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Post Office Address: 4250 Bethany Road, Buckhead, Georgia US

Inventor's Signature: Steffan Thomas, Jr. Date: 12/22/04

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 2003

APPENDIX 1 OF Docket Number

10/437736

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	29	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	43 minus 20 =	23
INDEPENDENT CLAIMS	5 minus 3 =	2
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	43	20	=
Independent	5	3	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total			=
Independent			=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total			=
Independent			=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

- * 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.

SMALL ENTITY TYPE ☐

OR OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	385.00
X\$ 9=	207
X43=	85
+145=	150
TOTAL	840

RATE	FEE
BASIC FEE	770.00
X\$18=	
X86=	
+290=	
TOTAL	

SMALL ENTITY OR

OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
X\$ 9=	
X43=	
+145=	
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X86=	
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+290=	
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RATE	ADDITIONAL FEE
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+145=	
TOTAL	

RATE	ADDITIONAL FEE
X\$18=	
X86=	
+290=	
TOTAL	

10/937736
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INDEX OF CLAIMS

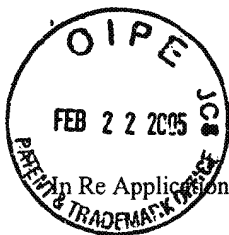
✓ Rejected
= Allowed
- (Through numeral)... Canceled
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N Non-elected
I Interference
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IFW
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Ponder, et al.

Confirmation No.: 1006

Group Art Unit: 1751

Serial No.: 10/937,736

Examiner: Unknown

Filed: 09/08/2004

Docket No.: 821920-1030

For: Refrigerant with Lubricating Oil for Replacement of R-22 Refrigerant

INFORMATION DISCLOSURE STATEMENT

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

Sir:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically:

- ☒ under 37 CFR 1.97(b), or
(within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- ☐ under 37 CFR 1.97(c) together with either a:
☐ Statement Under 37 C.F.R. 1.97(e), or
☐ a \$180.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before the final office action or notice of allowance, whichever occurs first)
- ☐ under 37 CFR 1.97(d) together with a:
☐ Statement under 37 CFR 1.97(e), and
☐ a \$180.00 petition fee set forth in 37 CFR 1.17(p).
(Filed after final office action or notice of allowance, whichever occurs first, but before payment of the issue fee)

Enclosed is a check in the amount of \$.

Enclosed is Credit Card Payment Form (PTO-2038) in the amount of \$.

Please charge \$ to deposit account . At any time during the pendency of this application, please charge any fees required to Deposit Account pursuant to 37 CFR 1.25. The Commissioner is hereby requested to credit any overpayment to Deposit Account No. .

- ☒ Applicant(s) submit herewith *Form PTO 1449A - Information Disclosure Statement by Applicant* together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.

- ☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO 1449 and is enclosed herewith.

The following rights are reserved by the Applicant(s): the right to establish the patentability of the claimed invention over any of the listed documents should they be applied as reference, and/or the right to prove that some of these documents may not be prior art, and/or the right to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

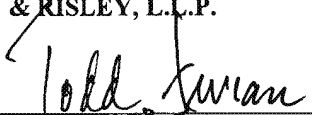
It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO-1449 to indicate the documents have been considered.

Also enclosed is the International Search Report and Written Opinion issued in connection with corresponding International Application PCT/US04/29643.

Respectfully Submitted,

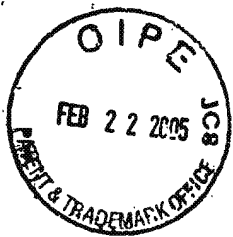
**THOMAS, KAYDEN, HORSTEMEYER
& RISLEY, L.L.P.**

By:



Todd Deveau, Reg. No. 29,526

100 Galleria Parkway, Suite 1750
Atlanta, Georgia 30339-5948
770-933-9500



CERTIFICATE OF MAILING

I hereby certify that the below listed items are being deposited with the U.S. Postal Service as first class mail in an envelope addressed to:

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on 2/16/05.

Laurie Delesandro
Laurie Delesandro

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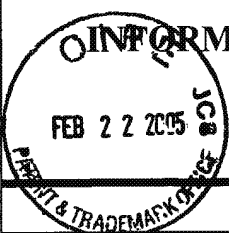
Docket No.: 821920-1030

For: Refrigerant with Lubricating Oil for Replacmenet of R-22 Refrigerant

The following is a list of documents enclosed:

Return Postcard
Information Disclosure Statement
PTO 1449

Further, the Commissioner is authorized to charge Deposit Account No. 20-0778 for any additional fees required. The Commissioner is requested to credit any excess fee paid to Deposit Account No. 20-0778.

Form PTO-1449				Attorney Docket No. 821920-1030		Serial No. 10/937,736		
 (Use several sheets if necessary)				Applicant Ponder, et al.				
				Filing Date 09/08/2004		Group 1751		
U.S. PATENT DOCUMENTS								
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
	A	6,000,230	12/14/99	Kanno, et al.				
	B	5,709,090	01/20/98	Endo, et al.				
	C							
	D							
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FOREIGN PATENT DOCUMENTS								
		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	L	EP 0742274 A1	11/13/96	Europe				X
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)								
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* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.								
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Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE

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Europäisches Patentamt
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EP 0 742 274 A1

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(30) Priorité: **12.05.1995 FR 9505644**

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(54) **Mélanges non azéotrophiques de 1,1,1,2-tétrafluoroéthane, difluorométhane et pentafluoroéthane, et leur application comme fluides frigorigènes**

(57) Pour remplacer le mélange azéotrope de dichlorodifluorométhane et de 1,1-difluoroéthane (R-500) en réfrigération de transport, l'invention propose d'utiliser un mélange non azéotrope contenant en masse

60 à 80% de 1,1,1,2-tétrafluoroéthane, 4 à 35% de pentafluoroéthane et 5 à 16% de difluorométhane.

Les propriétés thermodynamiques de ce mélange sont très proches de celles du mélange R-500.

EP 0 742 274 A1

Description

La présente invention concerne le domaine de la réfrigération et a plus particulièrement pour objet des mélanges non azéotropiques de fluides frigorigènes n'ayant pas ou peu d'action sur l'environnement, pour remplacer les chloro-

fluorocarbures (CFC) ou hydrochlorofluoro-carbures (HCFC) dans les systèmes de réfrigération.

Dans les systèmes exploités en réfrigération de transport, on opère selon un cycle thermodynamique défini généralement par une température d'évaporation pouvant descendre jusqu'à - 35°C, une température de condensation comprise entre 50 et 70°C, un sous-refroidissement liquide de l'ordre de - 5°C et une surchauffe des vapeurs égale à au moins 10°C.

Le fluide frigorigène couramment utilisé en réfrigération de transport est le mélange azéotropique (appelé R-500) de dichlorodifluorométhane et de 1,1-difluoroéthane. Ce mélange, préféré au dichlorodifluorométhane, permet d'obtenir une excellente capacité frigorifique, tout en gardant des niveaux de pression raisonnables. Or, il est maintenant établi qu'en raison de leur action sur l'ozone, les CFC et HCFC et en particulier le R-500, devront, à plus ou moins longue échéance, être remplacés par des fluides frigorigènes moins agressifs vis-à-vis de l'environnement.

Pour remplacer le R-500 dans les installations de réfrigération, le substitut doit présenter des propriétés thermodynamiques, en particulier une capacité frigorifique et des pressions de fonctionnement, aussi proches que possible de celles du R-500. D'autre part, pour la bonne stabilité du produit et la durabilité du matériel, il est souhaitable que la température de refoulement n'excède pas celle du R-500 de plus de 15°C environ. Enfin, le substitut doit être inflammable.

Le 1,1,1,2-tétrafluoroéthane (HFC-134a), le difluorométhane (HFC-32) et le pentafluoroéthane (HFC-125) n'ont comparativement aux composés chlorés aucune action sur l'ozone.

Les HFC-125 et 32, bien qu'ayant une excellente capacité frigorifique, présentent l'inconvénient majeur d'être des fluides haute pression. De plus, le HFC-32 est un composé inflammable.

Le HFC-134a, composé ininflammable, est un bon fluide frigorigène en terme d'efficacité, mais sa trop faible capacité frigorifique rend son emploi difficile comme substitut au R-500.

