(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
9 December 2004 (09.12.2004)

PCT

(10) International Publication Number
WO 2004/106271 A3

(51) International Patent Classification[7]: C07C 17/20, 19/08

(21) International Application Number: PCT/US2004/016231

(22) International Filing Date: 21 May 2004 (21.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/444,610 23 May 2003 (23.05.2003) US

(71) Applicant *(for all designated States except US)*: **HONEYWELL INTERNATIONAL INC.** [US/US]; 101 Columbia Road, P.O. Box 2245, Morristown, NJ 07960 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **TUNG, Hsueh, Sung** [US/US]; 16 Vassar Drive, Getzville, NY 14068 (US). **COTTRELL, Stephen, A.** [US/US]; 15142 Shenandoah Avenue, Baton Rouge, LA 70817 (US). **MARKS, Chad, L.** [US/US]; 14324 Brentwood Court, Gonzales, LA 70737 (US).

(74) Agents: **HOIRIIS, David** et al.; Honeywell International INC., 101 Columbia Road, P.O. Box 2245, Morristown, NJ 07960 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
3 March 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD OF MAKING HYDROFLUOROCARBONS

(57) Abstract: A manufacturing process for making hydrofluorocarbons (HFCs), by reacting a hydrochlorocarbon and HF in a liquid phase catalytic reactor using a large mole ratio of HF to hydrochlorocarbon to minimize formation of high boiling byproducts and improve HF consumption and hydrofluorocarbon yields.

WO 2004/106271 A3

INTERNATIONAL SEARCH REPORT

PCT/US2004/016231

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C07C17/20 C07C19/08

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C07C

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 187 976 B1 (ELLIS LOIS ANNE SHORT ET AL) 13 February 2001 (2001-02-13) example 3	1,4,5, 7-13,27, 30,31
X	US 5 763 708 A (BASS JOHN STEPHEN ET AL) 9 June 1998 (1998-06-09) column 2, line 13 - line 28; example 7 column 3, line 23 - line 32	1,2,5,7, 9-11, 13-16, 26-28,31
X	WO 97/15540 A (JANSSENS FRANCINE ; SOLVAY (BE); WILMET VINCENT (BE); SCHOEBRECHTS JEA) 1 May 1997 (1997-05-01) claims 1-7; example 4	1,4-10, 12,13, 27,30,31

-/--

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

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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

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

"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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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
17 November 2004	24/11/2004

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

INTERNATIONAL SEARCH REPORT

PCT/US2004/016231

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 442 075 A (BAYER AG) 21 August 1991 (1991-08-21) examples 1-4	1,7, 9-11,27
X	WO 93/25506 A (ICI PLC ; POWELL RICHARD LLEWELLWYN (GB); MOORE GEOFFREY JAMES (GB); B) 23 December 1993 (1993-12-23) example 2	1,7, 9-11,27
X	US 6 479 718 B1 (WISMER JOHN A ET AL) 12 November 2002 (2002-11-12) example 1	1,4,5, 7-13,27, 30,31
X	US 5 710 352 A (TUNG HSUEH SUNG) 20 January 1998 (1998-01-20) column 4, line 1 - line 27; claims 4-21; examples 1-4	1-13, 27-29, 31,32
X	WO 98/00378 A (ALLIED SIGNAL INC) 8 January 1998 (1998-01-08) cited in the application the whole document & US 5 763 706 A (ALLIED SIGNAL INC) 9 June 1998 (1998-06-09)	1-32
X	EP 0 931 783 A (ATOCHEM NORTH AMERICA ELF) 28 July 1999 (1999-07-28) the whole document	1-32

