docket: 713-2354 (22664)
Title: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

DECISION ON PETITION
under 37 CFR 1.181

This is a decision on the petitions filed on September 8, 2016 filed under 37 CFR 1.181 seeking 1) to withdraw the finality of the Office action mailed on July 8, 2016 and 2) to restart the time period for reply to run from the date that applicant received a copy of the "Understanding Variable Speed Drives (Part 3)" reference. The petitions are being considered pursuant to 37 CFR 1.181 and no fee is required.

The petitions are **granted**.

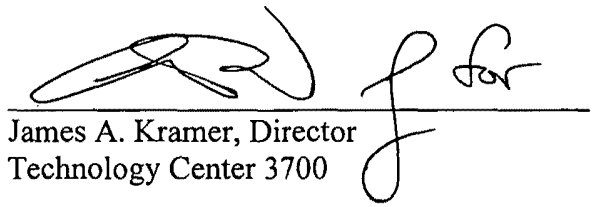
In finding petitioner's points of argument persuasive, the requested relief is granted. As such, the finality of the Office action issued on July 8, 2016 is premature and the finality of the Office action is hereby withdrawn. Since the finality is being withdrawn, then, any amendment responds to the outstanding Office action of July 8, 2016 will be entered and treated as a 37 CFR § 1.111 amendment.

Furthermore, since applicant did not receive a copy of the "Understanding Variable Speed Drives (Part 3)" reference until the mailing of the Advisory Action on September 8, 2016. The period to respond to the outstanding Office action is restarted to run from September 8, 2016.

The application is being forwarded to the examiner via the Supervisory Patent Examiner of Art Unit 3744 awaiting the applicant's Rule 1.111 Amendment.

Any inquiry regarding this decision should be directed to Julie Brocketti, Quality Assurance Specialist, at (571) 272-0206.

PETITION GRANTED.



James A. Kramer, Director
Technology Center 3700

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 02/02/2017

NSCRIVN1 SALE #00000001 Mailroom Dt: 12/29/2016 071337 13257669
01 FC : 1253 1,400.00 DA

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 04/11/2017

LJOHNSO1 ADJ #00000001 Mailroom Dt: 12/29/2016
Seq No: 1 Sales Acctg Dt: 02/02/2017 071337 13257669
01 FC : 1253 1400.00 CR

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of PCT/IB2010/051189	:	FILED: MARCH 18, 2010
Soren Risgaard DAHL et al.	:	Confirmation No. 9301
U.S. Patent Application No. 13/257,669	:	Art Unit: 3744
371c: September 20, 2011	:	Examiner: CRENSHAW, Henry T.

For: A PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

RESPONSE

MS AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

In response to the decision on Petition of September 19, 2016, declaring the Office Action of July a non-Final Office Action and resetting the period of response to be tolled based on the September 19th date, Applicant submits the following:

Electronic Acknowledgement Receipt

EFS ID:	27934719
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Tracy Luke
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	29-DEC-2016
Filing Date:	20-SEP-2011
Time Stamp:	20:23:07
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2016-12-29-Supplemental_Amendment.pdf	81244 d8773579092e7b927c0c37d392ecce3560ea7748	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Supplemental Response or Supplemental Amendment	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	10
Warnings:			
Information:			
	Total Files Size (in bytes):	81244	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

In Supplemental Response to the Office Action mailed July 8, 2016, where the period to reply was based on the September 16, 2016, mailing of the decision on petition, Applicant respectfully requests reconsideration. Based upon the following Remarks, Applicant respectfully requests that all outstanding rejections be reconsidered, and that they be withdrawn.

Authorization for Examiner's Amendment

Applicant authorizes the USPTO to place claim 22 into claim 13, and cancel claim 20, if such will result in allowance of the application. If this creates problems, we can work around this as well.

The above is informed by the interview with Examiner Krenshaw in October, 2016, where it was indicated that claims 22, 23 and 24 contain allowable subject matter.

Applicant has placed claims 23 and 24 into independent form, and amended the claims to depend from one of these two claims, save for claims 22 and 20, which can be dispositioned as detailed above to place the application into condition for allowance.

If there are any other issues with this application, Applicant's representative, Martin Cosenza, can be reached at 703-535-7341.

Claim Rejection Under §112, Second Paragraph

The Office Action has rejected claim 20 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failure to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In response, Applicant notes the above authorization to cancel claim 22 the application is in condition for allowance, which will render this rejection moot. Otherwise, Applicant traverses the rejection for the rejection for the reasons previously articulated which are incorporated by reference in their entirety.

Claim Rejections Under 35 U.S.C. §103

The Office Action has rejected claims 13-16, 23, and 28-29 as obvious under 35 U.S.C. §103 in view of U.S. Patent No. 5,383,335 to Anderson when combined with U.S. Patent Application Publication No. 2010/0031676 to Urbain in view of a new paper alleged to be entitled "Understanding Variable Speed Drives (Part 3). In response, Applicant submits that upon the amendment to claim 13 to include the recitations of claim 22 therein, and in view of the amendments to the dependent claims to depend from claims 23 and 24, the rejections are now moot.

To the extent that the above does not place the application into condition for allowance, Applicant hereby incorporates by reference the prior arguments articulated in the last response, those arguments remaining righteous.

Conclusion

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

HAUPTMAN HAM, LLP

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
(703) 684-1111
Facsimile: (703) 518-5499
Date: December 29, 2016
BJH:MJC/tal

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 – 12 (cancelled)

13. (Previously presented) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems.

14. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 23**, wherein the housing further accommodates at least one condenser fan positioned for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

15. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 23**, wherein the housing further accommodates at least one variable frequency driver connected for power supply of at least one condenser fan for generation of an airflow interacting with at least one of the condensers of the plurality of refrigeration systems.

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16. (Currently Amended) A preconditioned air unit according to ~~**claim 13**~~ **claim 23**, wherein the housing further accommodates a variable frequency driver connected for electrical power supply of the blower.

17. (Currently Amended) A preconditioned air unit according to ~~**claim 13**~~ **claim 23**, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

18. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

19. (Currently Amended) A preconditioned air unit according to ~~**claim 13**~~ **claim 31**, wherein the controller of the variable frequency driver is further configured for adjustment of the output frequency in response to a sensor output connected to the controller.

