(54)   **IDENTIFYING POSTAL ITEMS AT POSTAL LOCATIONS**

(57)   A method and a system for identifying postal items outgoing from a first postal location and incoming at a second postal location comprising: providing an interface for exchanging information with a cloud matching service; by the interface, receiving inputs from the first postal location of fingerprint data of a given postal item outgoing from the first postal location and passing them to the cloud matching service for registration; by the interface, receiving inputs from the second postal location of fingerprint data of a given postal item incoming to the second postal location and passing them to the cloud matching service for registration; and, by the cloud matching service, identifying a link between registered fingerprint data of postal items when a match between registered outgoing fingerprint data and its corresponding registered incoming fingerprint data is found.
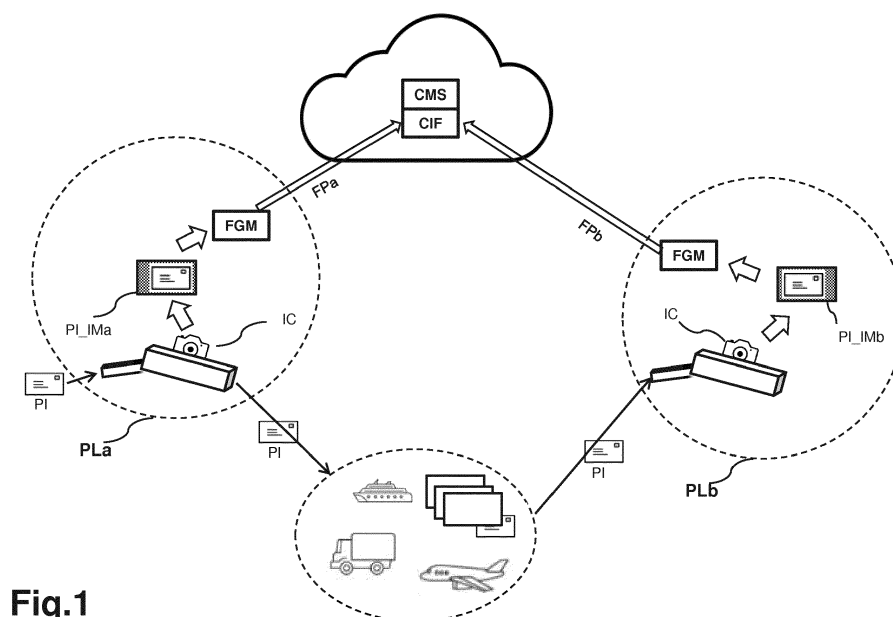
Fig.1

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Description

[0001] The present invention relates to a method and to a system for identifying mail items according to the preamble of claims 1 and 11 respectively.

[0002] In the field of postal logistics, postal automation systems support postal operators in achieving their delivery performance goals. Tracking the journey of postal items at specific postal locations along the post logistics delivery chain is an important task for checking quality of service and as well as for providing real time and automatic feedbacks to postal customers.

[0003] Document WO 2013/132164A1 discloses a method for tracking mail in a postal sorting system where correspondence between item identifiers is taken via digital images of mail.

[0004] An uprising mail identification technique is a technique based on fingerprint. Fingerprinting captures unique visual features of postal objects by means of cameras and uses extracted feature vectors to identify the postal object along the sorting process. Extracted feature vectors comprise physical characteristics of the visual features captured by the image of the mail items which may result helpful for its identification, as for example luminance parameters and histograms, location of address and stamp, content of the address field and other visual identification parameters. Fingerprint data may also include a textual description of the address portion.

[0005] Usually the fingerprint data is transmitted to the postal site where the postal item is shipped to. In the site when the postal item is lifted for sortation, a digital image is taken and the fingerprint data is extracted and matched versus all the available data of registered postal items.

[0006] The registration and matching of postal items along the postal network is a key task for the postal operator and there is a need for an improved technique for managing fingerprint identification of postal items.

[0007] It is therefore aim of the present invention to provide a method and system for identifying postal items (PI) outgoing from a first postal location (PLa) and incoming at a second postal location (PLb) which is satisfying the postal operator requirements in a flexible manner.

