PACKAGE DELIVERY SYSTEM

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References Cited
U.S. PATENT DOCUMENTS
4,727,368 A 2/1988 Larson et al.
5,444,444 A 8/1995 Ross
5,625,668 A 4/1997 Loomis et al.
5,774,053 A 6/1998 Porter
5,979,750 A 11/1999 Kindell
6,204,763 B1 3/2001 Sone
6,323,782 B1 11/2001 Stephens et al.

FOREIGN PATENT DOCUMENTS
JP 64-49505 2/1989

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ABSTRACT

A package storage and delivery system includes electronically controlled lockers disposed at or near customer locations. Each locker is unlocked by a courier, preferably by means of a short-range transceiver or transmitter carried on the courier’s person. The customer can unlock the locker and receive the delivered package. Cryptographically signed communications are employed along with nonvolatile usage logs to minimize the risk of loss of a package or fraud by courier or customer. The lockers may be stackable, permitting a delivery courier to add lockers in the event a customer receives too many deliveries to fit into a single locker. Each box has, of course, a physical location, and has associated with it an address code indicative of the physical location, for example by means of a human-readable or compressed representation of the precise latitude and longitude. A package delivered to such a box preferably bears the address code. A merchant can greatly reduce the risk of credit card fraud by requiring the use of such codes for the simple reason that a fraudulent transaction may be traced to a specific physical location.

1 Claim, 2 Drawing Sheets
JOE CUSTOMER

E BOX  ORD B3K7NP
WINNETKA, IL  60523

FIG. 2
PACKAGE DELIVERY SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS


BACKGROUND

The Internet and other technological changes have brought about sweeping changes in communications and commerce. But just as improved communications media such as optical fiber have been unable to solve the problem of the “last mile” of communications to a particular home, so have improved ways of placing merchandise orders been unable to solve the problem of the “last mile” of merchandise delivery to a particular home. While overnight package delivery services have become commonplace in recent years (for example, Federal Express, United Parcel Service, and Airborne), these services have great difficulty delivering to individual homes. The occupant of the home is often not there (being at work, for example) and thus a carrier may have to visit the home two or more times to effect delivery. The occupant of the home will likely return home from work to find a note on the door indicating that the carrier tried to deliver a package but no one was home.

A related set of problems present themselves when a customer seeks to return mail-order merchandise. The return may be due to a variety of reasons, from incorrect size or color to dissatisfaction with the quality or function of the merchandise. The return can be a nuisance for the customer. Real or perceived difficulty of making returns prompts some would-be mail-order customers to forgo placing the mail order.

Still another problem is mail fraud. Many mail-order merchants face problems with fraudulent orders placed using stolen credit card numbers. The losses attributable to such orders are, of course, passed back to merchants (and through them to customers) through the commissions charged for processing payments for such orders.

A related but distinct concern is simply the delivery cost of the “last mile”. A substantial part of the price charged by a carrier to deliver a package is due to the “last mile”.

There is thus a great need for package storage and delivery systems which overcome the difficulties described above. Such a system would deal with the problem that customers are often not at home. Such a system would make returns easier and would reduce risk of credit card fraud. Such a system would be less expensive than existing systems for last-mile delivery.

Many individuals and companies have devoted time, energy, and ingenuity to these problems. The typical approach is to provide lockers which are geographically nearby to customers and which are intended to remove the need for the customer to be home when the carrier arrives. Prior-art locker systems include those described in U.S. Pat. No. 5,645,215 for “Security mailbox”; U.S. Pat. No. 5,475,378 for “Electronic access control mail box system”; U.S. Pat. No. 5,229,829 for “Electric locker apparatus with automatic locker box designation device”; U.S. Pat. No. 5,074,135 for “System for the use of lockers or the like”; U.S. Pat. No. 4,894,717 for “Delivered article storage control system”; U.S. Pat. No. 4,048,926 for “Safe”; and U.S. Pat. No. 5,774,053 for “Storage device for the delivery and pickup of goods”.

No prior art approach known to applicants herein succeeds in solving all of the problems discussed above.

SUMMARY OF INVENTION

A package storage and delivery system includes electronically controlled lockers disposed at or near customer locations. Each locker is unlocked by a courier, preferably by means of a short-range receiver or transmitter carried on the courier’s person. The customer can unlock the locker and receive the delivered package. Cryptographically signed communications are employed along with nonvolatile usage logs to minimize the risk of loss of a package or fraud by courier or customer. The lockers may be stackable, permitting a delivery courier to add lockers in the event a customer receives too many deliveries to fit into a single locker. Each box has, of course, a physical location, and has associated with it an address code indicative of the physical location, for example by means of a human-readable or compressed representation of the precise latitude and longitude. A package delivered to such a box preferably bears the address code. A merchant can greatly reduce the risk of credit card fraud by requiring the use of such codes for the simple reason that a fraudulent transaction may be traced to a specific physical location.

BRIEF DESCRIPTION OF DRAWINGS

The invention will be described with respect to a drawing in several figures, of which:

FIG. 1 is a plan view showing a locker according to the invention and a home;

FIG. 2 shows a package addressed according to the invention; and

FIG. 3 shows a delivery box according to the invention.

Where possible, like reference designations have been used among the figures to show like elements.

DETAILED DESCRIPTION

Delivery of packages may be performed with respect to package lockers that are located according to a coordinate system. FIG. 1 shows a typical locker 34 attached to a home 35. The home has a location relative to lines of latitude 32, 33 and lines of longitude 30, 31 which define a grid. Lines 36, 37 define the position of the locker within the grid.