20. (Previously presented) A preconditioned air unit according to claim 13, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

21. (Previously presented) A preconditioned air unit according to claim 31, wherein the central controller is connected to at least one controller of at least one voltage frequency driver.

22. (Previously presented) A preconditioned air unit according to claim 13, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

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23. (Currently Amended) **A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating**

a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,

a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and

wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems,

~~**A preconditioned air unit according to claim 13,**~~ wherein the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, ~~**and the**~~ **or the** outgoing airflow from the preconditioned air unit.

24. (Currently Amended) **A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating**

a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft,

a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

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at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and

wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and

a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems,

~~**A preconditioned air unit according to claim 13,**~~ wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

25. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

26. (Currently Amended) A preconditioned air unit according to ~~**claim 13**~~ **claim 23**, wherein the housing further accommodates a rectifier connected to a mains supply input of the air unit for generation of a power DC voltage supply.

27. (Previously presented) A preconditioned air unit according to claim 26, wherein the rectifier is selected from the group consisting of a 12-pulse rectifier, an 18-pulse rectifier, and a 24-pulse rectifier.

28. (Currently Amended) A preconditioned air unit according to ~~**claim 13**~~ **claim 23**,, further comprising at least one of: a user interface panel with input keys and a display, a remote control, a computer interface, a network interface, ~~**and a**~~ **or a** loudspeaker.

29. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 23**, further comprising a heater in the flow duct.

30. (Cancelled)

31. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 24**, wherein at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver.

32. (Previously presented) A preconditioned air unit according to claim 17, wherein the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit.

33. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 24**, wherein at least one variable frequency driver keeps the ratio between the output voltage and the frequency substantially constant to maintain a high motor torque throughout the entire output frequency range.

34. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 23**,, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

35. (Currently Amended) A preconditioned air unit according to ~~claim 13~~ **claim 23**, wherein each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

36. (Previously presented) A preconditioned air unit according to claim 24, wherein the central controller is further configured to automatically adjust the required amount of cooling among the

remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

37. (Currently Amended) A preconditioned air unit according to ~~**claim 13**~~ **claim 23**, wherein:

at least one variable frequency driver has a controller that is configured for variation of the output frequency of the at least one variable frequency driver;

the controller is configured for variation of the output frequency of the at least one variable frequency driver above the frequency of the mains supply of the preconditioned air unit;

at least one variable frequency driver is configured to keep the ratio between the output voltage and the frequency substantially constant;

each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller; and

the central controller is further configured to automatically adjust the required amount of cooling among the remaining properly operating refrigeration systems of the plurality of refrigeration systems in response to the failure signal.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/257,669	Filing Date 09/20/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **12/29/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 24	Minus	** 24	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/NICOLLE L. SCRIVNER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

CPC- SEARCHED		
Symbol	Date	Examiner
b64f1/362; g05d	3/10/2014	htc
g05d23/19	3/10/2014	htc
y02t50/82	3/10/2014	htc

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	228.4236, 298, 434, 228.4	2/2/2017	htc

SEARCH NOTES		
Search Notes	Date	Examiner
Plus and claims search. Inventor and continuity search. East searches for US and foreign patents. NPL searches for variable speed drives.	3/10/2014	htc
updated searches	10/21/2014	htc
updated searches	1/8/2016	htc
updated searches	7/4/2016	htc
updated searches	2/2/2017	htc
see east priontou for interfernce search results	2/2/2017	htc

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
all	((preconditioned adj air adj unit) and (variable adj frequency adj driver)).clm.	2/2/2017	htc

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

33712 7590 02/10/2017

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 02/10/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

TITLE OF INVENTION: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	05/10/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Dabico
Exhibit 1002
Page 597

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

33712 7590 02/10/2017
HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

TITLE OF INVENTION: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	05/10/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
CRENSHAW, HENRY T	3744	062-228400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 02/10/2017

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	
ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 02/10/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *12/29/2016*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *13-19,21,23-29 and 31-37*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HENRY CRENSHAW/
Primary Examiner, Art Unit 3744

Examiner's Amendment and Reasons for Allowance

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

This action is in replay to the response filed 12/29/2016.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this amendment was provided by applicant's agent in the reply filed 12/29/2016

The allowed claims are 13-19, 21, 23-29, 31-37.

Examiner's Amendment

13. (currently amended) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes

at least one compressor,

at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and

at least one variable frequency driver for power supply of the at least one compressor, and a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems,

wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

20. (cancelled)

22. (cancelled)

Reasons for Allowance

The closest prior art of record is US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 3), hereafter "UVSD".

Anderson teaches a preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground (see abstract), the preconditioned air unit comprising a housing (Fig. 1) accommodating a flow duct (104, 28, 44, Fig. 1) with an air inlet for ambient air (102) and an air outlet (46) for connection to the parked a plurality of refrigeration systems, each of which includes (see col. 4 line 59 to col. 5, line 15,

describing two systems) at least one compressor, (58, 72) at least one condenser, (64,76) at least one expansion valve, (60, 81) at least one evaporator (50, 52) connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct (apparent from Fig. 1).

UVSD teaches that the variable frequency drive is the most effective motor controller in the industry, are affordable and reliable, and offer significant electrical energy savings through greatly reduced electrical bills.

Urbain teaches that an automatic controller manages the functioning of an air condition unit by controlling aircraft (col. 4, lines 33-36), a blower (38) connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, (col. 4, lines 25-26),

The art of record does not teach, in an obvious combination with the foregoing limitations, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption; the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the or the outgoing airflow from the preconditioned air unit; each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

Since the art of record does not teach all of the limitations of the independent claims, such claims are allowable as are the claims depending therefrom.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY CRENSHAW whose telephone number is (571)270-1550. The examiner can normally be reached on Monday-Friday 8:30am to 5:30pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Alexandra Elve can be reached on (571) 272-1173. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENRY CRENSHAW/
Primary Examiner, Art Unit 3744

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

CPC							
Symbol						**Type**	**Version**
B64F		1	/	362		F	2013-01-01
Y02T		50	/	82		A	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/HENRY CRENSHAW/ Primary Examiner.Art Unit 3744	02/02/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
62	228.4	F 2 5 B 1 / 00 (2006.0)	
		F 2 5 D 15 / 00 (2006.0)	
CROSS REFERENCE(S)		F 2 5 D 19 / 00 (2006.0)	
		F 2 5 D 17 / 02 (2006.01.01)	

