

SECURITY SYSTEM AND PROCESSES FOR GOODS SUPPLY CHAIN MANAGEMENT

FIELD OF THE INVENTION

This invention relates to methods and systems for improving and/or certifying a
5 level of security of transported items, such as cargo and containers including shipping
or airline containers, and for secure supply chain management in general.

BACKGROUND ART

Recent world events particularly murders perpetrated by terrorists have led to an
10 increasing awareness of the need for secure methods and systems for transport of items
such as cargo from a source location to a destination. Transport by or for terrorists of
explosives and explosive devices, lethal chemical and biological substances, and even
fissionable nuclear materials and bombs are causing great concern to societies as real-
istic threats. Maintenance of security throughout the whole packing, transport and de-
15 livery process is now considered desirable to the integrity of intra-state, national and
particularly international goods shipments. The recent Customs-Trade Partnership
Against Terrorism protocol (C-TPAT) has been developed by cooperation of US Cus-
toms services and the trade community to enhance border security throughout the inter-
national supply chain. Importers, exporters, manufacturers, suppliers, brokers and
20 warehouses are participants in the process as well as Customs services. Ensuring the
secure flow of goods shipped through the ports (which includes land, sea and air trans-
port terminals) and particularly shipping container facilities of the world is very desir-
able for a confident and progressive trade environment. Participants in the industry re-
quire a safe and effective shipping and transportation system. Parties taking delivery of
25 shipped/transported goods are requiring more assurances that items received do not
present a security risk at any point in the supply chain.

International trade may be expected to triple by the year 2020, exposing trans-
porters, shipping lines, freight forwarders and importers to increasing scrutiny as a re-
sult of real and perceived risk.

30 The above background is not intended to be, nor should it be interpreted as, an
indication of the common general knowledge pertaining to the field of the invention,

but rather to assist the person skilled in the art in understanding the developmental process which led to the invention.

It is an object of this invention to improve on current security processes and operations employed in the transportation/shipping of goods or to at least provide a useful
5 alternative thereto.

It is a further and preferred object of the present invention to provide a method and system for providing for a certifiable level of security of a goods shipment at source and for enabling monitoring and verification and certification that security of the goods shipment has been maintained through a shipment transit operation.

10 A further and preferred object is to provide a secure supply chain management method and system.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a method of provid-
15 ing and verifying security of goods shipments, the method including the processes of:

providing a shipment information system for storing data about particular identifiable goods shipments, the system being capable of interrogation to retrieve and provide such data from different interrogation locations and/or at different times in the shipment transit process,

20 providing a secure premises for preparation of shipments, the secure premises including physical security structures, a personnel access security system, monitoring systems for monitoring operations within the premises, and recording data transfer system for transferring data to be recorded concerning personnel identifications, personnel movements, personnel activities at the premises, and concerning goods move-
25 ments and operations at the premises,

inspecting goods to comprise a shipment at the secure premises, including performing at least one, and usually multiple, inspection operations under supervision of a computer programmed inspection monitoring system,

recording in the shipment information system data concerning the nature of the
30 inspection processes and the results of the inspection processes,

securing and certifying the shipment of goods at the secure premises including performing physical securing processes, and performing technological securing proc-

esses to enable detection of any tampering with or damage to the physical securing of the shipment or other possible compromise to the security of the shipment,

recording in the shipment information system data concerning the securing and certifying processes,

5 monitoring the shipment in transit after leaving the secure premises by identifying the shipment, identifying the location of the shipment, and identifying the security condition of the shipment, and

recording in the shipment information system data concerning the results of the shipment monitoring operations,

10 whereby the nature and security processes and operations performed on the goods shipment at the secure premises and throughout subsequent handling and transit operations can be checked and verified in the shipment information system including at the destination of the shipment enabling certification of the level of security of that shipment.

15 Preferably the recording data transfer system is operative to transfer data concerning personnel and goods to an operations archive for retrieval of that data for security verification and investigation purposes. At least some of the data concerning personnel and goods preferably comprise data linked to particular identifiable shipments and those linked data are transferred to and recorded in the shipment information system. Also, preferably the linked data include personnel activities at the premises which
20 are associated with the inspection operations performed on the goods which are included in or which comprise the particular associated identifiable shipment.

The process of inspecting goods may include multiple inspection operations selected from: visual inspections, physical examinations, radiological inspections, radioactivity inspections, vapour/trace chemical tests, chemical analyses, olfactory
25 evaluations, metal detection, and explosive detection.

The method may further include the process of classifying the particular type of goods to be included in or to comprise the shipment and selecting from multiple programmed inspection operations at least one inspection operation appropriate for such
30 goods, the method further including the step of routing the goods through selected inspection stations at the secure premises where the selected inspection operations are

performed, and recording the particular inspection operations and the results thereof at each station in the shipment information system.

The method may further include the process of performing an electronic securing process as the technological securing process, the method including the process of
5 detecting and signalling to at least the shipment information system any tampering, interference or damage to the electronic seal.