[0008] The aforementioned aim is achieved by a method and system for identifying postal items outgoing from a first postal location and incoming at a second postal location comprising:

a) providing an interface for exchanging information with a matching service in the cloud, hereinafter called cloud matching service, said cloud matching service managing the data of the postal items dispatched between the first and the second postal locations;

b) by the interface of the cloud matching service, receiving inputs from the first postal location of fingerprint data extracted from an image of a given postal item outgoing from said first postal location and passing said received fingerprint data to the cloud

matching service to be registered as data corresponding to the given outgoing postal item;

c) by the interface of the cloud matching service, receiving inputs from the second postal location of fingerprint data extracted from an image of a given postal item incoming to said second postal location and passing said received fingerprint data to the cloud matching service (CSS) to be registered as data corresponding to the given incoming postal item;

d) by the cloud matching service, identifying a link between registered fingerprint data of postal items when a match between registered outgoing fingerprint data and its corresponding registered incoming fingerprint data is found.

[0009] In invention embodiments, the first postal location may advantageously be, but not limited to, a first mile location; an outgoing sorting site; a dispatching postal location; a delivery unit; a transportation carrier; or, any other convenient location.

[0010] In invention embodiments, the second postal location may advantageously be, but not limited to, a last mile location; an incoming sorting site; a dispatching postal location; a delivery unit; a transportation carrier; or any other convenient location.

[0011] In invention embodiments, the finger print data may advantageously be extracted from the image by an application invoked by a portable device.

[0012] In invention embodiments, the image of the outgoing postal item may be taken at the first mile; the image of incoming postal item may be taken at the last mile; and, the fingerprint data registered at the cloud matching service of a specific mail item may be deleted when a match is found between the registered fingerprint data of outgoing mail items with the registered fingerprint data of incoming mail items. In invention embodiments, the fingerprint data may preferably be transmitted to the cloud matching service in an encrypted manner.

[0013] In invention embodiments, the set of fingerprint data (FPa) of step b) may comprise information on target address and receiver name; and a model of the postal distribution network between the first postal site and the target address is provided to the cloud matching service for advanced service purposes.

[0014] In invention embodiments, the purposes of advanced services may include one or more of the following:

- estimating the delivery time of the postal item to the target address by taking into account the model of the postal distribution network;
- supporting re-routing of postal items, in accordance with receiver initiation;
- forecasting volumes of postal items at given nodes of the postal distribution network.

[0015] In invention embodiments, the fingerprint data may preferably be transmitted to the cloud matching serv-

ice together with other information data, such as for example time stamps of the extracted fingerprint data; address information data; and/or non-address information data.

[0016]   Furthermore, a computer program element can be provided, comprising computer program code for performing steps according to the above mentioned method when loaded in a digital processor of a computing device.

[0017]   Additionally, a computer program product stored on a computer usable medium can be provided, comprising computer readable program code for causing a computing device to perform the mentioned method.

[0018]   Advantageously, with invention embodiments, identification of incoming and outgoing fingerprint data are possible along the postal distribution network, in different locations. Identification steps may be several and may take place at sorting centers, delivery units, along the logistic chain of the postal operator.

[0019]   Moreover, with invention embodiments, significant reduction of data to be transmitted to the cloud in order to identify items based on digital fingerprint of a postal item.

[0020]   Embodiments of the invention provide a flexible approach by enabling auto scaling in the cloud on demand; e.g. with a pay per use approach.

[0021]   Embodiments of the invention enable to define customer specific requirement for postal items identification along the mail delivery network chain.

[0022]   Embodiments of the invention enable to add hardware on demand to flexible fulfill customer requirements relating to specific higher performances or near-real time functionalities.

[0023]   Embodiments of the invention enable to reduce reduction of hardware investment and of maintenance and repair costs.

[0024]   The invention will now be described in preferred but not exclusive embodiments with reference to the accompanying drawings, wherein:

Figure 1   is a block diagram schematically illustrating the path of a postal item and of its corresponding extracted fingerprint data according to an example embodiment of the present invention;

Finger 2   is a flowchart diagram schematically illustrating a method for identifying postal items outgoing from a first postal location and incoming at a second postal location in accordance with disclosed embodiments.