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
62	236	298	434		

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/HENRY CRENSHAW/ Primary Examiner.Art Unit 3744	02/02/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	6	17	21	33										
-	2	7	18	13	34										
-	3	19	19	14	35										
-	4	-	20	22	36										
-	5	20	21	15	37										
-	6	-	22												
-	7	2	23												
-	8	16	24												
-	9	17	25												
-	10	9	26												
-	11	10	27												
-	12	11	28												
1	13	12	29												
3	14	-	30												
4	15	18	31												
5	16	8	32												

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 22	
/HENRY CRENSHAW/ Primary Examiner.Art Unit 3744 (Primary Examiner)	02/02/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	4541	(62/129 62/236 62/298 62/434 62/228.4).ccls.	US-PGPUB; USPAT	OR	ON	2017/02/02 12:06
L2	3398	(62/236 62/298 62/434 62/228.4).ccls.	US-PGPUB; USPAT	OR	ON	2017/02/02 12:06
S1	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:21
S2	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:25
S3	1	(12/301357).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/04 15:26
S5	110	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 16:26
S6	28	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:28
S7	86	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:30
S8	43	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:32
S9	0	(scroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:33
S10	8	(schroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:34
S11	14	("20080250903" | "20100031676" | "4272967" | "5107685").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:08

S12	0	62/228.4.ccls. and b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:24
S13	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:10
S14	3	S13 and (vfd or inverter or (variable adj speed))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:11
S15	4	"4272967".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:12
S16	386	(variable adj speed) near5 condenser near5 (fan or blower)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:44
S17	8	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/04 19:45
S18	0	S16 and S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:45
S19	0	S13 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:46
S20	601771	inverter ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2014/03/05 08:37

			IBM_TDB			
S21	609	inverter near5 ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S22	306	(inverter near5 ("60" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:39
S23	40	(inverter near5 ("60" adj hz) near5 ("50" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:41
S24	0	wo2007061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S25	0	wo20070061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S26	2	"7461516".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 09:00
S28	1	(12/741437).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/05 09:35
S29	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:42
S30	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2014/03/05 10:44

		adj speed adj motor adj controller)).ti.	EPO; JPO; DERWENT; IBM_TDB			
S31	28	S30 and (range near5 (hz or hertz))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S32	3153	(output near3 voltage) near10 frequency near10 ratio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S33	1	S30 and "l24"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S34	9	S30 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:16
S35	11	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$ or US-20080314064-$ or US-20030168862-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/07 14:57
S36	9	S35 and controller	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 14:57
S37	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S38	871	S37 near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S39	4931033	(main or central or system) near10 (controller or controls or processor)	US-PGPUB; USPAT;	OR	ON	2014/03/07 15:08

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S40	372	S38 and S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S41	30143	(independent or separate or redundant or backup) near20 (system or compressor or generator) near20 (fail$4 or malfunction)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:24
S42	143400	"62"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S43	277	S41 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S44	122	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 14:58
S45	47	(("20040089700") or ("20040262918")	US-PGPUB;	OR	OFF	2014/03/08

		or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	USPAT			14:58
S46	50	(("3640256") or ("3929285") or ("3929628") or ("4049395") or ("4060393") or ("4249655") or ("4259970") or ("4272499") or ("4274371") or ("4281522") or ("4296809") or ("4299285") or ("4300447") or ("4313499") or ("4343348") or ("4347708") or ("4357860") or ("4399742") or ("4442817") or ("4463022") or ("4519324") or ("4526090") or ("4539793") or ("4543677") or ("4554933") or ("4612096") or ("4615176") or ("4621504") or ("4764348") or ("4775627") or ("4781729") or ("4786301") or ("4829885") or ("4838345") or ("4842620") or ("4860642") or ("4866839") or ("4872397") or ("4884366") or ("4891892") or ("4921604") or ("4955372") or ("4967769") or ("5001346") or ("5015365") or ("5318099") or ("5540757") or ("5547421") or ("5740846") or ("5958346")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 15:04
S47	0	("(12-pulseor18-pulseor24-pulse)near10rectifier").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 16:07
S48	322	(12-pulse or 18-pulse or 24-pulse) near10 rectifier	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2014/03/08 16:07

			EPO; JPO; DERWENT; IBM_TDB			
S49	10	S48 and ((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:09
S50	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 09:47
S51	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:01
S52	1899	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:45
S53	120	S52 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:49
S54	0	yd2t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S55	334	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S56	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/21 18:59
S57	4	(high adj motor adj torque).clm.	USPAT	OR	ON	2014/10/21 18:59

S58	154	(high adj motor adj torque)	USPAT	OR	ON	2014/10/21 19:03
S59	4805	hauptmann	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:27
S60	0	(benjamin near2 hauptmann)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:29
S61	156	(benjamin near2 hauptman)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:30
S62	154	(benjamin near2 hauptman)	US-PGPUB; USPAT	OR	ON	2014/12/29 11:30
S63	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/30 13:41
S64	2468	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S65	163	S64 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S66	0	S65 and (unloader adj valve)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S67	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:31

S68	835	voltage near3 frequency near3 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:36
S69	576	voltage near3 frequency near3 torque	US-PGPUB; USPAT	OR	ON	2015/04/20 11:37
S70	291	(ratio near3 voltage near3 frequency near3 constant)	US-PGPUB; USPAT	OR	ON	2015/04/20 11:49
S71	27	S70 near10 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:49
S72	39	(US-20080314064-$ or US-20080141703-$ or US-20140138478-$ or US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20050034468-$ or US-20080238108-$ or US-20140103846-$ or US-20130147410-$ or US-20070209383-$ or US-20030168862-$ or US-20110153237-$ or US-20070024224-$ or US-20090084120-$ or US-20070035263-$ or US-20060086124-$ or US-20050086974-$ or US-20060266054-$ or US-20140354194-$ or US-20100031676-$ or US-20090151879-$).did. or (US-7325410-$ or US-6600278-$ or US-4859924-$ or US-6564571-$ or US-3784888-$ or US-7479749-$ or US-6446447-$ or US-8588983-$ or US-7380588-$ or US-7685838-$ or US-5107685-$ or US-6751979-$ or US-7484377-$ or US-7216492-$ or US-4691155-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2015/04/24 10:44
S73	19	S72 and torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 10:45
S74	285	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 11:04
S75	195	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:05
S76	109	(constant adj torque) near10 (voltage and frequency)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:11
S77	6	("2007135103").PN.	US-PGPUB;	OR	OFF	2015/12/09