Il a maintenant été trouvé que les mélanges contenant en masse environ 60 à 80 % de HFC-134a, 4 à 35 % de HFC-125 et 5 à 16 % de HFC-32, présentent des propriétés thermodynamiques, en particulier une capacité frigorifique, très proches de celles du R-500 et une tension de vapeur à 25°C qui n'excède pas de plus de 20 % celle du R-500. De plus, ces mélanges sont ininflammables à 100°C.

Les mélanges selon l'invention peuvent donc être utilisés dans les systèmes de réfrigération de transport. On utilise de préférence les mélanges contenant 65 à 75 % de HFC-134a, 9 à 12 % de HFC-32 et 13 à 26 % de HFC-125, le mélange tout particulièrement préféré contenant environ 70 % de HFC-134a, 20 % de HFC-125 et 10 % de HFC-32.

Les exemples suivants illustrent l'invention sans la limiter.

EXEMPLE 1

Cet exemple montre que la tension de vapeur des mélanges non azéotropiques de HFC-134a/HFC-125/HFC-32 est proche de celle du R-500 et ce sur une large gamme de température.

Le tableau 1 rassemble les données pour différents mélanges à 25°C et le tableau 2 rassemble les données à différentes températures pour un mélange contenant en masse 70 % de HFC-134a, 20 % de HFC-125 et 10 % de HFC-32. Cette tension de vapeur ne dépasse pas celle du R-500 de plus de 20 %, ce qui est acceptable pour un substitut.

TABLEAU 1

HFC-134a/HFC-125/HFC-32 (% masse)	Pression bulle (bar)	Tension vapeur R-500 (bar)	Ecart (%)
60/35/5	9,15	7,69	19
65/26/9	9,23	7,69	20,0
70/20/10	9,02	7,69	17,3
75/13/12	8,90	7,69	15,7
80/15/5	7,99	7,69	3,8
80/4/16	8,93	7,69	16,1

TABLEAU 2

Température (°C)	Pression bulle (bar)	Tension vapeur R-500 (bar)	Ecart (%)
- 35	1,05	0,949	13,8
- 20	1,99	1,77	14,1
- 5	3,50	3,06	14,7
15	6,73	5,78	16,4
30	10,36	8,79	17,8
45	15,29	12,82	19,3
55	19,43	16,17	20,0

EXEMPLE 2

Le domaine d'inflammabilité des mélanges d'HFC-134a/HFC-125/HFC-32 a été déterminé en recherchant le maximum de produit inflammable acceptable dans le mélange pour que ce dernier reste ininflammable.

Cette détermination a été réalisée selon la norme ASTM E681-85 sous pression atmosphérique et à deux températures (25 et 100°C). Le tableau 3 résume les résultats obtenus :

TABLEAU 3

Fluide dans HFC-32	Maximum HFC-32 (% masse)	
	25°C	100°C
HFC-125	63	58
HFC-134a	51,5	33

Le tableau 4 montre l'évolution des compositions des phases vapeur et liquide d'un mélange contenant en masse 70 % de HFC-134a, 20 % de HFC-125 et 10 % de HFC-32 en fonction de la température et du taux de remplissage (15 % et 90 % volume).

TABLEAU 4

Température (°C)	Composition HFC-134a/HFC-125/HFC-32 (% masse)		Taux remplissage % volume
	Phase liquide	Phase vapeur	
- 25°C	70/20/10	47,8/32,5/19,7	90
25 °C	70/20/10	55,7/27,8/16,5	90
60°C	70/20/10	61/24,8/14,2	90
- 25°C	70,7/19,6/9,7	48,8/32/19,2	15
25°C	72,2/18,8/9	58,6/26,4/15	15
60°C	73,1/18,3/8,6	64,6/23/12,4	15

Ces résultats montrent que ce mélange est ininflammable à 100°C sur une large gamme de température et de taux de remplissage.

EXEMPLE 3

Cet exemple illustre l'utilisation des mélanges de HFC-134a, HFC-125 et de HFC-32 selon l'invention comme fluides frigorigènes.

Les performances thermodynamiques ont été comparées à celle du R-500 pour un cycle thermodynamique standard défini comme suit :

- Température de condensation : + 50°C

- Température d'évaporation : - 35°C
- Température entrée compresseur : 18°C
- Sous-refroidissement liquide : - 5°C

5 Le tableau 5 résume les performances thermodynamiques observées dans ces conditions pour différents mélanges de l'invention.

TABLEAU 5

Composition HFC-134a/HFC-125/HFC-32 (% masse)	Glissement température évaporateur (K)	Capacité frigorifique volumique*	Différence température refoulement* (K)	COP*
60/35/5	1,9	0,940	- 9	0,945
60/24/16	2,8	1,047	+3	0,940
65/26/9	2,1	0,964	- 3	0,95
70/20/10	1,9	0,940	-2	0,955
75/13/12	1,9	0,935	+0,4	0,955
80/15/5	1,1	0,852	-6	0,965
80/4/16	1,9	0,947	+5	0,960

* relativement au R-500

25 Le tableau 6 résume les mêmes données, mais pour une température de condensation plus sévère (67°C) et une température d'entrée compresseur de 32°C, les autres conditions étant inchangées.

TABLEAU 6

Composition HFC-134a/HFC-125/HFC-32 (% masse)	Glissement température évaporateur (K)	Capacité frigorifique volumique*	Différence température refoulement* (K)	COP*
60/35/5	1,2	0,880	-10	0,900
60/24/16	1,9	0,980	+3	0,920
65/26/9	1,4	0,900	-4	0,905
70/20/10	1,3	0,890	-2,6	0,920
75/13/12	1,3	0,890	+0,4	0,93
80/15/5	0,7	0,815	-7,6	0,940
80/4/16	1,4	0,905	+4,9	0,935

* relativement au R-500

45 Revendications

1. Mélange non azéotropique contenant en masse 60 à 80 % de 1,1,1,2-tétrafluoroéthane, 5 à 16 % de difluorométhane et 4 à 35 % de pentafluoroéthane.
2. Mélange selon la revendication 1 contenant en masse 65 à 75 % de 1,1,1,2-tétrafluoroéthane, 9 à 12 % de difluorométhane et 13 à 26 % de pentafluoroéthane.
3. Mélange selon la revendication 2 contenant en masse environ 70 % de 1,1,1,2-tétrafluoroéthane, 10 % de difluorométhane et 20 % de pentafluoroéthane.
4. Utilisation d'un mélange selon l'une des revendications 1 à 3 comme fluide frigorigène pour la réfrigération.
5. Utilisation d'un mélange selon l'une des revendications 1 à 3 pour remplacer le R-500 en réfrigération de transport.



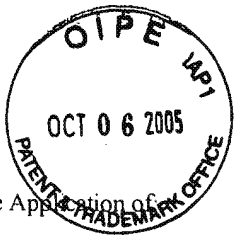
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RAPPORT DE RECHERCHE EUROPEENNE

Numero de la demande
EP 96 40 0976

DOCUMENTS CONSIDERES COMME PERTINENTS			
Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE (Int.Cl.6)
X	WO-A-92 11338 (DU PONT DE NEMOURS) * page 1, ligne 12 - ligne 25; revendications 1-5; tableau 1 * * abrégé *	1-4	C09K5/04
X	--- DATABASE WPI Week 9136 Derwent Publications Ltd., London, GB; AN 91-262364 XP002008732 & JP-A-03 170 594 (MATSUSHITA) , 24 Avril 1991 * abrégé *	1-4	
A	--- EP-A-0 430 169 (MATSUSHITA ELECTRIC) * abrégé; revendications 1-9; tableau 3 *	1-4	
A	--- EP-A-0 602 022 (DU PONT DE NEMOURS) * abrégé; revendications 1,7,8; exemple 2; tableaux 5,6 *	1-4	
A	--- WO-A-94 07971 (DU PONT DE NEMOURS) * page 5, ligne 34 - page 6, ligne 27; revendications 1-3; tableaux 2,4 *	1-4	
A	--- DE-A-41 16 274 (FORSCHUNGSZENTRUM FUER KALTETECHNIK) * abrégé; revendications 1,2 *	1-4	DOMAINES TECHNIQUES RECHERCHES (Int.Cl.6)
			C09K
Le présent rapport a été établi pour toutes les revendications			
Lieu de la recherche LA HAYE		Date d'achèvement de la recherche 18 Juillet 1996	Examinateur Nicolas, H
CATEGORIE DES DOCUMENTS CITES		T : théorie ou principe à la base de l'invention E : document de brevet antérieur, mais publié à la date de dépôt ou après cette date D : cité dans la demande L : cité pour d'autres raisons & : membre de la même famille, document correspondant	
X : particulièrement pertinent à lui seul Y : particulièrement pertinent en combinaison avec un autre document de la même catégorie A : arrière-plan technologique O : divulgation non-écrite P : document intermédiaire			

EPO FORM 1503 (01/91) (P04/CO)



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Confirmation No.: 1006

Group Art Unit: 1751

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INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
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This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically:

- ☒ under 37 CFR 1.97(b), or
(within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- ☐ under 37 CFR 1.97(c) together with either a:
☐ Statement Under 37 C.F.R. 1.97(e), or
☐ a \$180.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before the final office action or notice of allowance, whichever occurs first)
- ☐ under 37 CFR 1.97(d) together with a:
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- ☒ Applicant(s) submit herewith *Form PTO 1449A - Information Disclosure Statement by Applicant* together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.
- ☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO 1449 and is enclosed herewith.