[0025]   At least some embodiments of the present invention address the above described issue in which a method or a system is identifying postal item outgoing from a first postal location and incoming at a second postal location.

[0026]   Figure 1 is a block diagram schematically illustrating the path of a postal item and of its corresponding extracted fingerprint data according to an example embodiment of the present invention.

[0027]   A postal item PI outgoing from a first postal location PLa is incoming into a second postal location PLb. The delivery of the postal items PI may be done via a large variety of transportation means as for example ships, trucks, plane and/or trains. The transportation operator may be the same as the postal operator managing the postal items outgoing from the first postal location PLa and/or the postal operator PLb managing the postal items incoming into the second postal location. In international shipping, typically three or more operators are involved in the postal delivery chain.

[0028]   The first postal location illustrated in Figure 1 is a postal sorting center where outgoing postal items PI are typically processed by sorting machines. At the first postal location PLa, an image camera IC is capturing an image PI_IMa of the outgoing postal item PI. A fingerprint generating module FGM is extracting from the captured image PI_IMa fingerprint data FPa. The second postal location illustrated in Figure 1 is a postal sorting center where incoming postal items PI are typically processed by sorting and sequencing machines. Also at the second postal location PLb, a camera IC is capturing an image PI_1Mb of the outgoing postal item PI. A fingerprint generating module FGM is extracting from the captured image PI_IMa fingerprint data FPb.

[0029]   Those skilled in the art easily appreciate that, in other embodiments, not shown, the first and the second postal locations PLa, PLb may be other locations different than sorting sites as for example, a first or a last mile location, any dispatching postal location, any delivery unit, any postal transportation carrier and similar. Conveniently, the image of the postal items PI may be captured at several different locations along the postal distribution network. The camera IC may capture the image of the postal items PI automatically or may be manually activated by a human operator, who may also be on the move, as for example a postman. In the shown example embodiment, the fingerprint data are extracted from the captured image by an application which is residing in the finger generating module FGM. The extracted fingerprint data FPa, FPb are sent to an interface CIF for exchanging information with a cloud matching service CMS in the cloud. In Figure 1, the interface CIF is within the cloud, the skilled in the art easily understand that such interface to the cloud matching service may be located in other locations such as, for example, in a datacenter or a premise hardware, centralized at a customer site. The interface CIF is passing the outgoing/incoming fingerprint data FPa, FPb to the cloud matching service CMS where they are registered as data corresponding to the given outgoing/incoming postal item PI. The cloud matching service CMS identifies, if present, a link between registered fingerprint data FPa, FPb of postal items PI by finding, when possible, a match between at least one registered incoming fingerprint data FPb against a set of available registered outgoing fingerprint data FPa.

[0030] Since images PI_IMa, PI_IMb of postal items PI may be captured in different locations of the postal distribution network, also the corresponding identification of tracked postal items PI is conveniently possible at various locations. The matching algorithm is though advantageously performed by a cloud matching service in the cloud. In such a manner, computing and storage resources are available from the cloud on demand with a flexible approach. In fact, the cloud matching service CMS is provided for managing the data of the postal items PI dispatched between postal locations PLa, PLb; such data management is a resource consuming task in term of required computing resource, technical skills and maintenance.

[0031] Moreover, the identification in the cloud of matching postal items, by being based on fingerprint matching, does not congest network bandwidth, since, according to the present invention, only already extracted fingerprint data FPa, FPb is sent to the cloud. For example, a rough estimate is that the network required bandwidth is less than 80% than the bandwidth required when images PI_IMa, PI_IMb are sent to the cloud.

[0032] With invention embodiments, the fingerprint storage and the matching algorithm is performed in the cloud, while the extraction of fingerprint data from images may be done in in/out-bound and in/out-ward sorting sites or any other convenient locations as required by the postal operator.

[0033] The finger print data FPa, FPb may be extracted from the image by an application invoked by a portable device (e.g. for example a smartphone or a tablet of postal operator personnel on the move) or by a computer within a postal sorting center.