In the usual case, the location of the locker 34 is determined at the time of installation, for example using a GPS (global positioning system) receiver. The GPS receiver provides the latitude and longitude, expressed in a suitable notation such as degrees, minutes and seconds or degrees and decimal fractions of a degree. When SA (selective availability) is off, the receiver will provide a spatial resolution of typically ten or twenty feet. If SA is on, it is desirable to use DGPS (differential GPS) to provide a position of comparable accuracy.

A traditional numerical representation of a location by latitude and longitude is rather wasteful of characters. The only characters used are digits, and many of the digits are not used. Unused digits happen because, for example, the number of minutes in a degree is never more than sixty, so the first digit of a “minutes” value is never 7 or 8 or 9. Unused digits also happen because some combinations of digits correspond to geographic locations (e.g. in the Arctic or the middle of the ocean) that are unlikely to be referred to as a package delivery location. A straightforward matter to devise functions which permit expressing geographic locations with far fewer characters than decimally expressed...
latitudes and longitudes. Letters can be used along with all
ten digits to provide locations expressed in perhaps six or
eight characters depending on the desired resolution. Some
economy of effort can be accomplished by selecting a
reference point such as the airport which might be used to
deliver a courier package for an address. Once the airport
reference point is selected, it is a straightforward matter to
define latitude and longitude relative to that point rather than
relative to the usual global origin.

It is thus helpful to consider expressing a locker location
by means of an airport code followed by some letters and
numbers which communicate the precise position of the
locker relative to the reference point of the airport code.
Such an expression can be extremely helpful to a courier
delivery service. It tells which airport to send the package to,
as well as the position relative to that airport.

FIG. 2 shows a package addressed according to the
invention. A Zip code 47 may appear on the package but is
fundamentally unrelated to the position code just described.
The position code may consist of an airport code 45 as well
as a character string 46 which conveys the location relative
to the airport. Importantly, when a locker is installed, the
installer will take a GPS reading, and with appropriate
software will convert the latitude and longitude information
into the character string 46.

When a would-be customer places an order for delivery of
goods, the customer provides the entire “envelope” code 45, 46
to the merchant. The merchant uses the code 45, 46 to
address the package.

The courier company will necessarily perform sorts on
packages and will also need to load trucks efficiently. A
traditional truck-loading approach is to group the packages
by Zip code value. This has the advantage of being simple
to do, and has the disadvantage that it may pass up oppor-
tunities for trucks to be packed optimally. Two destinations
might be very near each other and yet have quite different
Zip codes, for example. Sorting packages by Zip code in
numerical order will not necessarily place packages near to
each other that represent delivery locations that are near to
each other.

The position code 45, 46 offers benefits for the trucking
and delivery companies. When a truck is being packed,
packages that are intended for locations that are suitably
nearby to reach other can be easily identified by visual
review of the position codes.

In accordance with the invention, what happens next is
that a delivery carrier takes the package to the geographic
location defined by the location code, and identifies a
delivery box 60 (FIG. 3). This box 60 has a lid 61 which
locks and unlocks under control of a microprocessor. The
carrier transmits a wireless signal to the box that prompts the
box to open, and lifts the lid 61 as shown in lifted position
63. The package may then be placed in the box 62. The lid
is closed, and the customer is notified that there is a package
in the box.

Later, the customer causes the box to unlock, preferably
by a second wireless signal, and the lid is opened. The
package is removed and the lid is closed. Preferably a log is
kept of the openings and closings of the box, and this log may
be stored in nonvolatile memory in the box for later study in
the event of some question as to the delivery of a package.

Importantly, if a merchant ships a package using a position
code of the type described here, it is likely that credit
and fraud losses could be reduced substantially. If a ship-
ment turns out to have been an order placed by a fraudulent
party, the position code permits the authorities to go directly
to the place where the package was delivered. This pinpoint-
locating ability will reduce fraud by making it easier to find
the fraudulent party, but also serves as preventive measure
since many would-be fraudulent parties will be deterred by
the increased risk of being caught.

On a very practical level a merchant that uses position-
coded addresses as described above will have a lower rate of
credit card fraud, and credit card merchant banks will likely
offer reduced credit card commissions or other incentives to
attract the business of such a merchant should also be
appreciated that a storage locker such as is described above

In an off-peak approach, the packages may be addressed
with location codes as described above. Alternatively, the
addresses may be traditional postal service addresses. In
either case, some means is required for securely unlocking
and locking the lockers. One approach is to receive an order
from a customer and to establish a unique identifier in
connection with the order. When the carrier reaches the
locker, a message is communicated to the locker, preferably
by wireless means such as radio or infrared. The locker tests
for a predetermined relationship between the message and
the identifier, and if the relationship is satisfied the locker
unlocks and the lid can be opened. The package is placed in
the locker and the lid is closed and locked. The user is then
notified that there is a package in the locker.

Those skilled in the art will have no difficulty devising
myriad obvious improvements and enhancements to the
invention described, all of which are to be considered with
the scope of the invention as defined by the claims which
follow.

What is claimed is:

1. A method for delivery of parcels with respect to peak
and off-peak times, the method comprising:

determining a physical location of a premises of a cus-
tomer within a coordinate system to within a predeter-
mined accuracy;

representing the physical location of the premises by
means of an address code indicative of the physical
location;

receiving an order for a parcel from the customer located
at the premises, the order comprising the address code;

establishing, in connection with the order, a unique iden-
tifier;

communicating the unique identifier to a locker located at
the premises;

addressing the parcel with information indicative of the
address code;

transporting the parcel to the premises, the parcel arriving
at the premises during an off-peak time;

opening the locker in the event the predetermmed rela-
tionship is found;

placing the parcel in the locker;

annunciating to the customer the placing of the parcel in
the locker.

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