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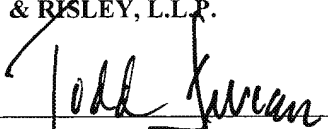
This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO-1449 to indicate the documents have been considered.

Respectfully Submitted,

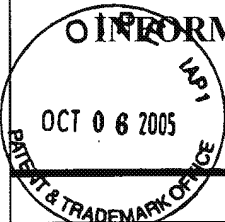
**THOMAS, KAYDEN, HORSTEMEYER
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By:



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Form PTO-1449				Attorney Docket No. 821920-1030		Serial No. 10/937,736	
 (Use several sheets if necessary)				Applicant Ponder			
				Filing Date 09/08/2004		Group 1751	
U.S. PATENT DOCUMENTS							
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	A	3,092,981	06/11/63	Begeman et al.			
	B	3,642,634	02/15/72	Olund			
	C	3,733,850	05/22/73	Olund			
	D	4,046,533	09/06/77	Olund			
	E	4,963,282	10/16/90	Jolley et al.			
	F	4,971,712	11/20/90	Gorski et al.			
	G	4,983,312	01/08/91	Tamura et al.			
	H	5,096,606	03/17/92	Hagihara et al.			
	I	5,145,594	09/08/92	Anton et al.			
	J	5,254,280	10/19/93	Thomas et al.			
	K	5,384,057	01/24/95	Wilczek			
FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
	L	JP 5 093198A	04/16/93	Japan			X
	M						X
	N						
	O						
OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)							
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Form PTO-1449				Attorney Docket No. 821920-1030		Serial No. 10/937,736	
INFORMATION DISCLOSURE CITATION				Applicant Ponder			
<i>(Use several sheets if necessary)</i>				Filing Date 09/08/2004		Group 1751	

U.S. PATENT DOCUMENTS							
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	A	5,417,872	05/23/95	Fukuda et al.			
	B	5,431,835	07/11/95	Katafuchi et al.			
	C	5,454,966	10/03/95	Thomas et al.			
	D	5,492,643	02/20/96	Weber, III			
	E	5,520,833	05/28/96	Kaneko			
	F	5,942,149	08/24/99	Weber, III			
	G	6,565,766	05/20/03	Weber, III			
	H	2004/0200992	10/14/04	Weber, III			
	I						
	J						
	K						

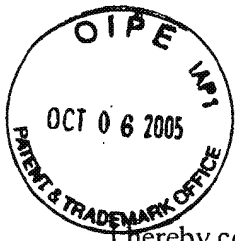
FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
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	M						
	N						
	O						

OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, etc.)</i>	
P	
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Laurie Delesandro

In Re Application of:

Ponder, et al.

Serial No.: 10/937,736

Filed: 09/08/2004

Confirmation No.: 1006

Group Art Unit: 1751

Examiner: Unknown

Docket No.: 821920-1030

For: Refrigerant with Lubricating Oil for Replacement of R-22 Refrigerant

The following is a list of documents enclosed:

Return Postcard
Information Disclosure Statement
PTO 1449

Further, the Commissioner is authorized to charge Deposit Account No. 20-0778 for any additional fees required. The Commissioner is requested to credit any excess fee paid to Deposit Account No. 20-0778.

(19)



JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

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(71) Applicant: **IDEMITSU KOSAN CO LTD**

(72) Inventor: **KANEKO MASATO**

**(54) LUBRICATION OF COMPRESSION
REFRIGERATING CYCLE**

(57) Abstract:

PURPOSE: To lubricate the title cycle effectively without spoiling the wear resistance, cooling efficiency and stability by using a specific fluorocarbon substitute as the refrigerant and a given lubricant as the lubricant in the title cycle.

CONSTITUTION: In a refrigerating cycle comprising a compressor and a condenser and further involving an oil separator and/or a hot gas line, the refrigerant

comprises at least the fluorocarbon substitute fluorocarbons selected from the group consisting of 1,1,1,2-tetrafluoroethane, 1,1,2,2-tetrafluoroethane, 1,1- dichloro-2,2,2-tetrafluoroethane, 1-chloro-1,1-difluoroethane, 1,1-difluoroethane, trifluoromethane, difluoromethane, pentafluoroethane and 1,1,1-trifluoromethane, and the lubricant comprises one which is liquid at room temperature and has a kinematic viscosity of 2-50cSt at 100°C and a surface tension of 25 dyne/cm or more (e.g. paraffinic mineral oil).

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(19)日本国特許庁 (J P)

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特開平5-93198

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105: 06)				
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審査請求 未請求 請求項の数1(全 6 頁) 最終頁に続く

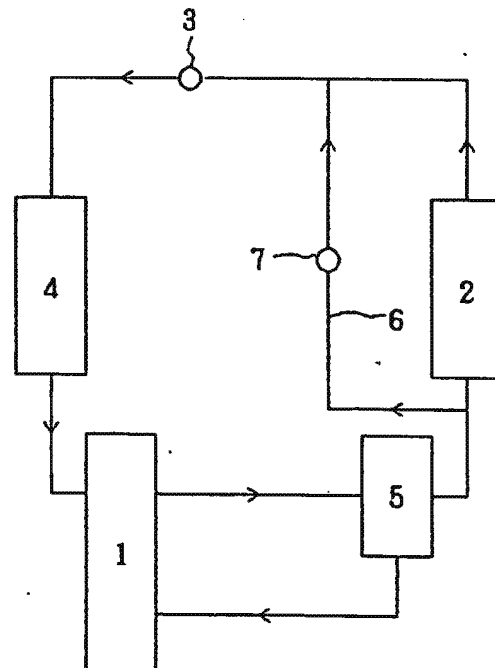
(21)出願番号	特願平4-76493	(71)出願人	000183646 出光興産株式会社 東京都千代田区丸の内3丁目1番1号
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(31)優先権主張番号	特願平3-158244	(74)代理人	弁理士 大谷 保
(32)優先日	平3(1991)6月28日		
(33)優先権主張国	日本 (J P)		

(54)【発明の名称】 圧縮式冷凍サイクルの潤滑方法

(57)【要約】

【目的】 代替フロン系の冷媒を用いた圧縮式冷凍サイクルの潤滑方法を開発すること。

【構成】 油分離器及び／又はホットガスラインを有する圧縮式冷凍サイクルにおいて、1, 1, 1, 2-テトラフルオロエタン等の代替フロン系冷媒及び100℃の動粘度が2~50 c S t であつ界面張力が25 d y n e / c m 以上の常温で液体の潤滑剤を用いることを特徴とする圧縮式冷凍サイクルの潤滑方法である。



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【特許請求の範囲】

【請求項1】 圧縮機、凝縮器、膨張弁及び蒸発器からなる冷凍サイクル系内に油分離器及び／又はホットガスラインを有する圧縮式冷凍サイクルにおいて、冷媒として1, 1, 1, 2-テトラフルオロエタン；1, 1, 2, 2-テトラフルオロエタン；1, 1-ジクロロ-2, 2, 2-トリフルオロエタン；1-クロロ-1, 1-ジフルオロエタン；1, 1-ジフルオロエタン；トリフルオロメタン；ジフルオロメタン；ペンタフルオロエタン及び1, 1, 1-トリフルオロエタンよりなる群から選ばれた少なくとも一種を主成分とする代替フロン系冷媒を用いるとともに、潤滑剤として100℃の動粘度が2～50cStでかつ界面張力が25dyne/cm以上の常温で液体の潤滑剤を用いることを特徴とする圧縮式冷凍サイクルの潤滑方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、圧縮式冷凍サイクルの潤滑方法に関し、詳しくは1, 1, 1, 2-テトラフルオロエタン(R-134a)等の代替フロン系冷媒と共に、特定の潤滑剤を併用することにより、圧縮式冷凍サイクルを、耐摩耗性、冷却性及び安定性を損なうことなく効果的に潤滑する方法に関する。