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			10:32
S78	6	("2007061622").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:34
S79	0	("6414455.pn.").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:42
S80	4	"6414455".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 10:42
S81	52	("4047083" | "4249120" | "4661751" | "4785225" | "5272429" | "5710500" | "6154002").PN. OR ("6414455").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/12/09 10:43
S82	3	"20130025303".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 11:22
S83	2714	(refrigeration near2 systems) and compressor and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:45
S84	431	(refrigeration near2 systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:46
S85	409	(refrigeration near2 syst$2) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S86	431	(refrigeration near2 syst$3) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S87	431	(refrigeration near2 system$1) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S88	406	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S89	268	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	OFF	2015/12/28 10:55

S90	81	((plurality or multiple) near2 (refrigeration adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:18
S91	92	((plurality or multiple) near2 ((refrigerat$4 or cool$4) adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:21
S92	4	"5383355".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:37
S93	4	"5383335".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:38
S94	2	"6446447".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:39
S95	1	"5383335".pn.	US-PGPUB; USPAT	OR	ON	2016/01/06 17:56
S96	3	"20100031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:40
S97	1	"20100031676".pn. and (condenser near3 fan)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:41
S98	1	"6414455".pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 15:14
S99	0	(" (dieseladjgenerator)near5inverter").PN.	US-PGPUB; USPAT	OR	OFF	2016/01/07 18:51
S100	72	(diesel adj generator) near5 inverter	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/07 18:52
S101	17	(diesel adj generator) near5 inverter	US-PGPUB; USPAT	OR	ON	2016/01/07 18:54
S102	105	"4835977" "5031690" "4352273" "2585570" "4272967"	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S103	5	("4835977" "5031690" "4352273"	US-PGPUB;	OR	ON	2016/01/07

		"2585570" "4272967").pn.	USPAT			19:13
S104	1	"6414455".pn.	USPAT	OR	ON	2016/01/07 20:27
S105	124	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/01 16:19
S106	32	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S107	127	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S108	61	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S109	214	S105 or S106 or S107 or S108	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S110	486	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/04 13:32
S111	139	S110	US-PGPUB; USPAT; EPO	OR	ON	2016/07/04 13:32
S112	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT	OR	ON	2016/09/03 09:47
S113	315	(high adj motor adj torque)	US-PGPUB; USPAT	OR	ON	2016/09/03 09:47

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	9	(preconditioned adj air adj unit).clm.	US-PGPUB; USPAT	OR	ON	2017/02/02 12:47
L4	2	((preconditioned adj air adj unit) and (variable adj frequency adj driver)).clm.	US-PGPUB; USPAT	OR	ON	2017/02/02 12:49

2/2/2017 12:54:16 PM
C:\Users\hcrenshaw\Documents\EAST\Workspaces\13257669.wsp

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	03-273927	JP	A	1991-12-05	TOSHIBA CORP		☐
	2	08-156580	JP	A	1996-06-18	MATSUSHITA ELECTRIC IND CO LTD		☒

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First Named Inventor	Soren Risgaard DAHL
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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Examiner Signature	/HENRY T CRENSHAW/	Date Considered	02/24/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

CERTIFICATION STATEMENT

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☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2014-04-23
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 03/02/2017

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
03/02/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

itw@ipfirm.com
docketing@ipfirm.com
pair_lhhb@firsttofile.com

Notice of Allowability	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *printer query 2/23/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *13-19,21,23-29 and 31-37*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date attached
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HENRY CRENSHAW/
Primary Examiner, Art Unit 3744

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL et al.
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4272967	A1	1981-06-16	WHITE et al.	
	2	5107685	A	1992-04-28	KOBAYASHI et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100031676	A1	2010-02-11	URBAIN	
	2	20080250903	A1	2008-10-16	HSIEH	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	0431563	EP	A2	1991-06-12	KABUSHIKI KAISHA TOSHIBA	Corresponds to US Patent No. 5107685 A	☒

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.T.C/

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Filing Date	2011-09-20
First Named Inventor	Soren Risgaard DAHL et al.
Art Unit	
Examiner Name	
Attorney Docket Number	713-2354 (22664)

	2	2150278	GB	A	1985-06-26	TELEDYNE INDUSTRIES INC.		☒
	3	10257796	JP	A	1998-09-25	MITSUBISHI ELECTRIC CORP		☒
	4	2007135103	WO	A2	2007-11-29	LEBRUN-NIMY EN ABREGE LEBRUN SA	Corresponds to US Publication No. 2010031676 A1	☒
	5	2007061622	WO	A1	2007-05-31	ILLINOIS TOOL WORKS INC.	Corresponds to US Publication No. 2008250803 A1	☒

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Search Report results for Danish Patent Application No. PA 2009 00392 dated November 3, 2009	☒
	2	ISR for PCT/IB2010/051189 dated January 11, 2011	☒

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Examiner Signature	/HENRY T CRENSHAW/	Date Considered	02/24/2017

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Receipt date: 09/20/2011

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First Named Inventor	Soren Risgaard DAHL et al.
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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2011-09-20
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.T.C/

Docket No.: 713-2354 (22664-US) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
Soren Risgaard DAHL	:	Confirmation No.9301
U.S. Patent Application No. 13/257,669	:	Group Art Unit: 3744
Filed: September 20, 2011	:	Examiner: HENRY T. CRENSHAW

For: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

REQUEST FOR REFUND

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

A refund in the amount of $1,400 is requested for the following reason.

The above note amount was mistakenly taken from our Deposit Account on February 2, 2017 for a 3-month Extension of Time. A Petition to Withdraw the Finality of the Office Action dated July 8, 2016 was filed on September 8, 2016, the same day that the Advisory Action was issued. A Decision on Petition was granted on September 19, 2016 to withdraw the finality.

Therefore, be believe that no extension fee was due.

Please immediately credit Deposit Account No.: 07-1337 in this amount.