[0034] In invention embodiments, the images are taken at the first mile for outgoing postal items PI and at the last mile for incoming postal items PI, the corresponding stored fingerprint data at the cloud matching site CMS are then deleted when a match is found between the registered fingerprint data FPa of outgoing postal items with the registered fingerprint data FPb of incoming postal items. Advantageously, there is some logic to store the fingerprint data as long as a postal item is in the postal process. In fact, according to such embodiments, the registration might be initiated by a scan and fingerprint calculation in the retail office at first mile. In a sorting site (outward or inward) an identification or registration may take place one or multiple times. The fingerprint data may be destroyed when the postal item is delivered, as for example by means of a last mile scan by mobile device followed by fingerprint extraction and identification at the cloud matching site.

[0035] In invention embodiments, the fingerprint data FPa, FPb may conveniently be transmitted to the cloud service site in an encrypted manner. Those skilled in the art will appreciate that encryption of fingerprint data is more secure than encryption of images.

[0036] In invention embodiments the set of fingerprint data FPa of the outgoing postal items PI may comprise information on target address and receiver name. The cloud matching site may comprise a model of the postal distribution network between the first postal site and the target address for advanced service purposes. The network model may conviniently be configured in the cloud software part. The model describes the flow between different site types e.g., collection, delivery unit, hub, hub, delivery unit, carrier.The model of the postal operator distribution network may for example include x retail offices, y depots, n sorting sites and usually again w depots and z routes. Furthermore the relation between the different node types may be modeled. Additionally, an operational data store may be introduced for keeping all the information data on postal items being in the process until delivery. With such embodments, information when the postal item is expected and at which sorting site may advantageously be provided. Additionally, re-routing of items may be supported, based on re-routing service initiated by the receiver of the item. Moreover, forecasting of volumes for the individual node types and node instances may be provided.

[0037] The fingerprint data may advantageously be transmitted to the cloud matching service CMS together with other information data such as time stamps of the extracted fingerprint data (e.g. generation time and scan time), address information (e.g. validated address, sender or receiver); and/or non-address information (e.g. stamps, endorsement forwarding information).

[0038] Finger 2 is a flowchart diagram schematically illustrating a method for identifying postal items outgoing from a first postal location and incoming at a second postal location in accordance with disclosed embodiments..

[0039] At step 20, it is provided an interface for exchanging information with a cloud matching service.

[0040] At step 22, the interface receives inputs from the first postal location of fingerprint data of a given postal item outgoing from the first postal location and passes them to the cloud matching service for registration.

[0041] At step 24, the interface receives inputs from the second postal location of fingerprint data of a given postal item incoming to the second postal location and passes them to the cloud matching service for registration.

[0042] At step 26, the cloud matching service identifies a link between registered fingerprint data of postal items when a match between registered outgoing fingerprint data and its corresponding registered incoming fingerprint data is found.

List of used reference signs

[0043]

CIF	interface for exchanging information with a cloud matching service
CMS	cloud matching service
FGM	fingerprint generating module
FPa	fingerprint data of outgoing postal item

FPb fingerprint data of incoming postal item
PI postal item
PI_Ima image of outgoing postal item
PI_Imb image of incoming postal item
PLa first postal location
PLb second postal location

Claims

1. A method for identifying postal items (PI) outgoing from a first postal location (PLa) and incoming at a second postal location (PLb) comprising the followings steps:

    a) providing an interface (CIF) for exchanging information with a matching service (CMS) in the cloud, hereinafter called cloud matching service, said cloud matching service (CMS) managing the data of the postal items (PI) dispatched between the first and the second postal locations (PLa, PLb);
    b) by the interface of the cloud matching service (CMS), receiving inputs from the first postal location (PLa) of fingerprint data (FPa) extracted from an image of a given postal item (PI) outgoing from said first postal location (PLa) and passing said received fingerprint data (FPa) to the cloud matching service (CMS) to be registered as data corresponding to the given outgoing postal item (PI);
    c) by the interface of the cloud matching service (CMS), receiving inputs from the second postal location (PLb) of fingerprint data (FPb) extracted from an image of a given postal item (PI) incoming to said second postal location (PLb) and passing said received fingerprint data (FPb) to the cloud matching service (CSS) to be registered as data corresponding to the given incoming postal item (PI);
    d) by the cloud matching service (CMS), identifying a link between registered fingerprint data (FPa, FPb) of postal items (PI) when a match between registered outgoing fingerprint data (FPa) and its corresponding registered incoming fingerprint data (FPb) is found.