【0002】

【従来の技術及び発明が解決しようとする課題】従来、圧縮機、凝縮器、膨張弁及び蒸発器からなる圧縮式冷凍サイクルには、冷媒としてジクロロジフルオロメタン(R-12)やクロロジフルオロメタン(R-22)等のフッ化炭化水素系のフロン化合物が用いられており、また、それと併用して問題のない潤滑剤が多数製造され、使用されてきた。しかるに、従来冷媒として使用されてきたこのフロン化合物は、大気中に放出されたときに、オゾン層を破壊し、環境汚染問題を惹起する恐れがあると懸念されている。近時、その環境汚染対策の面から、その代替となりうる1, 1, 1, 2-テトラフルオロエタン(R-134a)等の弗化炭化水素(あるいは塩化弗化炭化水素)の開発が進められ、既に、R-134aをはじめ、1, 1, 2, 2-テトラフルオロエタン(R-134)等、環境汚染の恐れが少なく、上記要求特性を満足しうる各種の所謂代替フロンが市場に出廻るようになって来ている。この新しい代替フロン系の冷媒は、従来のフロン系冷媒とは性質を異にし、それと併用される潤滑剤として、グリコール化合物、エステル化合物等が提案(米国特許第4,755,316号明細書、特開平3-33193号公報等)されているが、耐摩耗性、冷却性及び安定性に問題を残している。

【0003】本発明者は、圧縮式冷凍サイクルにおいて、代替フロン系の冷媒を用いるとともに、この代替フロン系冷媒に適合する潤滑剤を検討した。その結果、代替フロン系冷媒と特定の潤滑剤を組み合わせ使用するこ

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とによって、圧縮式冷凍サイクルを効率よく潤滑できることを見出した。本発明はこのような知見に基いて完成したものである。

【0004】

【課題を解決するための手段】すなわち、本発明は、圧縮機、凝縮器、膨張弁及び蒸発器からなる冷凍サイクル系内に油分離器及び／又はホットガスラインを有する圧縮式冷凍サイクルにおいて、冷媒として1, 1, 1, 2-テトラフルオロエタン(R-134a)；1, 1, 2, 2-テトラフルオロエタン(R-134)；1, 1-ジクロロ-2, 2, 2-トリフルオロエタン(R-123)；1-クロロ-1, 1-ジフルオロエタン(R-142b)；1, 1-ジフルオロエタン(R-152a)；トリフルオロメタン(R-23)；ジフルオロメタン(R-32)；ペンタフルオロエタン(R-125)及び1, 1, 1-トリフルオロエタン(R-143a)よりなる群から選ばれた少なくとも一種を主成分とする代替フロン系冷媒を用いるとともに、潤滑剤として100℃の動粘度が2～50cStでかつ界面張力が25dyne/cm以上の常温で液体の潤滑剤を用いることを特徴とする圧縮式冷凍サイクルの潤滑方法を提供するものである。

【0005】通常、圧縮式冷凍サイクルは、圧縮機-凝縮器-膨張弁-蒸発器からなる。また、冷凍機用の潤滑剤は、一般に、冷凍機に使用される冷媒と相溶性が良好なものが使用される。しかし、上記の冷凍サイクルで代替冷媒を用いたときに、冷凍機を一般的に使用されている潤滑剤で潤滑すると、耐摩耗性が不十分であったり、安定性が不足して長期安定使用ができなかった。特に、電気冷蔵庫や小型エアコンディショナーなどの冷凍サイクルのように、膨張弁としてキャピラリーチューブを使用する場合にこの傾向が著しい。

【0006】本発明は、かかる問題を解消するために通常の常識とは全く反対の発想に基づいて完成されたものである。つまり、冷凍サイクルに使用する潤滑剤は、冷凍サイクルに使用する冷媒との相溶性は必ずしも要しないという発想に基づいて完成されたものである。それに伴って、冷凍サイクルに一定の条件を加えてなるものである。すなわち、本発明は、油分離器及び／又はホットガスラインを有する圧縮式冷凍サイクルを代替フロン系冷媒を使用して運転する場合に、潤滑剤として100℃の動粘度が2～50cSt、好ましくは3～30cStでかつ界面張力が25dyne/cm以上、好ましくは30～80dyne/cmの常温で液体の潤滑剤を用いることを特徴とするものである。このような特徴を有する潤滑剤として本発明において使用することができるものは、様々なものがあるが、具体的には、鉱油(パラフィン基、ナフテン基、中間基)系潤滑油を始め、各種の合成潤滑油(例えば、アルキルベンゼン、アルキルナフタレン、ポリ- α -オレフィン等)を挙げることができ

る。また、これらの潤滑剤には、各種添加剤を配合することができる。その添加剤としては、リン酸エステル、亜リン酸エステル等の極圧剤をはじめ、酸化防止剤、塩素捕捉剤、金属不活性化剤、消泡剤、清浄分散剤、粘度指数向上剤、防錆剤、腐食防止剤、流動点降下剤等を挙げることができる。

【0007】一方、本発明において使用する冷媒としては、上述したようにR-134a、R-134、R-123、R-142b、R-152a、R-23、R-32、R-125およびR-143aよりなる群から選ばれた少なくとも一種を主成分とする冷媒が用いられる。これらは単独で、あるいは二種以上を組み合わせて使用すればよいが、特にR-134a及びR-32が最適である。また、二種以上混合する場合は、R-134aとR-32、R-32とR-125、あるいはR-134a、R-32とR-125の組み合わせが好適である。なお、上記冷媒には、下記の冷媒を比較的小割合で混合使用してもよい。すなわち、混合使用できる冷媒は、クロロテトラフルオロエタン(R-124)、ジクロロテトラフルオロエタン(R-141b)、1,1-ジクロロ-2,2,3,3-ペンタフルオロプロパン(R-225ca)、1,3-ジクロロ-1,1,2,2,3-ペンタフルオロプロパン(R-225cb)等が挙げられる。

【0008】

【実施例】次に、本発明を実施例により更に詳しく説明する。

* 表1
第1表

潤滑剤 の番号	種 類	動粘度 (100℃) (cSt)	界面張力 (dyne/cm)
1	パラフィン系鉱油	5.3	35.2
2	ナフテン系鉱油	4.3	38.2
3	アルキルベンゼン	4.7	52.4
4	アルキルナフタレン	6.2	53.8
5	ポリ- α -オレフィン	5.8	34.3
6	ポリエステル	9.1	11.7
7	ヒンダードエステル	6.4	6.4

界面張力：ASTM D971による。

【0010】そして、実機テストの結果を第2表に示す。

*【0011】

※ 表2

* 実施例1～9及び比較例1～4

各種圧縮式冷凍サイクルを用いて実機テストを行った。その結果は次の通りである。なお、膨張弁はキャピラリーチューブ式のものをを用いた。

圧縮式冷凍サイクルの方式

A：油分離機及びホットガスラインを有する「圧縮機-凝縮器-膨張弁-蒸発器」の圧縮式冷凍サイクル（図1参照）

B：油分離機を有する「圧縮機-凝縮器-膨張弁-蒸発器」の圧縮式冷凍サイクル（図2参照）

C：ホットガスラインを有する「圧縮機-凝縮器-膨張弁-蒸発器」の圧縮式冷凍サイクル（図3参照）

D：「圧縮機-凝縮器-膨張弁-蒸発器」の圧縮式冷凍サイクル（図4参照）。なお、Dは、比較用である。実機テストは、出力100WのA、B、C、Dの冷凍機について、代替フロン系の冷媒としてR-134aを用い、下記潤滑剤で1年間に亘って冷凍試験を実施した。