According to a further aspect of the invention there is provided a system for providing and verifying security of goods shipments, the system including:

a shipment information system for storing data about particular identifiable
10 goods shipments, the system being capable of interrogation to retrieve and provide such data at different locations and/or different times in the shipment transit process,

a secure premises for preparation of shipments, the secure premises including physical security structures, a personnel access security system, monitoring systems for monitoring operations within the premises, and a recording data transfer system for
15 transferring data to be recorded concerning personnel identifications, personnel movements, personnel activities at the premises, and concerning goods movements and operations at the premises,

means for inspecting goods to comprise a shipment at the secure premises by performing at least one inspection process on the goods under supervision of a com-
20 puter programmed inspection monitoring system,

means for recording in the shipment information system data concerning the nature of the inspection processes and the results of the inspection processes,

means for securing and certifying the shipment of goods at the secure premises including physical securing means, and performing technological securing means to
25 enable detection of any tampering with or damage to the physical securing of the shipment or other possible compromise to the security of the shipment,

means for recording in the shipment information system data concerning the use of the securing and certifying means in connection with the particular shipment,

means for monitoring the shipment in transit after leaving the secure premises
30 by identifying the shipment, identifying the location of the shipment, and identifying the security condition of the shipment, and

means for recording in the shipment information system data concerning the results of the operation of the shipment monitoring means,

whereby the nature and security processes and operations performed on the goods shipment at the secure premises and throughout subsequent handling and transit operations can be checked and verified in the shipment information system including at the destination of the shipment enabling certification of the level of security of that shipment.

The invention in a further aspect provides an installation for the secure preparation, optional storage, and despatch of a goods shipment to be transported, the installation including:

- a) a secure packing facility where the contents and/or details of the goods are verified and recorded, the shipment is sealed and an identification marker such as a tag is applied to the shipment;
- b) a non-intrusive inspection facility whereby the shipment is subjected to a non-intrusive inspection prior to and/or following sealing as appropriate;
- a) visual monitoring means capable of scanning the secure packing and inspection facilities;
- c) identification detection means capable of identifying the location of the identification marker within and when leaving the installation; and
- d) a monitoring and information system storing and displaying selectively outputting information and/or data from:
 - i) the verification and recordation of the contents and/or details of the goods;
 - ii) the identification detection means; and
 - iii) optionally exceptions and alerts arising from the nature of the goods or shipment or from the verification, recordation, inspection or marker identification processes.

In another aspect of the invention there is provided a method for the secure preparation and despatch of a goods shipment to be transported once processed in an installation, the method including the steps of:

- a) verifying and recording the contents and/or details of the goods in a monitoring and information system;

- b) securely packing the goods;
- c) sealing the shipment to maintain the integrity of the shipment during the transport process;
- d) applying an identification marker such as a tag to the shipment;
- 5 e) subjecting the shipment to a non-intrusive inspection;
- f) visually scanning the locations through which the goods and shipment progress in the installation using visual monitoring means;
- g) scanning for the identification marker using an identification marker detection means to locate and monitor the identification marker within the installation; and
- 10 h) monitoring the information and data relating to the shipment by association with the identification marker through a monitoring and information system capable of storing and selectively outputting information and/or data from steps a) and g).

15 The monitoring and information system preferably operates in real-time. The information and data which may be output or displayed by the monitoring and information system preferably reflects the current status of the shipment and its progress through the installation, as well as throughout the subsequent supply chain.

The method preferably further includes an intrusive inspection step whereby the
20 goods are subjected an intrusive inspection prior to packing. This may involve the physical and/or manual inspection of the goods. The weight and/or dimensions of the goods and/or containers may be assessed and recorded on the monitoring and information system.

The goods may be transported as a discrete entity or may be further packaged
25 for transport purposes by inclusion with other goods in a container, for example, a shipping container. This step may involve cargo staging and/or stuffing. This step may further involve the sealing of the container. The sealing of the container may involve providing a security or tamper evident seal adapted to deter or prevent unauthorised attempts to access the container or its contents.

30 The non-intrusive inspection facility may involve a radiological inspection of the item using an imaging device. For example, the use of an X-ray device such as that used to inspect luggage at airports may be employed. A Magnetic Resonance Imager

(MRI) may also be utilised. The imaging device may include a real-time display for an operator. Preferably the imaging device includes a facility whereby an image can be displayed and/or stored on the monitoring and information system. Storage of the image is advantageous for the purpose of despatch and delivery comparisons to identify
5 any anomalies, such as the removal of the item from a storage container, the addition of an unauthorised item to a storage container or an alteration in the contents of the item.

The non-intrusive inspection facility and/or the intrusive inspection step may involve searching or testing for substances which may constitute a security risk. For example, inspection pre- or post-packing of the contents of the item may involve analyses
10 for explosives, dangerous or damaging chemicals or biological agents radioactive materials, and/or illicit drugs. Such inspections may involve the use of vapour or residue trace analysis involving chemical or electronic devices, or may involve the use of trained animals with acute sensory abilities.

