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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 July 2008 (03.07.2008)

PCT

(10) International Publication Number
WO 2008/079131 A1

(51) International Patent Classification:
F01C 1/16 (2006.01) ***F03C 4/00*** (2006.01)
F01C 1/24 (2006.01) ***F04C 2/00*** (2006.01)
F03C 2/00 (2006.01) ***F04C 18/00*** (2006.01)

(21) International Application Number:
PCT/US2006/049289

(22) International Filing Date:
26 December 2006 (26.12.2006)

(25) Filing Language: English

(26) Publication Language: English

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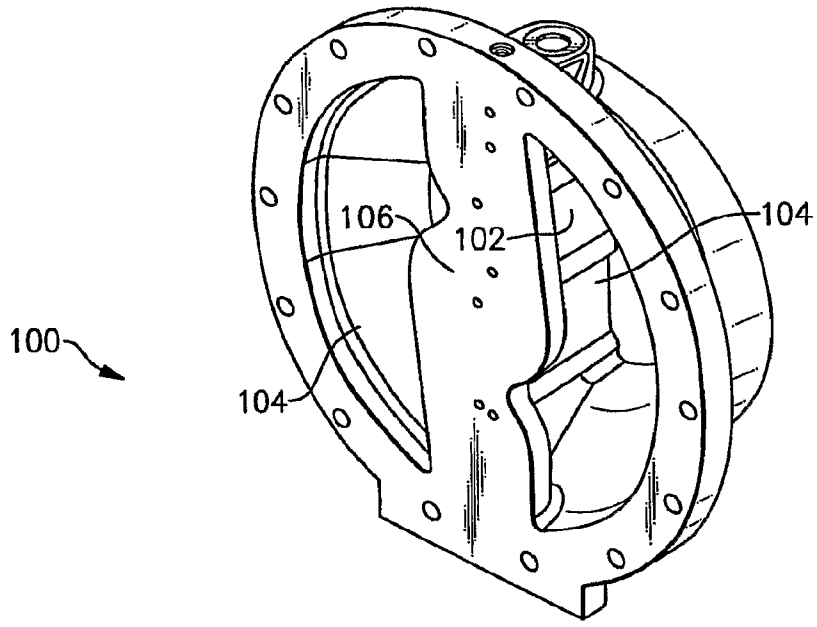
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,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

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv))*

Published:
— *with international search report*

(54) **Title:** SCREW COMPRESSOR WITH INTEGRAL BEARING COVER AND DISCHARGE PLENUM DIVIDER



(57) **Abstract:** A three rotor screw compressor is provided with a bearing cover, and an integral discharge case having a divider wall formed integrally with the bearing cover. The bearing cover closes bearing chambers for each of three rotor shafts, and the divider wall divides a plenum into two distinct chambers. By providing the divider wall, noise and efficiency losses from intermixing of two discharge flows from two separate compression chambers is eliminated. By forming a divider wall integrally with the bearing cover, leakage which has existed in the prior art is eliminated.

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SCREW COMPRESSOR WITH INTEGRAL BEARING COVER AND DISCHARGE PLENUM DIVIDER

BACKGROUND OF THE INVENTION

This application relates to a screw compressor, wherein a divider separates the output of two discharge chambers, and wherein a bearing cover is formed integrally with a discharge case which provides the divider wall.

Screw compressors are known, and typically include a plurality of rotating rotors each having external screw thread. The screw threads interfit with screw threads on the other rotors to define compression chambers. An entrapped fluid is compressed, and delivered toward a downstream location. One known type of screw compressor includes three rotors, and defines two compression chambers. These two compression chambers have typically delivered compressed fluid into a common discharge plenum. The discharge of fluid into a common chamber can be somewhat out of phase, and can result in increased pulsation and undesirable losses and noise.

Thus, it is known in the prior art to provide a divider wall that separates an output from the two chambers until they reach a downstream location. Typically, an outlet housing includes two distinct flow passages. The outlet housing is connected to a discharge case which includes a divider wall to define the two flow passages.

In addition, a bearing cover has typically been provided to cover bearings mounted in the outlet housing for each of the three rotors. In the prior art, the bearing cover is formed separately from the discharge case. A space between the divider wall and bearing cover has allowed cross flow between the two passages.