2. The method of claim 1, wherein the first postal location (PLa) is selected from the group consisting of :

    - a first mile location;
    - an outgoing sorting site;
    - a dispatching postal location;
    - a delivery unit;
    - a transportation carrier.

3. The method of claim 1 or 2, wherein the second postal location (PLb) is selected from the group consisting of :

    - a last mile location;
    - an incoming sorting site;
    - a dispatching postal location;
    - a delivery unit;
    - a transportation carrier.

4. The method according to any of the previous claims, wherein the finger print data (FPa, FPb) are extracted in step b) or c) from the image by an application invoked by a portable device.

5. The method according to any of the previous claims, wherein:

    - the image (PI_IMa) of the outgoing postal item (PI) is taken at the first mile;
    - the image (PI_IMb) of incoming postal item (PI) is taken at the last mile;
    - the fingerprint data registered at the cloud matching service (CMS) of a specific mail item is deleted, when a match is found between the registered fingerprint data (FPa) of outgoing mail items with the registered fingerprint data (FPb) of incoming mail items.

6. The method according to any of the previous claims, wherein the fingerprint data is transmitted to the cloud service site in an encrypted manner.

7. The method of any of the previous claims, wherein:

    - the fingerprint data (FPa) of step b) comprise information on target address and receiver name;
    - a model of the postal distribution network between the first postal location (PLa) and the target address is provided to the cloud matching service (CMS) for advanced service purposes.

8. The method of claim 7, wherein the advanced service purposes is selected from the group consisting of:

    - estimating the delivery time of the postal item (PI) to the target address by taking into account the model of the postal distribution network;
    - supporting re-routing of postal items (PI), in accordance with receiver initiation;
    - forecasting volumes of postal items (PI) at given nodes of the postal distribution network.

9. The method of any of the previous claims, wherein the fingerprint data are transmitted to the cloud matching service (CMS) together with other information data selected from the group consisting of:

    - time stamps of the extracted fingerprint data;

- address information data; and
- non-address information data.

10. The method according to any of the previous claims **characterized in that** it is implemented in software.

11. A system for identifying postal items (PI) outgoing from a first postal location (PLa) and incoming at a second postal location (PLb) comprising the followings:

