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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 August 2011 (18.08.2011)

PCT

(10) International Publication Number
WO 2011/098415 A1

(51) International Patent Classification:
G06F 17/30 (2006.01)

(21) International Application Number:
PCT/EP2011/051711

(22) International Filing Date:
7 February 2011 (07.02.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10153126.7 10 February 2010 (10.02.2010) EP

(71) Applicant *(for all designated States except US)*: **DEUTSCHE POST AG** [DE/DE]; Charles-de-Gaulle-Straße 20, 53113 Bonn (DE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **APTHORP, Adrian Paul** [GB/GB]; 26 Mount Pleasant Road, Lingfield Surrey RH7 6BH (GB). **JENKINSON, David** [CZ/CZ]; Netolicka 16, 14800 Kunratice, Praha 4 (CZ). **DOBBIE, Charlie** [DE/DE]; Simrockallee 12, 53173 Bonn (DE). **SYKES, Ian** [AU/US]; 1210 Pine Island Road, Plantation FL, 33324 (US). **KELLY, Dave** [SG/SG]; 107 Joo Chiat Place, Singapore 427634 (SG).

(74) Agent: **JOSTARNDT, Dr. Hans-Dieter**; Brüsseler Ring 51, 52074 Aachen (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, 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, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) **Title**: DISTRIBUTED ARCHITECTURE FOR PAPERWORK IMAGING

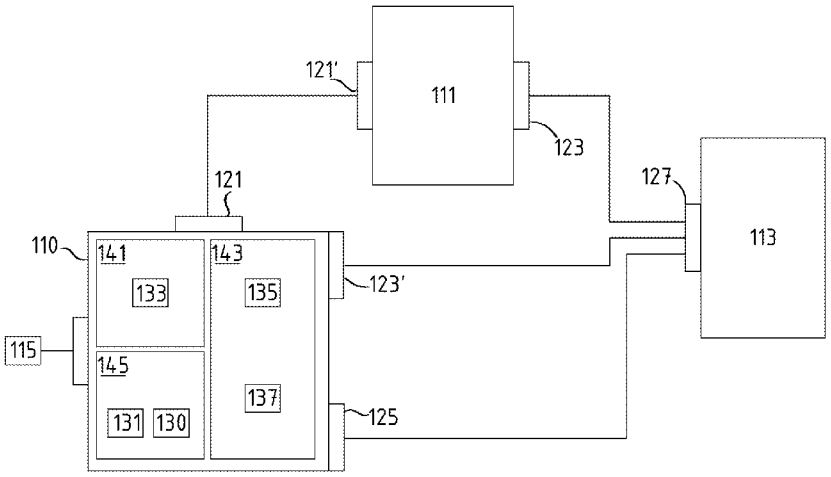


Fig. 1

(57) **Abstract**: The present invention provides a method and system for storage of data files, comprising notifying at least one local reference storage about storing and/or deleting a data file on a central data repository, depositing a reference element on the at least one local reference storage after notifying, requesting a deposited reference element from the local reference storage for demanding a data file contained in the central data repository, retrieving the demanded data file on submitting the reference element to the central data repository.

WO 2011/098415 A1

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Distributed architecture for paperwork imaging

The present invention relates to distributed computer systems and computer architecture for storing and referencing of large data files.

Courier services are specialised in delivering mail pieces of high priority, high value or high sensitivity in express good mailing. Computer systems serving courier services for executing and organising logistic processes and further for the exchange of data with major customers are known.

Generally for international shipment of cargo paperwork concerning the content and customs declaration of mail pieces in form of waybills or shipping lists are mandatory. Additional services e.g. registered letters, additional papers or information in form of large data files are necessary. In some cases processing of shipment documents before the actual arrival of the cargo, e.g. for the reason of custom declaration paperwork, is advantageous.

Traditionally, waybill documents will be affixed to cargo units. Through an electronic submission of shipping documents by the delivery of cargo pieces can, however, may be significantly simplified.

For this reason it is desirable to provide an electronic processing of arbitrary cargo documents. Often, cargo documents are provided as scanned images of hand-written paper documents. Such a scanned document has a large amount of data. Accordingly, it is necessary to take steps to transfer such data to the place of delivery in a dependable and effective way. Due to different available data transmission capacity to the actual location of delivery, a solution must be found to allow an access to image documents with large amount of data in an easy and reliable way, independent of the place of service and independent of locally available data transmission capacity.