運転状況

吸入温度：-40℃

凝縮温度：30℃

評価法

1. 蒸発機の温度を測定した。

2. 運転状態に異常が生じた時点で停止し、その原因追求のため各部を観察した。

冷凍試験にあたって使用した潤滑剤を第1表に示す。

【0009】

第2表

№	冷凍 サイクル	潤滑剤 の番号	蒸発器の 温度 (°C)	観察事項
実施例 1	A	1	-40	異常なし
実施例 2	A	3	-40	異常なし
実施例 3	B	1	-40	異常なし
実施例 4	B	2	-40	異常なし
実施例 5	B	3	-40	異常なし
実施例 6	B	4	-40	異常なし
実施例 7	B	5	-40	異常なし
実施例 8	C	2	-40	異常なし
実施例 9	C	3	-40	異常なし
比較例 1	A	6	停止 6 ヶ月	吐出圧上昇*
比較例 2	A	7	停止 9 ヶ月	吐出圧上昇*
比較例 3	B	7	停止 9 ヶ月	吐出圧上昇*
比較例 4	D	1	停止 15 日	吐出圧上昇*

* : キャピラリーチューブの閉塞による。

【0012】実施例10～18及び比較例5～8 30*【0013】
 代替フロン系冷媒としてR-32を用い、同様に冷凍試 【表3】
 験を実施した。実機テストの結果を第3表に示す。 *

第3表

Na	冷凍 サイクル	潤滑剤 の番号	蒸発器の 温度 (°C)	観察事項
実施例10	A	1	-50	異常なし
実施例11	A	5	-50	異常なし
実施例12	B	1	-50	異常なし
実施例13	B	2	-50	異常なし
実施例14	B	3	-50	異常なし
実施例15	B	4	-50	異常なし
実施例16	B	5	-50	異常なし
実施例17	C	2	-50	異常なし
実施例18	C	5	-50	異常なし
比較例5	A	6	停止3ヶ月	吐出圧上昇*
比較例6	A	7	停止6ヶ月	吐出圧上昇*
比較例7	B	7	停止6ヶ月	吐出圧上昇*
比較例8	D	1	停止10日	吐出圧上昇*

* : キャピラリーチューブの閉塞による。

【0014】

【発明の効果】以上のように、代替フロン系の冷媒であっても、本発明のように100℃の動粘度が2~50cStでかつ界面張力が25dyne/cm以上の常温で液体の潤滑剤を使用すれば、耐摩耗性、冷却性及び安定性に問題なく運転することができる。したがって、本発明の方法は、冷凍装置を小型化する際に特に効果的であり、その工業的な利用価値は高い。

【図面の簡単な説明】

【図1】本発明において適用された圧縮式冷凍サイクルのA方式の流れ図である。

【図2】本発明において適用された圧縮式冷凍サイクルのB方式の流れ図である。

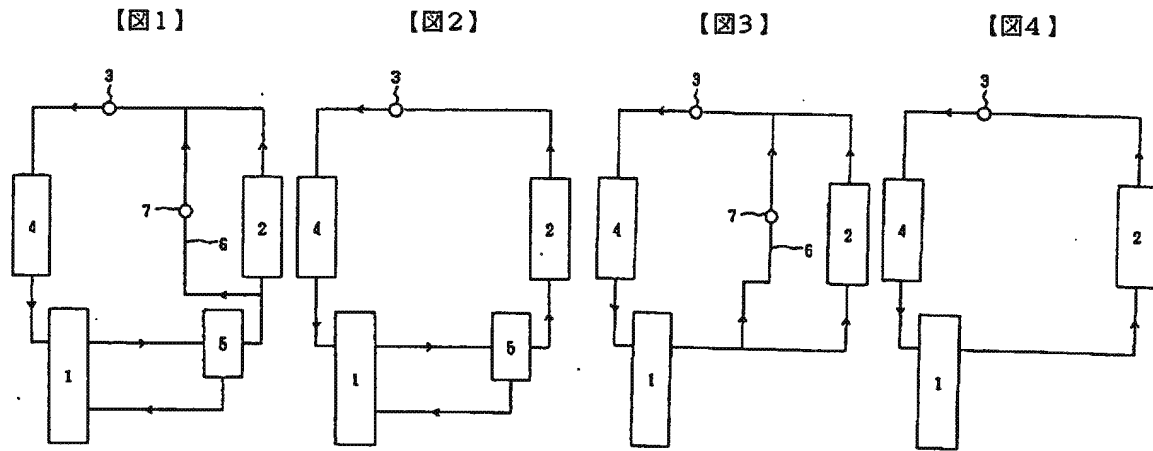
30*【図3】本発明において適用された圧縮式冷凍サイクルのC方式の流れ図である。

【図4】比較例に適用された圧縮式冷凍サイクルのD方式の流れ図である。

【符号の説明】

- 1 : 圧縮機
- 2 : 凝縮器
- 3 : 膨張弁
- 4 : 蒸発器
- 5 : 油分離器
- 40 6 : ホットガスライン
- 7 : ホットガスライン用弁

*



フロントページの続き

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105:04

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Z 8217-4H

(FILE 'HOME' ENTERED AT 16:57:48 ON 19 FEB 2006)

FILE 'REGISTRY' ENTERED AT 16:57:53 ON 19 FEB 2006

L1 0 S PENTAFLUOROETHANE AND CHF5
L2 29 S PENTAFLUOROETHANE AND C2HF5
SEL CHEM 29
L3 83 S TETRAFLUOROETHANE AND C2H2F4
SEL CHEM 82-83

FILE 'USPATFULL, CAPLUS, IFIPAT, JAPIO' ENTERED AT 17:00:01 ON 19 FEB 2006

L4 5588 S E1-13
L5 13745 S E14-54
L6 1841 S L4 (S) L5
L7 1067 S L6 AND (REFRIGERANT OR REFRIGERATION)

FILE 'REGISTRY' ENTERED AT 17:07:22 ON 19 FEB 2006

L8 13 S R 22
SEL CHEM 13

FILE 'USPATFULL, CAPLUS, IFIPAT, JAPIO' ENTERED AT 17:08:04 ON 19 FEB 2006

L9 15855 S E55-94
L10 1029 S L9 (S) SUBSTITUT?
L11 520 S L7 AND L9
L12 488 DUP REM L11 (32 DUPLICATES REMOVED)
L13 488 S L7 (P) L9 AND L12
L14 520 S L7 (P) L9
L15 663 S L6 (P) L9
L16 344 S L15 AND L12
L17 71 S L16 AND NAPHTHEN?
L18 774 S L6 NOT L7
L19 1067 S L6 NOT L18
L20 520 S L19 (P) L9
L21 520 S L19 AND L9
L22 119 S L19 AND L10
L23 28 S L22 AND NAPHTHEN?
L24 28 DUP REM L23 (0 DUPLICATES REMOVED)
L25 6810 S L9 AND (SUBSTITUT? OR REPLAC?)
L26 1416 S L9 (S) (SUBSTITUT? OR REPLAC?)
L27 201 S L19 AND L26
L28 50 S L27 AND NAPHTHEN?
L29 50 DUP REM L28 (0 DUPLICATES REMOVED)
L30 22 S L29 NOT L24



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/937,736	09/08/2004	Kenneth M. Ponder	821920-1030	1006

24504 7590 02/24/2006

THOMAS, KAYDEN, HORSTEMEYER & RISLEY, LLP
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ATLANTA, GA 30339-5948

EXAMINER

HARDEE, JOHN R

ART UNIT	PAPER NUMBER
----------	--------------

1751

DATE MAILED: 02/24/2006

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

Office Action Summary	Application No.		Applicant(s)	
	10/937,736		PONDER ET AL.	
	Examiner		Art Unit	
	John R. Hardee		1751	

-- 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 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ 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

- 4) ☒ Claim(s) 1-10,21-25 and 27-31 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10,21-25 and 27-31 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 September 2004 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).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

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).
- a) ☐ All b) ☐ Some * c) ☐ None of:
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) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application (PTO-152) |
| 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>(2)</u> . | 6) ☐ Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 21-25, 27-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Mahler, US 5,053,155. At col. 3, lines 13+, the reference discloses a refrigerant consisting of, most preferably, at least 50% of HFC-134 blended with HFC-125. Accordingly, the person of ordinary skill in the refrigeration art would “immediately envisage” a 50:50 composition of HFC-134 and HFC-125. This reads on applicant’s recitations of “about 40-45%” of HFC-125 and “about 55-60%” of HFC-134 in combination with 0% of the recited lubricant. Note that the recitation of “about 0%” of lubricant clearly reads on 0% (specification, p. 9, line 10).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 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 negated by the manner in which the invention was made.