Respectfully submitted,

HAUPTMAN & HAM, LLP

/Benjamin J. Hauptman/

Benjamin J. Hauptman
Registration No. 29,310

2318 Mill Road, Suite 1400
Alexandria, Virginia 22314
Telephone: (703) 684-1111
Facsimile: (703) 518-5499
Date: April 4, 2017
BJH/aek

Electronic Acknowledgement Receipt

EFS ID:	28830970
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Amy Kendall
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	04-APR-2017
Filing Date:	20-SEP-2011
Time Stamp:	16:41:11
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Refund Request	2017-04-04-Request_for_Refund.pdf	86289 7d99a7d0cf4beb93ef149a51ed5779fc153a0026	no	1

Warnings:

Information:	
Total Files Size (in bytes):	86289

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	29167820
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Amy Kendall
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	10-MAY-2017
Filing Date:	20-SEP-2011
Time Stamp:	11:47:59
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	051017INTEFSW11490800
Deposit Account	071337
Authorized User	Benjamin Hauptman

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	2017-05-10-RCE.pdf	1349886 f075eb5c47bdb5d88262c449dfbcbcab373b19ff	no	3
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	2017-05-10-IDS.pdf	1035278 f040f0be88faf57ff3520f3c74d6c2f16f641dc8	no	4
Warnings:					
Information:					
3	Foreign Reference	F1-JP3190397B2.pdf	3046273 e8d676d5208bb95a50615528b85d80dfbee6a57e	no	8
Warnings:					
Information:					
4	Foreign Reference	F2-JP4119761B2.pdf	634864 364f57743611cbba8d36d50eec776876d4eb54ca	no	10
Warnings:					
Information:					
5	Foreign Reference	F3-JPH0549903B2.pdf	924734 dfacdd12850e84c95ed0fffad3759b1be37de167	no	10
Warnings:					
Information:					
6	Foreign Reference	F4-JPS63238382A.pdf	3335253 bef03c2d45eb0c01a13ce72c998e8d11c090c8a6	no	8
Warnings:					
Information:					

7	Foreign Reference	F5-JPS6373897A.pdf	557840 03aa531d5f3287362417fd285b9b721c9008db76	no	9
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	31087 6292c7976f1a3fd31b8ebd100c34fdfe634b06b5	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	10915215		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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New International Application Filed with the USPTO as a Receiving Office

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Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman/Amy Kendall
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1st Request	1801	1	1200	1200
		Total in USD ($)		**1200**

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard Dahl
Art Unit	3744
Examiner Name	CRENSHAW, HENRY T
Attorney Docket Number	713-2354 (22664)

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6240742	B1	2001-06-05	KAUFMAN ET AL.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	3190397	JP	B2	2001-07-23	MATSUSHITA REFRIG CO LTD		
	2	4119761	JP	B2	2008-07-16	TOSHIBA KYARIA KK		
	3	0549903	JP	B2	1993-07-27	MITSUBISHI ELECTRIC CORP		X

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13257669
	Filing Date	2011-09-20
	First Named Inventor	Soren Risgaard Dahl
	Art Unit	3744
	Examiner Name	CRENSHAW, HENRY T
	Attorney Docket Number	713-2354 (22664)

	4	63-238382	JP	A	1988-10-04	MATSUSHITA REFRIGERATION		☒
	5	63-73897	JP	A	1988-04-04	TOSHIBA CORP		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard Dahl
Art Unit	3744
Examiner Name	CRENSHAW, HENRY T
Attorney Docket Number	713-2354 (22664)

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2017-05-10
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/30EFS (07-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	13/257,669	Filing Date	2011-09-20	Docket Number (if applicable)	713-2354 (22664)	Art Unit	3744
First Named Inventor	Soren Risgaard Dahl			Examiner Name	CRENSHAW, HENRY T		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8 1995, to any international application that does not comply with the requirements of 35 U.S.C. 371, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV.

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the orde in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 071337

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (07-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2017-05-10
Name	Benjamin J. Hauptman	Registration Number	29310

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is t file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Tim will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions fo reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the informatio solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

33712 7590 05/30/2017
HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER
CRENSHAW, HENRY T

ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 05/30/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

TITLE OF INVENTION: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	08/30/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Dabico
Exhibit 1002
Page 647

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

33712 7590 05/30/2017
HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

TITLE OF INVENTION: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	08/30/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
CRENSHAW, HENRY T	3744	062-228400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

33712 7590 05/30/2017

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

EXAMINER	
CRENSHAW, HENRY T	
ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 05/30/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/257,669	Applicant(s) DAHL ET AL.	
	Examiner HENRY CRENSHAW	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *RCE 5/10/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *13-19,21,23-29 and 31-37*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date attached
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HENRY CRENSHAW/
Primary Examiner, Art Unit 3744

Examiner's Amendment and Reasons for Allowance

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

This action is in replay to the RCE filed 5/10/2017.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this amendment was provided by applicant's agent in the reply filed 12/29/2016.

The allowed claims are 13-19, 21, 23-29, 31 -37.

Examiner's Amendment

13. (currently amended) A preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground, the preconditioned air unit comprising a housing accommodating a flow duct with an air inlet for ambient air and an air outlet for connection to the parked aircraft, a blower connected with the flow duct for generation of an air flow from the air inlet toward the air outlet,

a plurality of refrigeration systems, each of which includes at least one compressor, at least one condenser,

at least one expansion valve,

at least one evaporator connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct, and at least one variable frequency driver for power supply of the at least one compressor, and a central controller that is configured for controlling the operation of the preconditioned air unit including variable frequency drivers of the plurality of refrigeration systems,,

wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption.

20. (cancelled)

22. (cancelled)

Reasons for Allowance

The closest prior art of record is US 5,383,335 to Anderson, US 2010/0031676 to Urbain, and Understanding Variable Speed Drives (Part 3), hereafter "UVSD".

Anderson teaches a preconditioned air unit for supplying preconditioned air to an aircraft parked on the ground (see abstract), the preconditioned air unit comprising a housing (Fig. 1) accommodating a flow duct (104, 28, 44, Fig. 1) with an air inlet for ambient air (102) and an air outlet (46) for connection to the parked a plurality of refrigeration systems, each of which includes (see col. 4 line 59 to col. 5, line 15, describing two systems) at least one compressor, (58, 72) at least one condenser, (64,76) at least one expansion valve, (60, 81) at least one evaporator (50, 52) connected in a flow circuit containing a refrigerant, and wherein the at least one evaporator interacts with the air flow in the flow duct (apparent from Fig. 1).