It is the object of the present invention to provide a flexible and time efficient method to pre-deliver shipment documents for custom declaration, pickup and/or delivery of physical objects.

According to the invention, this object is achieved by a method according to claim 1 and a system according to claim 7.

The invention proposes a method for storage of data files on a central file storage, comprising:

- notifying at least one local reference storage about storing and/or deleting a data file on a central data repository;
- depositing a reference element on the at least one local reference storage after notifying;
- requesting a deposited reference element from the local reference storage for demanding a data file contained in the central data repository;
- retrieving the demanded data file on submitting the reference element to the central data repository.

Further the invention proposes a system for storage of large data sets with at least one local reference storage and a central data repository, providing communication interfaces, comprising:

- a notification interface for notifying the at least one local reference storage about storing and/or deleting of data files on the central data storage;
- a location interface to locate a requested data file of the central data storage by a reference element in the local reference storage;
- a retrieval interface to retrieve the data file in the central data storage on submitting the reference element to the central data repository.

The invention deals with a system for providing easy and effective access with a small handheld terminal with limited storage capacity or a terminal connected via an internet link with limited traffic capacities to large data files e.g. scanned images of freight documents stored on a remote central server.

The main benefit of the proposed architecture is that it allows a single consistent approach to be taken to providing image access across a computer network. This in turn has the potential for a number of common components to be developed only once for the network.

Additionally, the architecture of the present invention provides better support for the customer service requirement for accessing images. The original architecture required the customer service agent to go through a number of additional steps in order to actually locate the images that they were interested in. With the architecture proposed in the present invention an integrated user interface is being developed that allows a customer service agent to query shipment status and also be presented with the availability of images of waybills or customs declaration documents for that shipment on a local storage and then directly retrieve the chosen image for the central storage server.

As the architecture has local image reference handling component the load associated with retrieving images is distributed across the network. As large data files are “pulled” rather than “pushed” large data traffic on the computer network is minimized.

In an embodiment the present invention provides that the reference data is being deposited on a plurality of local reference storages. Information about the index references will be distributed across multiple local references within the network. Thus, transfer times within the network are minimized and so data traffic is not subject to interference or disruption. The data advantageously can be placed on the local references in a preferred order. For example, frequent local references can be stored on a memory with fast availability and low average access time.

The present invention also provides a method, wherein a request for a data file can be routed to one selected reference storage under a choice of several local reference storages. In the context of load balancing within a network requests to local references can be conducted such that the network is uniformly and optimally loaded.

The present invention also provides a method, wherein the interface receives a data file to locate request information and outputs a reference element in the form of a uniform resource locator and/or a uniform resource number. Referencing to access the image files will be made in a manner that uses consistent references such as Uniform Resource Locators. Moreover, it is possible that these reference numbers are available to access other image transmission technologies such as fax or the like.

The present invention also provides a method, wherein the large data file and the data file reference may administrated by a store logic unit. The store logic unit provides a load balanced utilization of the disk media and at the same time provides a reliable assignment of the data to references and indexes.

The present invention also provides a method, wherein the location and/or retrieve of data is being conducted by an access server providing a query and/or retrieve logic. An access server and logic ensures that the service requested by e.g. the references, the requested image files are in a format adapted to the client.

The aforementioned and other aspects of the invention will also be apparent from and elucidated with reference to the embodiments of the invention described herein after making reference to the drawings.

Figure 1 shows a schematic view of computer architecture in accordance with the present invention.

Detailed description of preferred embodiments of the invention according to the figure.

Figure 1 presents the basic structure of computer architecture. The architecture consists of a number of components 110, 111, 113, in which some are centrally provided, as for example the server 110, and other are distributed across the network, for example the local reference 111 and the client 113. Different parts of the computer architecture interfaces are connected.

The server consists of a data store 145, an index memory 141 and an access server 143. Captured large information is received and stored by the image server. The store logic 131 transfers the image data file to the image data base and the index of the storage on the image data base to the index data base 133. The index database 133 triggers a notification and forwards the index information to the local reference 111 locally or globally. In a preferred embodiment the notification information may be send to a shipment destination's import processing location 111 which provides an index store.