INTERNATIONAL SEARCH REPORT

PCT/US2004/016231

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6187976 B1	13-02-2001	EP 1070034 A1	24-01-2001
		JP 2002511437 T	16-04-2002
		WO 9952844 A1	21-10-1999
US 5763708 A	09-06-1998	AT 234797 T	15-04-2003
		AU 702786 B2	04-03-1999
		AU 6977596 A	09-04-1997
		BR 9610669 A	13-07-1999
		CA 2232596 A1	27-03-1997
		CN 1201446 A	09-12-1998
		DE 69626834 D1	24-04-2003
		DE 69626834 T2	18-12-2003
		EP 0854848 A1	29-07-1998
		ES 2193261 T3	01-11-2003
		HU 9901285 A2	28-07-1999
		JP 11512454 T	26-10-1999
		PL 325554 A1	03-08-1998
		PT 854848 T	31-07-2003
		TR 9800505 T1	22-06-1998
		TW 388751 B	01-05-2000
		WO 9711043 A1	27-03-1997
		US 6365580 B1	02-04-2002
WO 9715540 A	01-05-1997	FR 2740132 A1	25-04-1997
		AT 211723 T	15-01-2002
		AU 722645 B2	10-08-2000
		AU 7284996 A	15-05-1997
		BR 9611223 A	06-04-1999
		CA 2232421 A1	01-05-1997
		CN 1205682 A ,B	20-01-1999
		CZ 9801254 A3	15-07-1998
		DE 69618476 D1	14-02-2002
		DE 69618476 T2	29-08-2002
		DK 858440 T3	29-04-2002
		EA 1416 B1	26-02-2001
		WO 9715540 A1	01-05-1997
		EP 0858440 A1	19-08-1998
		ES 2171228 T3	01-09-2002
		HU 9802978 A2	28-04-1999
		IL 124086 A	29-06-2000
		JP 2000513705 T	17-10-2000
		NO 981800 A	11-06-1998
		NZ 320161 A	28-10-1998
		PL 326367 A1	14-09-1998
		PT 858440 T	31-07-2002
		SK 48998 A3	09-09-1998
		US 6730817 B1	04-05-2004
		US 2004019244 A1	29-01-2004
		ZA 9608481 A	20-05-1997
EP 0442075 A	21-08-1991	DE 4004495 A1	22-08-1991
		CA 2036220 A1	15-08-1991
		DE 59002322 D1	16-09-1993
		EP 0442075 A1	21-08-1991
		ES 2044382 T3	01-01-1994
		JP 2672191 B2	05-11-1997
		JP 4211027 A	03-08-1992
		US 5171901 A	15-12-1992

INTERNATIONAL SEARCH REPORT

PCT/US2004/016231

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9325506 A	23-12-1993	AT 157640 T	15-09-1997
		AU 672210 B2	26-09-1996
		AU 4342893 A	04-01-1994
		BR 9306515 A	15-09-1998
		CA 2115430 A1	23-12-1993
		CA 2137234 A1	23-12-1993
		DE 69307884 D1	13-03-1997
		DE 69307884 T2	22-05-1997
		DE 69313610 D1	09-10-1997
		DE 69313610 T2	08-01-1998
		EP 0644867 A1	29-03-1995
		EP 0605683 A1	13-07-1994
		ES 2097514 T3	01-04-1997
		ES 2107037 T3	16-11-1997
		WO 9325505 A1	23-12-1993
		WO 9325506 A1	23-12-1993
		JP 3328282 B2	24-09-2002
		JP 7507787 T	31-08-1995
		JP 3323201 B2	09-09-2002
		JP 6509819 T	02-11-1994
		US 5744660 A	28-04-1998
		US 5902913 A	11-05-1999
US 6479718 B1	12-11-2002	WO 03082784 A1	09-10-2003
US 5710352 A	20-01-1998	DE 69724134 D1	18-09-2003
		DE 69724134 T2	09-06-2004
		DE 931043 T1	09-03-2000
		EP 0931043 A1	28-07-1999
		ES 2137143 T1	16-12-1999
		JP 3393142 B2	07-04-2003
		JP 2001500882 T	23-01-2001
		WO 9812161 A1	26-03-1998
WO 9800378 A	08-01-1998	US 5763706 A	09-06-1998
		WO 9800378 A1	08-01-1998
US 5763706 A	09-06-1998	WO 9800378 A1	08-01-1998
EP 0931783 A	28-07-1999	US 5877359 A	02-03-1999
		EP 0931783 A1	28-07-1999
		JP 11228462 A	24-08-1999