Art Unit: 1751

4. 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 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.

5. This application currently names joint inventors. In considering patentability of the claims under 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 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-10, 21-25 and 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Egawa et al., US 6,261,474. The reference discloses lubricating oils for compression-type refrigerants comprising pentafluoroethane (abstract).

Compositions consisting of 20-80% by weight of pentafluoroethane and 80-20% of 1,1,1,2-tetrafluoroethane are disclosed in claim 1. The compositions are disclosed as replacements for R-22 (cols. 2-3). Note that the recitation of "about 0%" of lubricant clearly reads on 0% (specification, p. 9, line 10). The method steps of claim 6 recite a conventional method of recharging refrigeration apparatus and lend little patentable

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weight. This reference differs from the claimed subject matter in that it does not disclose a composition which reads on applicant's claims with sufficient specificity to constitute anticipation.

It would have been obvious at the time the invention was made to make such a composition, because this reference teaches that all of the ingredients recited by applicants are suitable for inclusion in a replacement refrigerant composition for R-22. The person of ordinary skill in the refrigerant art would expect the recited compositions to have properties similar to those compositions which are exemplified, absent a showing to the contrary.

In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed Cir. 1990).

7. Any prior art made of record and not relied upon is of interest and is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to the examiner, Dr. John R. Hardee, whose telephone number is (571) 272-1318. The examiner can normally be reached on Monday through Friday from 8:00 until 4:30. In the event that the examiner is not available, his supervisor, Dr. Yogendra Gupta, may be reached at (571) 272-1316.

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The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8100.

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).



John R. Hardee
Primary Examiner
February 20, 2006

Form PTO-1449				Attorney Docket No. 821920-1030		Serial No. 10/937,736		
INFORMATION DISCLOSURE CITATION FEB 22 2005 PATENT & TRADEMARK OFFICE (Use several sheets if necessary)				Applicant Ponder, et al.				
				Filing Date 09/08/2004		Group 1751		
U.S. PATENT DOCUMENTS								
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
	A	6,000,230	12/14/99	Kanno, et al.				
	B	5,709,090	01/20/98	Endo, et al.				
	C							
	D							
	E							
	F							
	G							
	H							
	I							
	J							
	K							
FOREIGN PATENT DOCUMENTS								
		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	L	EP 0742274 A1	11/13/96	Europe				X
	M							
	N							
	O							
OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)								
	P							
	Q							
	R							
* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.								
EXAMINER'S SIGNATURE:					DATE CONSIDERED: 2/20/06			

Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE

Form PTO-1449

Attorney Docket No.
821920-1030Serial No.
10/937,736

INFORMATION DISCLOSURE CITATION
Applicant
PonderFiling Date
09/08/2004Group
1751

(Use several sheets if necessary)

U.S. PATENT DOCUMENTS

Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
K	A	3,092,981	06/11/63	Begeman et al.			
	B	3,642,634	02/15/72	Olund			
	C	3,733,850	05/22/73	Olund			
	D	4,046,533	09/06/77	Olund			
	E	4,963,282	10/16/90	Jolley et al.			
	F	4,971,712	11/20/90	Gorski et al.			
	G	4,983,312	01/08/91	Tamura et al.			
	H	5,096,606	03/17/92	Hagihara et al.			
	I	5,145,594	09/08/92	Anton et al.			
	J	5,254,280	10/19/93	Thomas et al.			
K		5,384,057	01/24/95	Wilczek			

FOREIGN PATENT DOCUMENTS

	Item	Document Number	Date	Country	Class	Subclass	ENGLISH Translation ABSTRACT	
							Yes	No
K	L	JP 5 093198A	04/16/93	Japan			X	
	M						X	
	N							
	O							

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)

	P	
	Q	
	R	

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EXAMINER'S SIGNATURE: *Hardu*DATE CONSIDERED: *2/25/06*

Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE

Form PTO-1449				Attorney Docket No. 821920-1030		Serial No. 10/937,736	
INFORMATION DISCLOSURE CITATION				Applicant Ponder			
<i>(Use several sheets if necessary)</i>				Filing Date 09/08/2004		Group 1751	

U.S. PATENT DOCUMENTS							
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
P	A	5,417,872	05/23/95	Fukuda et al.			
I	B	5,431,835	07/11/95	Katafuchi et al.			
I	C	5,454,966	10/03/95	Thomas et al.			
I	D	5,492,643	02/20/96	Weber, III			
I	E	5,520,833	05/28/96	Kaneko			
I	F	5,942,149	08/24/99	Weber, III			
P	G	6,565,766	05/20/03	Weber, III			
P	H	2004/0200992	10/14/04	Weber, III			
	I						
	J						
	K						

FOREIGN PATENT DOCUMENTS							
		Document Number	Date	Country	Class	Subclass	Translation
							Yes No
	L						
	M						
	N						
	O						

OTHER DOCUMENTS <i>(Including Author, Title, Date, Pertinent Pages, etc.)</i>	
P	
Q	
R	

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EXAMINER'S SIGNATURE: <i>Heerde</i>	DATE CONSIDERED: <i>2/20/06</i>
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Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE

Notice of References Cited	Application/Control No. 10/937,736	Applicant(s)/Patent Under Reexamination PONDER ET AL.	
	Examiner John R. Hardee	Art Unit 1751	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,261,474 B1	07-2001	Egawa et al.	252/68
*	B	US-5,053,155	10-1991	Mahler, Walter	252/68
	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	Classification
	N	EP 742274 A1	11-1996	EP		
	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.



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 742 274 A1**

(12)

DEMANDE DE BREVET EUROPEEN

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13.11.1996 Bulletin 1996/46

(51) Int Cl.⁶: **C09K 5/04**

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(22) Date de dépôt: **07.05.1996**

(84) Etats contractants désignés:
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(30) Priorité: **12.05.1995 FR 9505644**

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(72) Inventeurs:
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(54) **Mélanges non azéotropiques de 1,1,1,2-tétrafluoroéthane, difluorométhane et pentafluoroéthane, et leur application comme fluides frigorigènes**

(57) Pour remplacer le mélange azéotropique de dichlorodifluorométhane et de 1,1-difluoroéthane (R-500) en réfrigération de transport, l'invention propose d'utiliser un mélange non azéotropique contenant en masse

60 à 80% de 1,1,1,2-tétrafluoroéthane, 4 à 35 % de pentafluoroéthane et 5 à 16 % de difluorométhane.

Les propriétés thermodynamiques de ce mélange sont très proches de celles du mélange R-500.

EP 0 742 274 A1

Description

La présente invention concerne le domaine de la réfrigération et a plus particulièrement pour objet des mélanges non azéotropiques de fluides frigorigènes n'ayant pas ou peu d'action sur l'environnement, pour remplacer les chloro-

fluorocarbures (CFC) ou hydrochlorofluoro-carbures (HCFC) dans les systèmes de réfrigération.

Dans les systèmes exploités en réfrigération de transport, on opère selon un cycle thermodynamique défini généralement par une température d'évaporation pouvant descendre jusqu'à - 35°C, une température de condensation comprise entre 50 et 70°C, un sous-refroidissement liquide de l'ordre de - 5°C et une surchauffe des vapeurs égale à au moins 10°C.

Le fluide frigorigène couramment utilisé en réfrigération de transport est le mélange azéotropique (appelé R-500) de dichlorodifluorométhane et de 1,1-difluoroéthane. Ce mélange, préféré au dichlorodifluorométhane, permet d'obtenir une excellente capacité frigorifique, tout en gardant des niveaux de pression raisonnables. Or, il est maintenant établi qu'en raison de leur action sur l'ozone, les CFC et HCFC et en particulier le R-500, devront, à plus ou moins longue échéance, être remplacés par des fluides frigorigènes moins agressifs vis-à-vis de l'environnement.

Pour remplacer le R-500 dans les installations de réfrigération, le substitut doit présenter des propriétés thermodynamiques, en particulier une capacité frigorifique et des pressions de fonctionnement, aussi proches que possible de celles du R-500. D'autre part, pour la bonne stabilité du produit et la durabilité du matériel, il est souhaitable que la température de refoulement n'excède pas celle du R-500 de plus de 15°C environ. Enfin, le substitut doit être ininflammable.

Le 1,1,1,2-tétrafluoroéthane (HFC-134a), le difluorométhane (HFC-32) et le pentafluoroéthane (HFC-125) n'ont comparativement aux composés chlorés aucune action sur l'ozone.