SUMMARY OF THE INVENTION

In the disclosed embodiment, a screw compressor is formed with three rotors. Each of the three rotors has shafts which are mounted in bearings. The bearings are fixed within an outlet housing. The outlet housing is fixed to a compressor case. A bearing cover is formed integrally with a discharge case, as is a divider wall. The outlet housing provides two separate discharge passages which communicate with two separate compression chambers. The two separate discharge passages allow fluid to flow downstream into two separate plenum chambers or flow passages. The separate plenum

chambers are defined by the divider wall and the integral bearing cover in the discharge case. Since the bearing cover and the discharge case are formed as integral parts, there are no complex surfaces which must be sealed between the two and no leakage between the plenum chambers. In a sense, the bearing cover forms a part of the divider wall.

These and other features can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded view of a prior art compressor.

Figure 2 shows the bearing cover feature of the prior art compressor.

Figure 3 is an end view of an integral cover and compressor discharge case.

Figure 4 is a perspective view of one side of the inventive compressor component.

Figure 5 is a perspective view from the opposed side of the inventive compressor component.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A compressor 20, as known in the prior art, is illustrated in Figure 1. A compressor case 22 carries screw rotors 24, 26 and 28. As known, the screw rotors have threads which interfit to compress and drive a refrigerant toward a discharge chamber 38. Refrigerant enters at an opposed end through an inlet 140. The rotors 24, 26, and 28 all have shafts 30 which are mounted within bearing assemblies 32. The bearing assemblies 32 extend into chambers 34 in a outlet housing 36.

The outlet housing 36 includes passages 40 which communicate with the discharge chambers 38 and serve to deliver the compressed fluid downstream without allowing fluid from the two chambers 38 to cross flow.

A discharge case 46 includes chambers 50 which communicate with the passages 40. A divider wall 48 divides the two chambers 50, such that the compressed fluid will not mix until downstream of the discharge case 46. However, the divider wall 48 and the bearing cover 42 have generally not been on the same plane at the end of the outlet housing 36. Thus, a space has existed between the two separate parts, which has allowed leakage. Figure 2 shows the prior art cover 42.

Figure 3 shows an inventive discharge case 100. As shown, a divider wall 102 still divides and separates the chambers 104. However, the bearing cover 106 is formed integrally with this wall 102.

Thus, as shown in Figure 4, the bearing cover 106 merges into the divider wall 102. There is no leakage between the wall 102 and the cover 106 as they are formed integrally. The two chambers 104 are thus maintained separate by the relatively simple formation of the integral component. In a sense, the bearing cover forms a portion of the wall.

Figure 5 is a perspective view of the opposed side, and shows the chambers 104 separated by the wall 102. As can be appreciated from the several figures, the divider wall 102 is relatively thin compared to the bearing cover 106. The divider wall 102 also extends over the majority of the axial length of the discharge case 100. Adjacent an end of the discharge case 100 which abuts the outlet housing 20, the discharge divider wall 102 merges to be thicker, and provide the bearing cover 106.

Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. For that reason the following claims should be studied to determine the true scope and content of this invention.

CLAIMS

What is claimed is:

1. A compressor comprising:

at least three screw rotors, each of said screw rotors having a shaft, said compressor for delivering a compressed fluid to each of at least two separate discharge ports in a compressor case;

bearings received in bearing chambers and supporting each of said three shafts of said at least three screw rotors; and

a bearing cover surface closing off said bearing chambers for each of said bearings, said bearing cover being formed integrally with a discharge case, said discharge case including a divider wall for providing a separate discharge chamber communicating with each of said discharge ports, such that a fluid compressed in the compressor passes the bearing cover, and through the separate discharge chambers, to a downstream use.

2. The compressor set forth in Claim 1, wherein said bearings chambers are positioned within an outlet housing, said outlet housing abutting said compressor housing, and said discharge case being secured to said outlet housing.

3. The compressor as set forth in Claim 2, wherein said divider wall extends over a relatively thin extent, and becomes larger to merge into said bearing cover.

4. The compressor as set forth in Claim 1, wherein said divider wall extends over a relatively thin extent, and becomes larger to merge into said bearing cover.

5. The compressor as set forth in Claim 1, wherein said divider wall extends for the majority of an axial length of the discharge case, and the bearing cover is generally formed adjacent an end of the discharge case.