UVSD teaches that the variable frequency drive is the most effective motor controller in the industry, are affordable and reliable, and offer significant electrical energy savings through greatly reduced electrical bills.

Urbain teaches that an automatic controller manages the functioning of an air condition unit by controlling aircraft (col. 4, lines 33-36), a blower (38) connected with the flow duct for generation of an air flow from the air inlet toward the air outlet, (col. 4, lines 25-26),

The art of record does not teach, in an obvious combination with the foregoing limitations, wherein the central controller has a power sharing control input for control of the preconditioned air unit power consumption; the central controller automatically adjusts the cooling performed by the preconditioned air unit according to at least one of: the selected type of aircraft, the ambient temperature, the humidity, the cabin temperature, and the or the outgoing airflow from the preconditioned air unit; each refrigeration system of the plurality of refrigeration systems is configured for failure detection so that, in the event that one of the refrigeration systems fails, the failing refrigeration system transmits a failure signal to the central controller.

Since the art of record does not teach all of the limitations of the independent claims, such claims are allowable as are the claims depending therefrom.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY CRENSHAW whose telephone number is

(571)270-1550. The examiner can normally be reached on Monday-Friday 8:30am to 5:30pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Alexandra Elve can be reached on (571) 272-1173. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/HENRY CRENSHAW/
Primary Examiner, Art Unit 3744

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	Art Unit
	HENRY CRENSHAW	3744

CPC- SEARCHED		
Symbol	Date	Examiner
b64f1/362; g05d	3/10/2014	htc
g05d23/19	3/10/2014	htc
y02t50/82	3/10/2014	htc

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
62	228.4236, 298, 434, 228.4	2/2/2017	htc

SEARCH NOTES		
Search Notes	Date	Examiner
Plus and claims search. Inventor and continuity search. East searches for US and foreign patents. NPL searches for variable speed drives.	3/10/2014	htc
updated searches	10/21/2014	htc
updated searches	1/8/2016	htc
updated searches	7/4/2016	htc
updated searches	2/2/2017	htc
see east priontou for interfernce search results	2/2/2017	htc
updated searches	5/15/2017	htc
see east printout for interfernce search results	5/15/2017	htc

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
all	((preconditioned adj air adj unit) and (variable adj frequency adj driver)).clm.	2/2/2017	htc
all	((preconditioned adj air adj unit) and (variable adj driver)).clm.	2/2/2017	htc

/HENRY CRENSHAW/ Examiner.Art Unit 3744	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	420	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/05/15 11:56
L2	3510	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/05/15 11:56
L3	518	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/05/15 11:56
L4	1201	L1 or L2 or L3	US-PGPUB; USPAT; EPO	OR	ON	2017/05/15 11:56
S1	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:21
S2	7	"2010031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 15:25
S3	1	(12/301357).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/04 15:26
S5	110	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2014/03/04 16:26

			DERWENT; IBM_TDB			
S6	28	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:28
S7	86	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:30
S8	43	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:32
S9	0	(scroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:33
S10	8	(schroder and lars).in.	US-PGPUB; USPAT	OR	ON	2014/03/04 16:34
S11	14	("20080250903" | "20100031676" | "4272967" | "5107685").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:08
S12	0	62/228.4.ccls. and b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 17:24
S13	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:10
S14	3	S13 and (vfd or inverter or (variable adj speed))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 18:11
S15	4	"4272967".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:12
S16	386	(variable adj speed) near5 condenser near5 (fan or blower)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:44
S17	8	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/04 19:45

S18	0	S16 and S17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:45
S19	0	S13 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/04 19:46
S20	601771	inverter ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S21	609	inverter near5 ("60" adj hz)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:37
S22	306	(inverter near5 ("60" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:39
S23	40	(inverter near5 ("60" adj hz) near5 ("50" adj hz)) and (motor or compressor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:41
S24	0	wo2007061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S25	0	wo20070061622.pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 08:56
S26	2	"7461516".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2014/03/05 09:00

			DERWENT; IBM_TDB			
S28	1	(12/741437).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/05 09:35
S29	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:42
S30	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S31	28	S30 and (range near5 (hz or hertz))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 10:44
S32	3153	(output near3 voltage) near10 frequency near10 ratio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S33	1	S30 and "l24"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:15
S34	9	S30 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/05 11:16
S35	11	(US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20090084120-$ or US-20100031676-$ or US-20080314064-$ or US-20030168862-$).did. or (US-6751979-$ or US-5107685-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2014/03/07 14:57
S36	9	S35 and controller	US-PGPUB; USPAT; USOCR;	OR	ON	2014/03/07 14:57

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S37	6261	((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S38	871	S37 near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:07
S39	4931033	(main or central or system) near10 (controller or controls or processor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S40	372	S38 and S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/07 15:08
S41	30143	(independent or separate or redundant or backup) near20 (system or compressor or generator) near20 (fail$4 or malfunction)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:24
S42	143400	"62"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S43	277	S41 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 14:25
S44	122	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 14:58

		("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.				
S45	47	(("20040089700") or ("20040262918") or ("20050126703") or ("20060093713") or ("20060123804") or ("20060162371") or ("20070200343") or ("20070209383") or ("20080054631") or ("20080300749") or ("20090032652") or ("20100117247") or ("20100129273") or ("20100207383") or ("20100207384") or ("20110093182") or ("20120042685") or ("3717953") or ("3929628") or ("4646966") or ("4872397") or ("4921604") or ("5318099") or ("5383335") or ("5384593") or ("5394935") or ("5414207") or ("5885154") or ("6119058") or ("6182721") or ("6289949") or ("7147141") or ("7152886") or ("7171819") or ("7322203") or ("7404262") or ("7685838") or ("7873451") or ("7873451") or ("7984930") or ("7984930") or ("8016325") or ("8016325") or ("8146957") or ("8146958") or ("8174396") or ("8365530") or ("8394153") or ("8545665") or ("8665100")).PN.	US-PGPUB; USPAT	OR	OFF	2014/03/08 14:58
S46	50	(("3640256") or ("3929285") or ("3929628") or ("4049395") or ("4060393") or ("4249655") or ("4259970") or ("4272499") or ("4274371") or ("4281522") or ("4296809") or ("4299285") or ("4300447") or ("4313499") or ("4343348") or ("4347708") or ("4357860") or ("4399742") or ("4442817") or ("4463022") or ("4519324") or ("4526090") or ("4539793") or ("4543677") or ("4554933") or ("4612096") or ("4615176") or ("4621504") or ("4764348") or ("4775627") or ("4781729") or ("4786301") or	US-PGPUB; USPAT	OR	OFF	2014/03/08 15:04