The store logic 131 manages the access to a first or image database 130 for stored image information, which contains images of scanned documents, like waybills, custom declarations etc. The storage logic 131 is applied for the storage and retrieval of information. In one embodiment of the present invention, it is envisaged that image servers 110 will be implemented within a country or for a group of countries, and at transit facilities.

The large information server 110 provides three main components:
The image store part 145 of the server provides the image database 130 and the store logic 131. Within the image database server 130, large image data files are managed in an image database store 130. An image database store 130 may be embodied as a simple database with a low retention period or as a large memory archival system with full hierarchical large memory storage and management capabilities.

The index store 141 of the server provides the support the management of local references 111 of image data files. The image database server 110 is providing an index store 133 that maintains a copy of the searchable attributes of the image database 130 data files to the notification interface 121.

The access server 143 provides an interface between the image requestor and the image store and is ideally co-located with the image store. In addition, the server has three interfaces: a localization interface, a query interface and a notification interface.

In order to provide a uniform and readily implemented interface for retrieving large images via either a browser or a business application, the HTTP protocol is preferably being selected.

The architecture consists of a number of components that have distributed across the network like the local references 111 and the user clients 113 and other that will be centrally provided like the server 110. The components are connected with each other or with interfaces. Each interface 121,121', 123, 123', 125, 127 is connected to components of the network, wherein each interface has specific task for providing their unified large architecture.

The central component of the architecture is an information server 110 which is provided with an information capture application 115 providing e.g. large images of clearance paperwork or other cargo related documents. The information is captured and being passed to a store logic 131 and capture information data. The store logic analysis the incoming information and provides data on to a large database which provides storage for large data and the references of the large data stored on the large database to an index database. The capturing of images or data my also be provided by a handheld 113 with a scanner, a touch screen or the like device for data capturing. For example the signature of a customer may be captured in the mail delivery process.

Further the stored logic provides information is for notification interfaces, providing information for specific components outside the origin domain of the central server.

The index databases connected to an index query logic 135 on the access server 143 and the image database 130 is connected to an image retrieve logic 137 on the access server 143.

The image data administration architecture identifies at least the following interfaces:

- Notification interface 121, 121'
- Retrieve interface 125
- Locate interface 123, 123'

These interfaces are being specialized for documents indexed by internal registration numbers system or by any other computer-based registration system, however the same architecture may be used for indexing and retrieving documents with a different key.

The architecture also includes the interfaces for querying shipment clearance information to support the requirements for Clearance Paperwork Imaging.

Notification to image reference data

The Notification interface 121, 121' is an event based interface that sends a notification to interested parties of the availability of an image and provides a reference for locating the stored image database 130. Interested parties include the location performing import processing of a shipment and the local reference 111. Notifications also may be sent for shipment document and delivery sheet images.

The reference will be implemented by a URL, by a URN (Uniform Resource Name) or any other linking and reference system. Any other known suitable system may be used as well.

The notification interface will be implemented with a message referred to as the large data reference message. This will be routed via proprietary computer message-based infrastructure, either using a Common Messaging Platform or Communications Infrastructure.

Retrieve Image data

The Retrieve Image interface allows a user to request an image by passing the image's "reference" to the image server. In response to the request for an image the server will either return the image or an error message. In one embodiment the large data may be returned e.g. as image in TIFF format. And further the interface may be implemented using HTTP.

A standard TCP/IP port number, e.g. port 29001, has been identified for image retrieval. This will enable image traffic on proprietary networks to be managed.

Furthermore, it is thus possible to obtain images of alternative routes to, such as fax or the like. Such procedure is advantageous in areas of the world where rather an Internet connection than a telephone is available.

Locate Image data

The Locate Image interface allows a user to search for an image based on some attributes associated with it. In the case of shipment documents the searchable attributes are attributes of a shipment. In the case of delivery sheets the searchable attributes relate to the delivery route. In one embodiment the interface may be implemented using HTTP.

The Local reference 111 supports the requirements of the client locating a paperwork image associated with a shipment as well as providing a central lookup for image reference information for clearance processing. This index store may also hold notifications of delivery sheet images or waybill images. Also images for executing the delivery may be stored, like maps or data for identification like biometrical data or the like may be stored and delivered to the client device on request. To retrieve waybill sheet images in this way depends upon establishing the relationship between a delivery checkpoint and delivery sheet image notification based on courier route information.