Les HFC-125 et 32, bien qu'ayant une excellente capacité frigorifique, présentent l'inconvénient majeur d'être des fluides haute pression. De plus, le HFC-32 est un composé inflammable.

Le HFC-134a, composé ininflammable, est un bon fluide frigorigène en terme d'efficacité, mais sa trop faible capacité frigorifique rend son emploi difficile comme substitut au R-500.

Il a maintenant été trouvé que les mélanges contenant en masse environ 60 à 80 % de HFC-134a, 4 à 35 % de HFC-125 et 5 à 16 % de HFC-32, présentent des propriétés thermodynamiques, en particulier une capacité frigorifique, très proches de celles du R-500 et une tension de vapeur à 25°C qui n'excède pas de plus de 20 % celle du R-500. De plus, ces mélanges sont ininflammables à 100°C.

Les mélanges selon l'invention peuvent donc être utilisés dans les systèmes de réfrigération de transport. On utilise de préférence les mélanges contenant 65 à 75 % de HFC-134a, 9 à 12 % de HFC-32 et 13 à 26 % de HFC-125, le mélange tout particulièrement préféré contenant environ 70 % de HFC-134a, 20 % de HFC-125 et 10 % de HFC-32.

Les exemples suivants illustrent l'invention sans la limiter.

EXEMPLE 1

Cet exemple montre que la tension de vapeur des mélanges non azéotropiques de HFC-134a/HFC-125/HFC-32 est proche de celle du R-500 et ce sur une large gamme de température.

Le tableau 1 rassemble les données pour différents mélanges à 25°C et le tableau 2 rassemble les données à différentes températures pour un mélange contenant en masse 70 % de HFC-134a, 20 % de HFC-125 et 10 % de HFC-32. Cette tension de vapeur ne dépasse pas celle du R-500 de plus de 20 %, ce qui est acceptable pour un substitut.

TABLEAU 1

HFC-134a/HFC-125/HFC-32 (% masse)	Pression bulle (bar)	Tension vapeur R-500 (bar)	Ecart (%)
60/35/5	9,15	7,69	19
65/26/9	9,23	7,69	20,0
70/20/10	9,02	7,69	17,3
75/13/12	8,90	7,69	15,7
80/15/5	7,99	7,69	3,8
80/4/16	8,93	7,69	16,1

TABLEAU 2

Température (°C)	Pression bulle (bar)	Tension vapeur R-500 (bar)	Ecart (%)
- 35	1,05	0,949	13,8
- 20	1,99	1,77	14,1
- 5	3,50	3,06	14,7
15	6,73	5,78	16,4
30	10,36	8,79	17,8
45	15,29	12,82	19,3
55	19,43	16,17	20,0

EXEMPLE 2

Le domaine d'inflammabilité des mélanges d'HFC-134a/HFC-125/HFC-32 a été déterminé en recherchant le maximum de produit inflammable acceptable dans le mélange pour que ce dernier reste ininflammable.

Cette détermination a été réalisée selon la norme ASTM E681-85 sous pression atmosphérique et à deux températures (25 et 100°C). Le tableau 3 résume les résultats obtenus :

TABLEAU 3

Fluide dans HFC-32	Maximum HFC-32 (% masse)	
	25°C	100°C
HFC-125	63	58
HFC-134a	51,5	33

Le tableau 4 montre l'évolution des compositions des phases vapeur et liquide d'un mélange contenant en masse 70 % de HFC-134a, 20 % de HFC-125 et 10 % de HFC-32 en fonction de la température et du taux de remplissage (15 % et 90 % volume).

TABLEAU 4

Température (°C)	Composition HFC-134a/HFC-125/HFC-32 (% masse)		Taux remplissage % volume
	Phase liquide	Phase vapeur	
- 25°C	70/20/10	47,8/32,5/19,7	90
25 °C	70/20/10	55,7/27,8/16,5	90
60°C	70/20/10	61/24,8/14,2	90
- 25°C	70,7/19,6/9,7	48,8/32/19,2	15
25°C	72,2/18,8/9	58,6/26,4/15	15
60°C	73,1/18,3/8,6	64,6/23/12,4	15

Ces résultats montrent que ce mélange est ininflammable à 100°C sur une large gamme de température et de taux de remplissage.

EXEMPLE 3

Cet exemple illustre l'utilisation des mélanges de HFC-134a, HFC-125 et de HFC-32 selon l'invention comme fluides frigorigènes.

Les performances thermodynamiques ont été comparées à celle du R-500 pour un cycle thermodynamique standard défini comme suit :

■ Température de condensation : + 50°C

- Température d'évaporation : - 35°C
- Température entrée compresseur : 18°C
- Sous-refroidissement liquide : - 5°C

5 Le tableau 5 résume les performances thermodynamiques observées dans ces conditions pour différents mélanges de l'invention.

TABLEAU 5

Composition HFC-134a/HFC-125/HFC-32 (% masse)	Glissement température évaporateur (K)	Capacité frigorifique volumique*	Différence température refoulement* (K)	COP*
60/35/5	1,9	0,940	- 9	0,945
60/24/16	2,8	1,047	+3	0,940
65/26/9	2,1	0,964	- 3	0,95
70/20/10	1,9	0,940	-2	0,955
75/13/12	1,9	0,935	+0,4	0,955
80/15/5	1,1	0,852	-6	0,965
80/4/16	1,9	0,947	+5	0,960

* relativement au R-500

25 Le tableau 6 résume les mêmes données, mais pour une température de condensation plus sévère (67°C) et une température d'entrée compresseur de 32°C, les autres conditions étant inchangées.

TABLEAU 6

Composition HFC-134a/HFC-125/HFC-32 (% masse)	Glissement température évaporateur (K)	Capacité frigorifique volumique*	Différence température refoulement* (K)	COP*
60/35/5	1,2	0,880	-10	0,900
60/24/16	1,9	0,980	+3	0,920
65/26/9	1,4	0,900	-4	0,905
70/20/10	1,3	0,890	-2,6	0,920
75/13/12	1,3	0,890	+0,4	0,93
80/15/5	0,7	0,815	-7,6	0,940
80/4/16	1,4	0,905	+4,9	0,935

* relativement au R-500

Revendications

1. Mélange non azéotropique contenant en masse 60 à 80 % de 1,1,1,2-tétrafluoroéthane, 5 à 16 % de difluorométhane et 4 à 35 % de pentafluoroéthane.
2. Mélange selon la revendication 1 contenant en masse 65 à 75 % de 1,1,1,2-tétrafluoroéthane, 9 à 12 % de difluorométhane et 13 à 26 % de pentafluoroéthane.
3. Mélange selon la revendication 2 contenant en masse environ 70 % de 1,1,1,2-tétrafluoroéthane, 10 % de difluorométhane et 20 % de pentafluoroéthane.
4. Utilisation d'un mélange selon l'une des revendications 1 à 3 comme fluide frigorigène pour la réfrigération.
5. Utilisation d'un mélange selon l'une des revendications 1 à 3 pour remplacer le R-500 en réfrigération de transport.



Office européen
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RAPPORT DE RECHERCHE EUROPEENNE

Numero de la demande
EP 96 40 0976

DOCUMENTS CONSIDERES COMME PERTINENTS			
Categorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE (Int.Cl.6)
X	WO-A-92 11338 (DU PONT DE NEMOURS) * page 1, ligne 12 - ligne 25; revendications 1-5; tableau 1 * * abrégé *	1-4	C09K5/04
X	--- DATABASE WPI Week 9136 Derwent Publications Ltd., London, GB; AN 91-262364 XP002008732 & JP-A-03 170 594 (MATSUSHITA) , 24 Avril 1991 * abrégé *	1-4	
A	--- EP-A-0 430 169 (MATSUSHITA ELECTRIC) * abrégé; revendications 1-9; tableau 3 *	1-4	
A	--- EP-A-0 602 022 (DU PONT DE NEMOURS) * abrégé; revendications 1,7,8; exemple 2; tableaux 5,6 *	1-4	
A	--- WO-A-94 07971 (DU PONT DE NEMOURS) * page 5, ligne 34 - page 6, ligne 27; revendications 1-3; tableaux 2,4 *	1-4	
A	--- DE-A-41 16 274 (FORSCHUNGSZENTRUM FUER KALTETECHNIK) * abrégé; revendications 1,2 *	1-4	DOMAINES TECHNIQUES RECHERCHES (Int.Cl.6)
			C09K
Le présent rapport a été établi pour toutes les revendications			
Lieu de la recherche LA HAYE		Date d'achèvement de la recherche 18 Juillet 1996	Examinateur Nicolas, H
CATEGORIE DES DOCUMENTS CITES		T : théorie ou principe à la base de l'invention E : document de brevet antérieur, mais publié à la date de dépôt ou après cette date D : cité dans la demande L : cité pour d'autres raisons & : membre de la même famille, document correspondant	
X : particulièrement pertinent à lui seul Y : particulièrement pertinent en combinaison avec un autre document de la même catégorie A : arrière-plan technologique O : divulgation non-écrite P : document intercalaire			