		("4829885") or ("4838345") or ("4842620") or ("4860642") or ("4866839") or ("4872397") or ("4884366") or ("4891892") or ("4921604") or ("4955372") or ("4967769") or ("5001346") or ("5015365") or ("5318099") or ("5540757") or ("5547421") or ("5740846") or ("5958346")).PN.				
S47	0	("(12-pulseor18-pulseor24-pulse)near10rectifier").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/03/08 16:07
S48	322	(12-pulse or 18-pulse or 24-pulse) near10 rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:07
S49	10	S48 and ((variable near2 (frequency or speed) near2 drive) or (adjustable near2 (frequency or speed) near2 drive) or (AC adj drive) or microdrive or (variable adj speed adj motor adj controller)).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/08 16:09
S50	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 09:47
S51	272	b64f1/362.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:01
S52	1899	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:45
S53	120	S52 and (inverter or vsd or vfd or (variable adj speed) or (variable adj frequency))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:49
S54	0	yd2t50/82.cpc.	US-PGPUB; USPAT; USOCR;	OR	ON	2014/03/10 10:58

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S55	334	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/03/10 10:58
S56	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/21 18:59
S57	4	(high adj motor adj torque).clm.	USPAT	OR	ON	2014/10/21 18:59
S58	154	(high adj motor adj torque)	USPAT	OR	ON	2014/10/21 19:03
S59	4805	hauptmann	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:27
S60	0	(benjamin near2 hauptmann)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:29
S61	156	(benjamin near2 hauptman)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/29 11:30
S62	154	(benjamin near2 hauptman)	US-PGPUB; USPAT	OR	ON	2014/12/29 11:30
S63	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/30 13:41
S64	2468	g05d23/19.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S65	163	S64 and (inverter or vsd or vfd or	US-PGPUB;	OR	ON	2014/12/31

		(variable adj speed) or (variable adj frequency))	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			14:42
S66	0	S65 and (unloader adj valve)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/12/31 14:42
S67	3	"20120023985".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:31
S68	835	voltage near3 frequency near3 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:36
S69	576	voltage near3 frequency near3 torque	US-PGPUB; USPAT	OR	ON	2015/04/20 11:37
S70	291	(ratio near3 voltage near3 frequency near3 constant)	US-PGPUB; USPAT	OR	ON	2015/04/20 11:49
S71	27	S70 near10 torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/20 11:49
S72	39	(US-20080314064-$ or US-20080141703-$ or US-20140138478-$ or US-20120042685-$ or US-20120023985-$ or US-20100171373-$ or US-20050034468-$ or US-20080238108-$ or US-20140103846-$ or US-20130147410-$ or US-20070209383-$ or US-20030168862-$ or US-20110153237-$ or US-20070024224-$ or US-20090084120-$ or US-20070035263-$ or US-20060086124-$ or US-20050086974-$ or US-20060266054-$ or US-20140354194-$ or US-20100031676-$ or US-20090151879-$).did. or (US-7325410-$ or US-6600278-$ or US-4859924-$ or US-6564571-$ or US-3784888-$ or US-7479749-$ or US-6446447-$ or US-8588983-$ or US-7380588-$ or US-7685838-$ or US-5107685-$ or US-6751979-$ or US-7484377-$ or US-7216492-$ or US-4691155-$ or US-4272967-$ or US-4514991-$).did.	US-PGPUB; USPAT	OR	ON	2015/04/24 10:44

S73	19	S72 and torque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 10:45
S74	285	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/04/24 11:04
S75	195	(constant adj torque) near10 (voltage and speed)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:05
S76	109	(constant adj torque) near10 (voltage and frequency)	US-PGPUB; USPAT	OR	ON	2015/04/24 11:11
S77	6	("2007135103").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:32
S78	6	("2007061622").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:34
S79	0	("6414455.pn.").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/12/09 10:42
S80	4	"6414455".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 10:42
S81	52	("4047083" | "4249120" | "4661751" | "4785225" | "5272429" | "5710500" | "6154002").PN. OR ("6414455").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/12/09 10:43
S82	3	"20130025303".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/09 11:22
S83	2714	(refrigeration near2 systems) and compressor and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:45
S84	431	(refrigeration near2 systems) and	US-PGPUB;	OR	ON	2015/12/28

		(single near2 compressor) and ((plurality or first or pair) near3 evaporator)	USPAT			10:46
S85	409	(refrigeration near2 syst$2) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S86	431	(refrigeration near2 syst$3) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:48
S87	431	(refrigeration near2 system$1) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S88	406	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	ON	2015/12/28 10:49
S89	268	(refrigeration adj systems) and (single near2 compressor) and ((plurality or first or pair) near3 evaporator)	US-PGPUB; USPAT	OR	OFF	2015/12/28 10:55
S90	81	((plurality or multiple) near2 (refrigeration adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:18
S91	92	((plurality or multiple) near2 ((refrigerat$4 or cool$4) adj systems)) and (single near2 compressor)	US-PGPUB; USPAT	OR	OFF	2015/12/28 11:21
S92	4	"5383355".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:37
S93	4	"5383335".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:38
S94	2	"6446447".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/28 12:39
S95	1	"5383335".pn.	US-PGPUB; USPAT	OR	ON	2016/01/06 17:56
S96	3	"20100031676".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/06 19:40
S97	1	"20100031676".pn. and (condenser near3 fan)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2016/01/06 19:41