The client 113 will generally be a device that is used to deliver mail pieces such as a laptop, a computer or a handheld device. The device will provide conventional methods and devices to send and receive data. For example, typically the device provides a proxy or a cache, and also provides operating software that is typically embodied with a browser and a TIFF viewer. The client has an interface 127 for sending and receiving data to peripheral computers.

The retrieval of images for direct on screen viewing by customer service agents with a client or client device 113, import processing staff and ad-hoc users is by a standard web browser with either a TIFF plug-in or an external TIFF viewer configured as a helper application. An external TIFF viewer is widely available in current operating systems.

A proxy image server may be provided within the client 113 for caching of image reference information and of retrieved images. Image reference information is pro-actively cached by the distribution of the image reference message to the proxy image servers that support clearance processing. As a proxy this component provides the same interfaces as the services it is acting as a proxy for: Locate Image and Retrieve Image.

This component supports the identification of shipments for which clearance processing is required and in particular for which the supporting paperwork images are required.

For each image which is stored on the server 110, the store logic 131 generates an index reference. The references are stored in the index database 133. The index database 133 then sends a message to the notification interface 121 and to the index query logic 135, respectively. The notification interface 121 in turn passes the index references notice to the corresponding interface 121' for storing the data to a local reference 111.

Hence in the case a client 113 requires an image of a freight's waybill, the client 113 addressed a request over the interfaces 127 and the locate interface 123 to the local reference 111. The local reference 111 passes the requested reference information on the locate interface 123. The locate interface 123 passes this information back as a data link to the client 113. The client 113 is setting up an inquiry with the corresponding data link to the retrieve interface 125 of access server 143. The data retrieve logic 137 processes the data link and requests the requested image data from the image data storage 130 to the access server 143 and passes the image e.g. in a TIFF Format via the retrieve interface 125 to the client 113.

List of reference numerals:

110	Server
111	Local reference
113	Client
121,121'	Notification Interface
123,123'	Locate Interface
125	Retrieve Interface
127	Client Interface
130	Image Database
131	Store Logic
133	Index Database
135	Index Query Logic
137	Image Retrieve Logic

Claims:

1. Method for storage of data files on a central file storage, comprising:
   notifying at least one local reference storage about storing and/or deleting a data file on a central data repository;
   depositing a reference element on the at least one local reference storage after notifying;
   requesting a deposited reference element from the local reference storage for demanding a data file contained in the central data repository;
   retrieving the demanded data file on submitting the reference element to the central data repository.

2. Method according to claim 1, wherein the reference data is being deposited on a plurality of local reference storages.

3. Method according to any of the preceding claims, wherein a request for the data file can be routed to one determined local reference storage under a choice of a plurality of local reference storages.

4. Method according to any of the preceding claims, wherein the interface receives request to locate a data file and outputs the reference element as a uniform resource locator and/or a uniform resource number.

5. Method according to any of the preceding claims, wherein the data file and the reference element are administrated by store logic units.

6. Method according to any of the preceding claims, wherein the location and/or retrieve of data is being conducted by an access server providing a query and/or retrieve logic.

7. System for storage of large data sets with at least one local reference storage and a central data repository, providing communication interfaces, comprising:
   - a notification interface for notifying the at least one local reference storage about storing and/or deleting of data files on the central data storage;

- a location interface to locate a requested data file of the central data storage by a reference element in the local reference storage;
- a retrieval interface to retrieve the data file in the central data storage on submitting the reference element to the central data repository.

8. System according to claim 7, wherein the each reference data storage provides stored reference data of the central data storage.

9. System according to any of the preceding claims, wherein the request for a data file can be routed to one selected reference storage under a choice of a plurality of local reference storages.

10. System according to any of the preceding claims, wherein the interface receives a data file to locate request information and outputs a reference element as a uniform resource locator and/or a uniform resource number.

11. System according to any of the preceding claims, wherein the data file and the reference element are administrated by store logic units.

12. System according to any of the preceding claims, wherein the location and/or retrieve of data is being conducted by an access server providing a query and/or retrieve logic.