> a) means for providing an interface (CIF) for exchanging information with a matching service (CMS) in the cloud, hereinafter called cloud matching service, said cloud matching service (CMS) managing the data of the postal items (PI) dispatched between the first and the second postal locations (PLa, PLb);
> b) means for receiving, by the interface of the cloud matching service (CMS), inputs from the first postal location (PLa) of fingerprint data (FPa) extracted from an image of a given postal item (PI) outgoing from said first postal location (PLa) and passing said received fingerprint data (FPa) to the cloud matching service (CMS) to be registered as data corresponding to the given outgoing postal item (PI);
> c) means for receiving, by the interface of the cloud matching service (CMS), inputs from the second postal location (PLb) of fingerprint data (FPb) extracted from an image of a given postal item (PI) incoming to said second postal location (PLb) and passing said received fingerprint data (FPb) to the cloud matching service (CSS) to be registered as data corresponding to the given incoming postal item (PI);
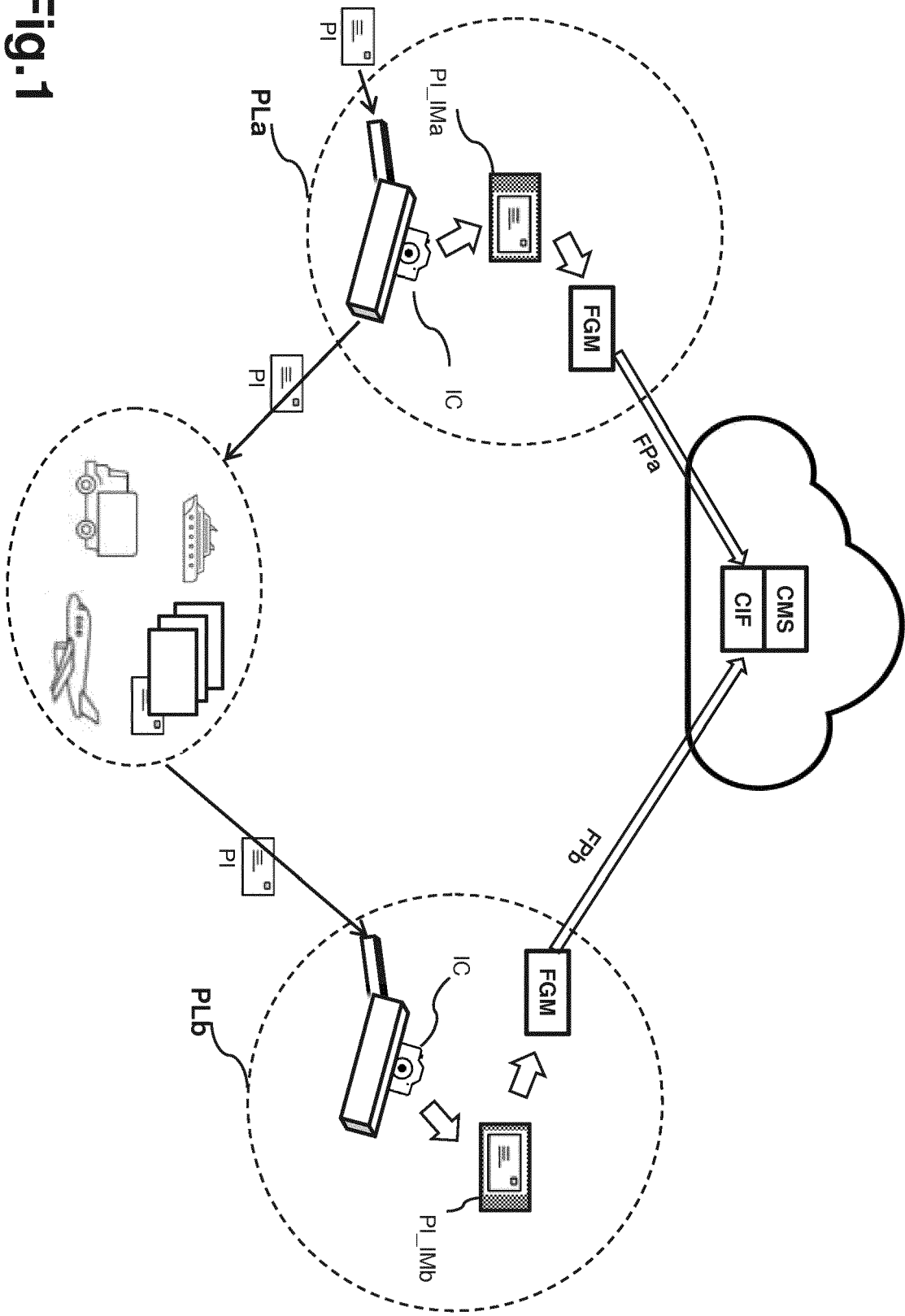> d) means for identifying, by the cloud matching service (CMS), a link between registered fingerprint data (FPa, FPb) of postal items (PI) when a match between registered outgoing fingerprint data (FPa) and its corresponding registered incoming fingerprint data (FPb) is found.
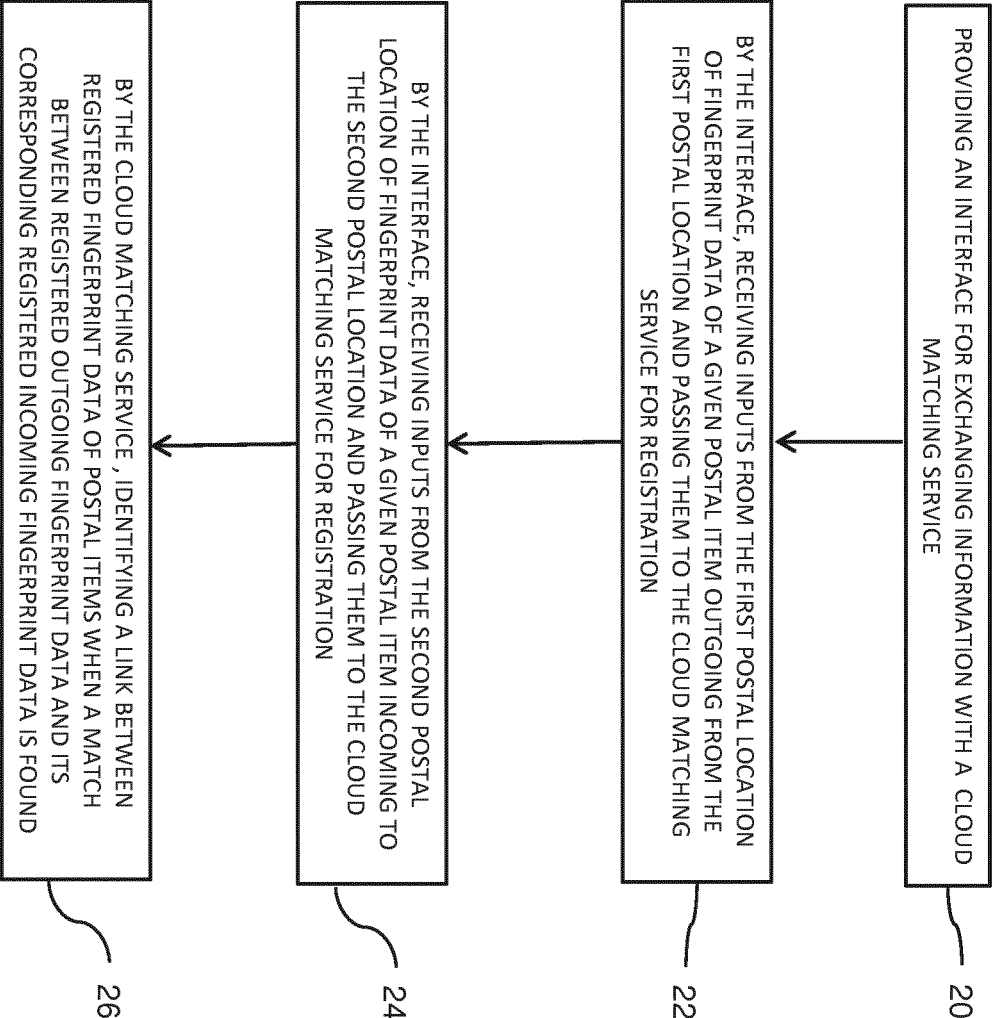
Fig.1