			EPO; JPO; DERWENT; IBM_TDB			
S98	1	"6414455".pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 15:14
S99	0	("(dieseladjgenerator)near5inverter").PN.	US-PGPUB; USPAT	OR	OFF	2016/01/07 18:51
S100	72	(diesel adj generator) near5 inverter	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/01/07 18:52
S101	17	(diesel adj generator) near5 inverter	US-PGPUB; USPAT	OR	ON	2016/01/07 18:54
S102	105	"4835977" "5031690" "4352273" "2585570" "4272967"	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S103	5	("4835977" "5031690" "4352273" "2585570" "4272967").pn.	US-PGPUB; USPAT	OR	ON	2016/01/07 19:13
S104	1	"6414455".pn.	USPAT	OR	ON	2016/01/07 20:27
S105	124	(soren and dahl).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/01 16:19
S106	32	(soren and dahl).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S107	127	(nielsen and bo).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S108	61	(henrik and olsson).in.	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S109	214	S105 or S106 or S107 or S108	US-PGPUB; USPAT	OR	ON	2016/07/01 16:19
S110	486	y02t50/82.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/04 13:32
S111	139	S110	US-PGPUB; USPAT; EPO	OR	ON	2016/07/04 13:32
S112	8	(high adj motor adj torque).clm.	US-PGPUB; USPAT	OR	ON	2016/09/03 09:47
S113	315	(high adj motor adj torque)	US-PGPUB; USPAT	OR	ON	2016/09/03 09:47

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	0	((preconditioned adj air adj unit) and	US-PGPUB;	OR	ON	2017/05/15

		(variable adj driver)).clm.	USPAT		12:13

5/ 15/ 2017 12:14:51 PM
C:\ Users\ hcrenshaw\ Documents\ EAST\ Workspaces\ 13257669.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

CPC						
Symbol					**Type**	**Version**
B64F		1	/	362	F	2013-01-01
Y02T		50	/	82	A	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
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			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/HENRY CRENSHAW/ Primary Examiner.Art Unit 3744	05/15/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
62	228.4

CROSS REFERENCE(S)					
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**				
62	236	298	434		

INTERNATIONAL CLASSIFICATION					
CLAIMED					**NON-CLAIMED**
F	2	5	B	1 / 00 (2006.01.01)	
F	2	5	D	15 / 00 (2006.01.01)	
F	2	5	D	19 / 00 (2006.01.01)	
F	2	5	D	17 / 02 (2006.01.01)	

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/HENRY CRENSHAW/ Primary Examiner.Art Unit 3744	05/15/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13257669	DAHL ET AL.
	Examiner	**Art Unit**
	HENRY CRENSHAW	3744

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	6	17	21	33										
-	2	7	18	13	34										
-	3	19	19	14	35										
-	4	-	20	22	36										
-	5	20	21	15	37										
-	6	-	22												
-	7	2	23												
-	8	16	24												
-	9	17	25												
-	10	9	26												
-	11	10	27												
-	12	11	28												
1	13	12	29												
3	14	-	30												
4	15	18	31												
5	16	8	32												

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 22	
/HENRY CRENSHAW/ Primary Examiner.Art Unit 3744 (Primary Examiner)	05/15/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard Dahl
Art Unit	3744
Examiner Name	CRENSHAW, HENRY T
Attorney Docket Number	713-2354 (22664)

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6240742	B1	2001-06-05	KAUFMAN ET AL.	

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	1	3190397	JP	B2	2001-07-23	MATSUSHITA REFRIG CO LTD		
	2	4119761	JP	B2	2008-07-16	TOSHIBA KYARIA KK		
	3	0549903	JP	B2	1993-07-27	MITSUBISHI ELECTRIC CORP		X

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.T.C/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard Dahl
Art Unit	3744
Examiner Name	CRENSHAW, HENRY T
Attorney Docket Number	713-2354 (22664)

	4	63-238382	JP	A	1988-10-04	MATSUSHITA REFRIGERATION		☒
	5	63-73897	JP	A	1988-04-04	TOSHIBA CORP		☐

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EXAMINER SIGNATURE

Examiner Signature	/HENRY T CRENSHAW/	Date Considered	05/15/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.T.C/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13257669
Filing Date	2011-09-20
First Named Inventor	Soren Risgaard Dahl
Art Unit	3744
Examiner Name	CRENSHAW, HENRY T
Attorney Docket Number	713-2354 (22664)

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Benjamin J. Hauptman/	Date (YYYY-MM-DD)	2017-05-10
Name/Print	Benjamin J. Hauptman	Registration Number	29,310

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.T.C/

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.T.C/

Electronic Acknowledgement Receipt

EFS ID:	30162538
Application Number:	13257669
International Application Number:	
Confirmation Number:	9301
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Customer Number:	33712
Filer:	Benjamin J. Hauptman/Amy Kendall
Filer Authorized By:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)
Receipt Date:	24-AUG-2017
Filing Date:	20-SEP-2011
Time Stamp:	14:53:54
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$960
RAM confirmation Number	082517INTEFSW14545700
Deposit Account	071337
Authorized User	Benjamin Hauptman

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

37 CFR 1.492(a) (Basic national fee only)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	2017-08-24-Issue_Fee.pdf	189614 1688a9d0558df0481669695e73293f1cabdd4ffb	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30956 04528779c68a33808369b5407fd5078f5c594d4d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	220570		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

33712 7590 05/30/2017
HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/20/2011	Soren Risgaard Dahl	713-2354 (22664)	9301

TITLE OF INVENTION: PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	08/30/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
CRENSHAW, HENRY T	3744	062-228400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 HAUPTMAN HAM, LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: AXA POWER APS

(B) RESIDENCE: (CITY and STATE OR COUNTRY): ODENSE N, DENMARK

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ☐ A check is enclosed.
- ☒ Payment by credit card. Form PTO-2038 is attached.
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 07-1337 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ☐ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Benjamin J. Hauptman/ Date August 24, 2017

Typed or printed name Benjamin J. Hauptman Registration No. 29,310

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	13257669
Filing Date:	20-Sep-2011
Title of Invention:	PRECONDITIONED AIR UNIT WITH VARIABLE FREQUENCY DRIVING
First Named Inventor/Applicant Name:	Soren Risgaard Dahl
Filer:	Benjamin J. Hauptman
Attorney Docket Number:	713-2354 (22664)

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/257,669	09/26/2017	9771169	713-2354 (22664)	9301

33712 7590 09/06/2017

HAUPTMAN HAM, LLP (ITW)
2318 Mill Rd
Suite 1400
ALEXANDRIA, VA 22314

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 1359 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Soren Risgaard Dahl, Odense SV, DENMARK;
Bo Vork Nielsen, Morud, DENMARK;
Henrik Olsson, Odense SV, DENMARK;
Lars Schroder, Assens, DENMARK;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.