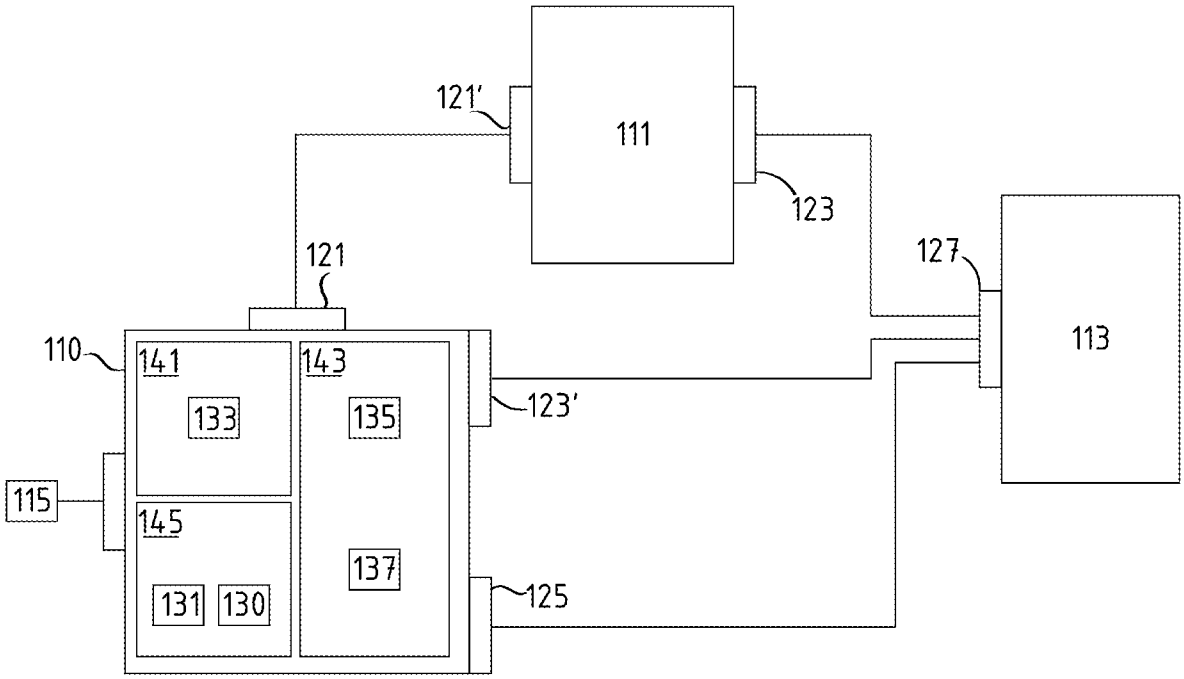

121'
111
123
121
127
113
110
141
133
143
135
123'
115
145
131
130
137
125

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/051711

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F17/30
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/060774 A1 (AUSPEX SYSTEMS INC [US]; BENELISHA STEPHEN [US]; MILLER BRENT [US]; FA) 24 July 2003 (2003-07-24) abstract page 1, line 8 - line 9 page 1, lines 27-29 page 3, line 14 - page 4, line 2 page 4, line 21 - line 28; figure 1 page 16, line 32 - line 33	1-12
X	US 6 424 966 B1 (MEYERZON DMITRIY [US] ET AL) 23 July 2002 (2002-07-23) abstract line 55 - page 5, line 65 line 41 - column 15, line 54; figure 6	1-12

-/--

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

[X] See patent family annex.

* Special categories of cited documents :

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

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

"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
15 June 2011	22/06/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Siódmok, Wojciech

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/051711

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00/68839 A1 (SEARCH MECHANICS INC [US]) 16 November 2000 (2000-11-16) abstract page 1, line 10 - line 29 page 5, line 32 - page 6, line 2 page 7, line 25 - line 34 -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/051711

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03060774 A1	24-07-2003	AU 2003202271 A1	30-07-2003
		EP 1476824 A1	17-11-2004
		JP 2005515556 T	26-05-2005
US 6424966 B1	23-07-2002	NONE	
WO 0068839 A1	16-11-2000	AU 4993800 A	21-11-2000
		CA 2373828 A1	16-11-2000
		EP 1221114 A1	10-07-2002
		US 6253198 B1	26-06-2001
		US RE40683 E1	24-03-2009