6. A compressor comprising:

at least three screw rotors, each of said screw rotors having a shaft, said screw rotors interfitting to define two compression chambers, said compressor for delivering a compressed refrigerant from each of said two compression chambers to one of two separate discharge ports in a compressor case;

bearings received in bearing chambers formed in an outlet housing, said outlet housing attached to said compressor case, said bearings supporting each of said shafts of said at least three screw rotors, said discharge ports communicating with discharge passages in said outlet housing; and

a bearing cover surface closing off said bearing chambers for each of said bearings, and attached to said outlet housing, said bearing cover being formed integrally with a discharge case, said discharge case including a divider wall for providing a separate discharge chamber communicating with each of the discharge passages formed in said outlet housing, and the divider wall ensuring that fluid compressed in the compressor passes the bearing cover and through the separate discharge chambers in the discharge case to a downstream use, said divider wall extending over a relatively thin extent, and becoming larger to merge into said bearing cover, with said divider wall extending over the majority of an axial length of said discharge case, and said bearing cover being formed adjacent an end of said discharge case which faces said outlet housing.

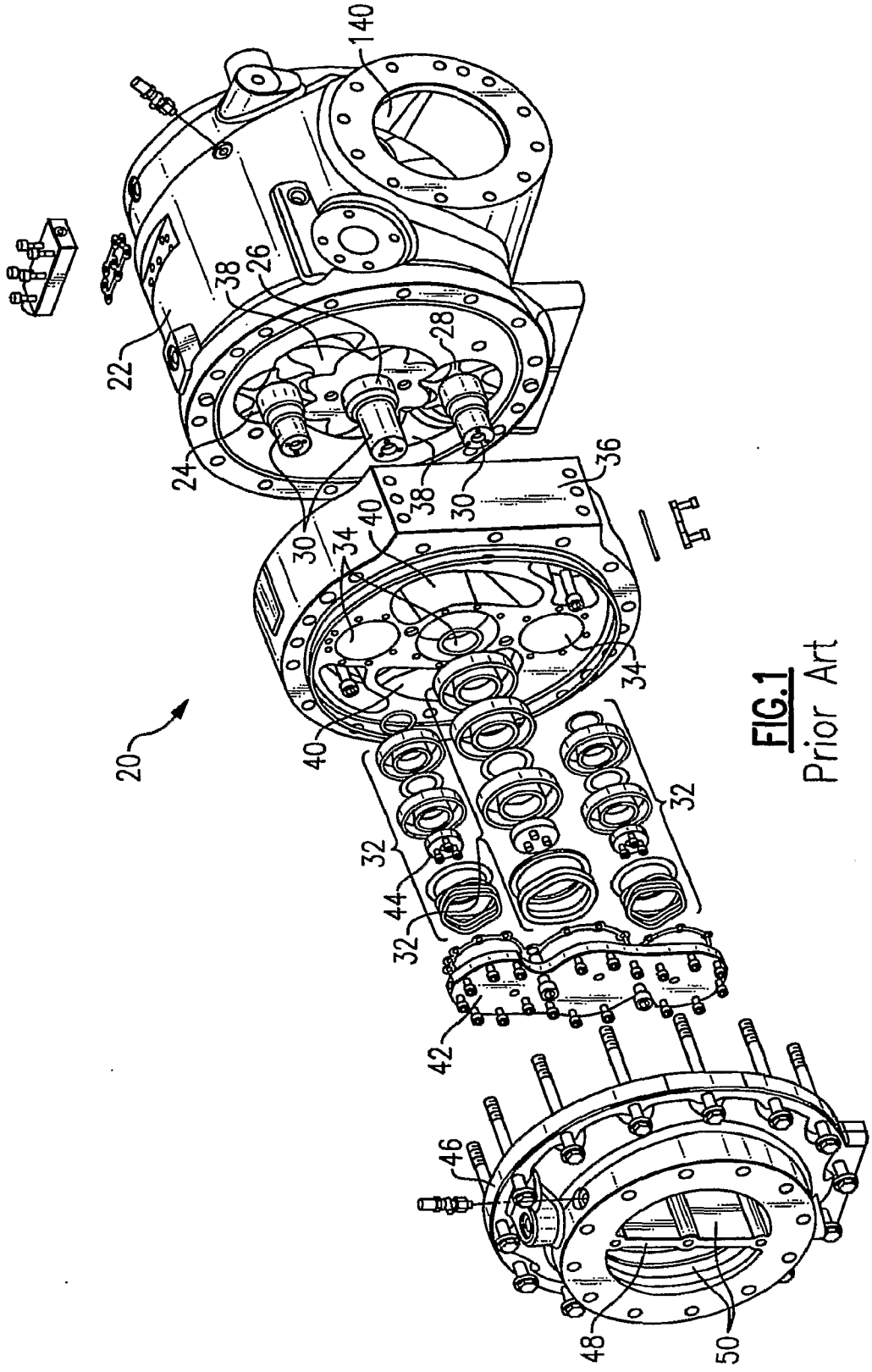

FIG.1
Prior Art

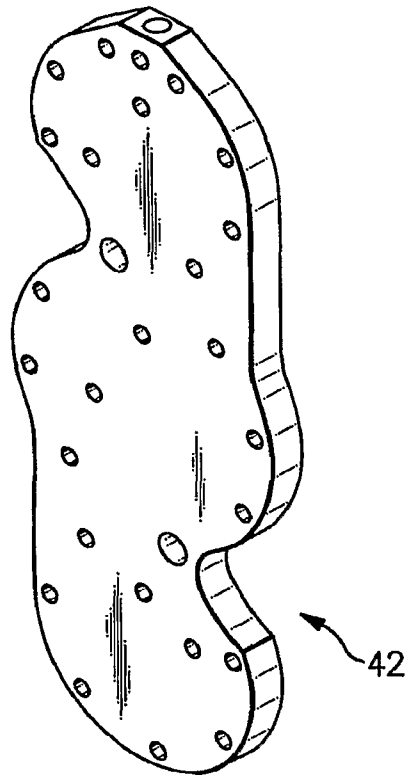

FIG.2
Prior Art

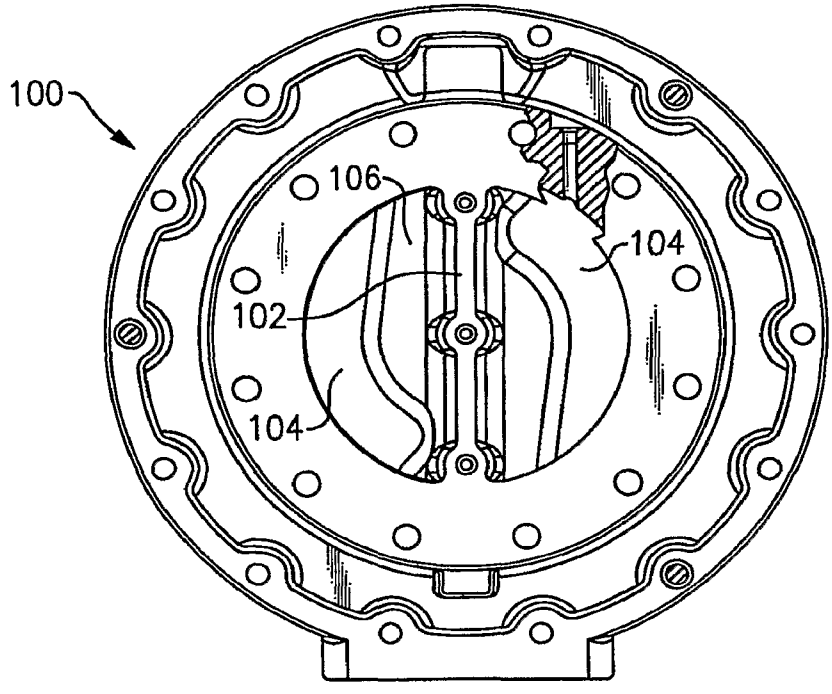

FIG.3

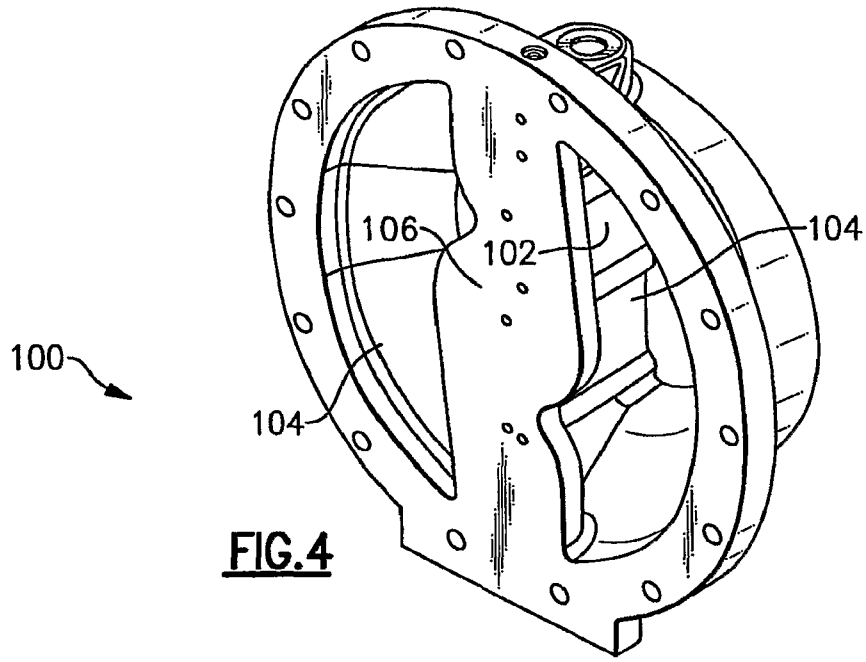

FIG.4

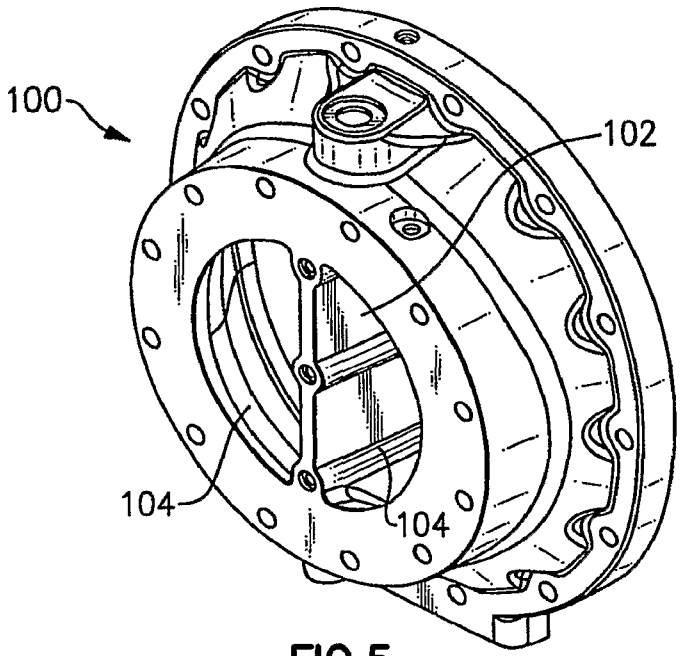

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 06/49289

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - F01C 1/16; F01C 1/24; F03C 2/00; F03C 4/00; F04C 2/00; F04C 18/00
USPC - 418/201.1
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(8): F01C 1/16; F01C 1/24; F03C 2/00; F03C 4/00; F04C 2/00; F04C 18/00
USPC: 418/201.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 418/201.2; 418/201.3; 418/202, 418/205; 384/299, 384/303, 384/453, 384/504, 384/609, 384/912

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Electronic Databases Searched:
PubWEST(USPT,PGPB,EPAB,JPAB); Google Patents; Google Scholar; WIPO database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 7,121,814 B2 (Rockwell, et al.) 17 October 2006 (17.10.2006) (col. 1, lines 60 - col. 2, line 65; col. 3, lines 14-24)	1-6
Y	US 6,976,833 B2 (Daniels, et al.) 20 December 2005 (20.12.2005) col. 1, lines 63-67; col. 2 lines 1-6; 12-25 33-49	1-6

☐ Further documents are listed in the continuation of Box C. ☐

* 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 application or patent but published on or after the international filing date
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"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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"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
12 September 2007 (12.09.2007)	26 OCT 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774