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John R. Hardee

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INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

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Date: 5/24/2006
Laurie DelesandroTOTAL PAGES 12

In Re Application of: Docket No.: 821920-1030

PONDER, K., et al.,

Art Unit: 1751

Serial No.: 10/937,736

Examiner: John R. Hardee

Filing Date: September 8, 2004

Confirmation No.: 1006

For: **Refrigerant with Lubricating Oil for Replacement of R-22 Refrigerant****RESPONSE AND AMENDMENT**

MAY 24 2006**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re Application of:

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RESPONSE AND AMENDMENTCommissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

The Office Action, Paper No./Mail Date 02202006, from Examiner John R. Hardee of Art Unit 1751, mailed February 24, 2006, has been received and carefully reviewed. Applicants respectfully request reconsideration and withdrawal of the rejections presented in the Office Action in view of the following remarks and amendment. No new matter and, thus, no new issues are presented.

AUTHORIZATION TO DEBIT ACCOUNT

It is not believed that any additional fees are required beyond those, which may otherwise be provided for in documents accompanying this paper. However, any additional fees that are required (including fees for net addition of claims) are hereby authorized to be charged to deposit account no. 20-0778.

IN THE CLAIMS

Please amend the claims to read as follows wherein changes in a claim are shown by double brackets for deleted matter and underlining for added matter:

1. (Currently Amended) In an apparatus designed for use with chlorodifluoromethane refrigerant, the improvement comprising substituting the chlorodifluoromethane with a substitute blend refrigerant containing a lubricant, said substitute refrigerant consisting of:
about 40% to about 45% by weight pentafluoroethane;
about 55% to about 60% by weight tetrafluoroethane; and
said substitute refrigerant packaged with [[about 0%]] up to about 20% by weight of the refrigerant with a lubricating oil that is soluble in chlorodifluoromethane, pentafluoroethane and tetrafluoroethane[.]]

wherein the lubricating oil is selected from the group consisting of napthenic based lubricants, paraffinic based lubricants, and mixtures thereof, mineral oil, polyol ester, synthetic alkyl aromatic lubricants, synthetic alkyl aromatic lubricants mixed with mineral oil, and synthetic alkyl aromatic lubricants mixed with polyol ester.

2. (Original) The invention according to Claim 1, the lubricating oil having the following components:

65-88% hydrotreated light napthenic distillate, and
10-20% solvent refined light napthenic distillate petroleum.

3. (Original) The invention according to claim 1 wherein in the substitute refrigerant said pentafluoroethane is present in the ratio of about 40% by weight to said tetrafluoroethane present in an amount of about 60% by weight.

4. (Original) The invention according to claim 1 wherein in the substitute refrigerant said pentafluoroethane is present in the ratio of about 42% by weight to said tetrafluoroethane present in an amount of about 58% by weight.

5. (Original) The invention according to claim 1 wherein in the substitute refrigerant said pentafluoroethane is present in the ratio of about 45% by weight to said tetrafluoroethane present in an amount of about 55% by weight.

6. (Currently Amended) A method for refilling an apparatus designed for use with chlorodifluoromethane refrigerant, the method comprising:

(1) supplying a substitute refrigerant under pressure, in a cylinder can fitted with an outlet compatible with a chlorodifluoromethane recharging manifold of the apparatus; and

(2) adding to said apparatus via the manifold a substitute refrigerant for chlorodifluoromethane, said substitute refrigerant consisting of:

about 40% to about 45% by weight pentafluoroethane ;

about 55% to about 60% by weight tetrafluoroethane; and

said substitute refrigerant packaged with ~~[[about 0%]]~~ up to about 20% by weight of the refrigerant of a lubricating oil that is soluble in chlorodifluoromethane, pentafluoroethane and tetrafluoroethane~~[[.]]~~

wherein the lubricating oil is selected from the group consisting of naphthenic based lubricants, paraffinic based lubricants, and mixtures thereof, mineral oil, polyol ester, synthetic alkyl aromatic lubricants, synthetic alkyl aromatic lubricants mixed with mineral oil, and synthetic alkyl aromatic lubricants mixed with polyol ester.

7. (Previously presented) The method according to claim 6, the lubricating oil having the following components:

65-85% hydrotreated light naphthenic distillate, and

10-20% solvent refined light naphthenic distillate petroleum.

8. (Previously presented) The method according to claim 6 wherein in the substitute refrigerant said pentafluoroethane is present in the ratio of about 40% by weight to said tetrafluoroethane present in an amount of about 60% by weight.

9. (Previously presented) The method according to claim 6 wherein in the substitute refrigerant said pentafluoroethane is present in the ratio of about 42% by weight to said tetrafluoroethane present in an amount of about 58% by weight.

10. (Previously presented) The method according to claim 6 wherein in the substitute refrigerant said pentafluoroethane is present in the ratio of about 45% by weight to said tetrafluoroethane present in an amount of about 55% by weight.

11. – 20. (Cancelled)

21. (Currently Amended) A refrigerant consisting of:

about 40% to about 45% by weight pentafluoroethane;

about 55% to about 60% by weight tetrafluoroethane;

said refrigerant packaged with [[about 0%]] up to about 20% by weight of the refrigerant of a lubricating oil that is soluble in chlorodifluoromethane, pentafluoroethane and tetrafluoroethane[.]]

wherein the lubricating oil is selected from the group consisting of naphthenic based lubricants, paraffinic based lubricants, and mixtures thereof, mineral oil, polyol ester, synthetic alkyl aromatic lubricants, synthetic alkyl aromatic lubricants mixed with mineral oil, and synthetic alkyl aromatic lubricants mixed with polyol ester.

22. (Original) The invention according to claim 21, the lubricating oil having the following components:

65-85% hydrotreated light naphthenic distillate, and

10-20% solvent refined light naphthenic distillate petroleum.

23. (Original) A refrigerant according to claim 21 wherein said pentafluoroethane is present in the ratio of about 40% by weight to said tetrafluoroethane present in an amount of about 60% by weight.

24. (Original) A refrigerant according to claim 21 wherein said pentafluoroethane is present in the ratio of about 45% by weight to said tetrafluoroethane present in an amount of about 55% by weight with a napthenic lubricant.

25. (Original) A refrigerant according to claim 21 wherein said pentafluoroethane is present in the ratio of about 40% by weight to said tetrafluoroethane present in an amount of about 60% by weight with a napthenic lubricant.

26. (Cancelled)

27. (Previously presented) The refrigerant according to claim 21, wherein the lubricating oil further includes an acrylic polymer or a corrosion inhibitor or both.

28. (Cancelled)

29. (Previously presented) The refrigerant according to claim 21, wherein the lubricating oil is an alkylbenzene-based lubricating oil.

30. (Previously presented) The invention according to claim 1, wherein the apparatus is selected from the group consisting of refrigeration equipment, air-conditioning equipment, and HVAC equipment.

31. (Previously presented) The invention according to claim 1, wherein the lubricating oil includes an additive selected from the group consisting of acrylic polymer, a corrosion inhibitor and mixtures thereof.

32. (Cancelled)

33. (Previously presented) The invention according to claim 1, wherein the lubricating oil is an alkylbenzene-based lubricating oil.

34. (Previously presented) The method according to claim 6, wherein the apparatus is selected from the group consisting of refrigeration equipment, air-conditioning equipment, and HVAC equipment.

35. (Previously presented) The method according to claim 6, wherein the lubricating oil includes an additive selected from the group consisting of acrylic polymer, a corrosion inhibitor and mixtures thereof.

36. (Cancelled)

37. (Previously presented) The method according to claim 6, wherein the lubricating oil is an alkylbenzene-based lubricating oil.