Fig. 2

PROVIDING AN INTERFACE FOR EXCHANGING INFORMATION WITH A CLOUD MATCHING SERVICE

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BY THE INTERFACE, RECEIVING INPUTS FROM THE FIRST POSTAL LOCATION OF FINGERPRINT DATA OF A GIVEN POSTAL ITEM OUTGOING FROM THE FIRST POSTAL LOCATION AND PASSING THEM TO THE CLOUD MATCHING SERVICE FOR REGISTRATION

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BY THE INTERFACE, RECEIVING INPUTS FROM THE SECOND POSTAL LOCATION OF FINGERPRINT DATA OF A GIVEN POSTAL ITEM INCOMING TO THE SECOND POSTAL LOCATION AND PASSING THEM TO THE CLOUD MATCHING SERVICE FOR REGISTRATION

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BY THE CLOUD MATCHING SERVICE , IDENTIFYING A LINK BETWEEN REGISTERED FINGERPRINT DATA OF POSTAL ITEMS WHEN A MATCH BETWEEN REGISTERED OUTGOING FINGERPRINT DATA AND ITS CORRESPONDING REGISTERED INCOMING FINGERPRINT DATA IS FOUND

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EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2006/100357 A1 (SOLYSTIC [FR]; DESPREZ OLIVIER [FR]; MIETTE EMMANUEL [FR]; CAILLON CHR) 28 September 2006 (2006-09-28) * abstract; claim 1; figures 1-4 * -----	1-11	INV. G06Q50/00
Y	KR 2012 0127339 A ((BDRI-N) BDRIVE INC) 21 November 2012 (2012-11-21) * abstract * -----	1-11	

TECHNICAL FIELDS
SEARCHED   (IPC)

G06Q
G06F
H04L
B07C
G06K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 October 2016	Viets, Ana

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 16 18 7344

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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07-10-2016

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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