The visual monitoring means may include a variety of different light or heat
15 sensitive scanners, such as standard and infrared cameras. The visual monitoring means may be associated with or have a recording facility, such as a digital data storage capability linked to the monitoring and information system. The visual monitoring means preferably includes strategically placed cameras in the installation. Preferably the cameras are linked to one or more closed circuit television monitoring (CCTV sys-
20 tem) which may be controlled by or associated with the monitoring and information system. The cameras may record still or moving images which may be correspondingly stored as such. The cameras may be able to pan and/or tilt, governed by an automatic program controlled by the monitoring and information system or optionally manually operable by a remote operator such as customs or security personnel.

25 Personnel may be equipped with handheld data input devices to feed data to the monitoring and information system. This may be utilised to record the physical inspection of the goods pre and post packing, and to provide status updates.

The identification marker may be, for example, a visual marker (e.g. barcode label) or an electronic tag. Preferably, the identification tag is detectable by a remote
30 scanning device using transponder or inductance technology. Most preferably, the identification tag is detectable by radio frequency identification (RFID). The identification tag scanning devices are preferably linked to the monitoring and information

system, so that RFID tracking may be performed by the monitoring and information system. The RFID tags may be applied during the sealing process following packing of the shipment. The sealing process may be performed using a heat welding, chemical or electronic sealing method. Preferably the sealing method involves electronic sealing
5 and the application of the RFID.

The identification tag may be detectable by one or more checking in and out stations. For example, the tag identification station may be posted at a critical location in the installation to detect the passage of the item from one sector of the installation to another, for example between the packing storage and despatch sectors. Where the
10 identification tag is an RFID tag, the checking station may be an RFID signpost. Therefore, the location of the shipment and its progress through the installation may be monitored in real-time and its status categorised in terms of the zone in which it is currently located.

The installation may include a storage area for storing shipments such as packed
15 goods and/or containers. The storage area may be monitored by the visual monitoring means and/or identification marker detection means.

The installation may include standard security devices such as physical fencing to exclude accidental or intentional intruders. The fencing may be electrified. The fencing may include physical breach detection means to identify unauthorised entries.
20 Authorised personnel identification, authorisation, movement and activities monitoring using conventional ID systems and procedures and using camera monitoring and security are preferably performed continuously at the installation.

The method may further include the following steps:

- i) tracking and tracing the transport progress of the shipment from the instal-
25 lation through shipment progress points and/or one or more exchange centres to the item's ultimate destination.

The exchange centres may include train, road transport, airport and marine shipping terminals. The exchange centres may include an origin or national home port, a transshipment or intermediate port, a country-of-destination port, a distribution centre, a retailer's store support such as a warehouse and/or a retail store. Other exchange
30 or destination centres such as may be involved in postal or intra-company deliveries include government, military, institution, private and business premises.

The entire process from despatch from the installation to the ultimate destination preferably involves the tracking and tracing of the shipment using the identification marker. If at any point, security of the shipment is breached by tampering the seal/tag, then exception and alerts will be generated. The monitoring and information system
5 may be linked to each of the exchange centres whereby the location and movement of the shipment may be monitored at all times during the transportation process. Linkage may be in real-time whereby to provide constantly updated data on the location and security maintenance of the shipment.

The inventive method may therefore be used to monitor the progress of a large
10 plurality of shipments such as may be included in freight transport via shipping, rail, road or air transport.

The monitoring and information system may be a computer hardware installation and associated operating computer software. The monitoring and information system may be a computer system controlled by dedicated software. It may be adapted
15 to provide a comprehensive menu of services modifiable according to a user's individual requirements. The computer software may be adapted to support the following operations and functions:

1. Continuous shipment/container monitoring including from remote locations
e.g. through Web access by authorised persons;
- 20 2. Targeting and profiling modules to determine the mode of inspection;
3. Highly configurable workflow processes;
4. Image capturing of both personnel and goods security processes;
5. An audit trail;
6. Exception handling and real time notification and alerts;
- 25 7. Comprehensive reporting capabilities with Key Performance Indicators (KPI);
8. Support for electronic sealing of shipments; and/or
9. Support for interfacing with multiple information systems.

According to a yet further aspect of the invention there is provided a method of
30 enhancing presumption of security of cargo through a supply chain from a source to a destination comprising:

- (1) conducting secure cargo handling and transportation by

- (i) providing security at the source by
 - (a) validating the cargo and conducting inspection processes appropriate for the nature of the cargo, and
 - (b) providing physical and/or technological sealing of the cargo,
- 5 (ii) providing security during transport of the cargo from the source to the destination by monitoring of location, progress, and conditions of sealing of the cargo during that transport,
- (2) collecting and recording information for monitoring and validating security of the cargo including
 - 10 (i) monitoring and recording the nature and results of the cargo validating and inspection processes,
 - (ii) monitoring and recording details of the sealing of the cargo, and
 - (iii) recording details of the monitoring of the location, progress and conditions of sealing of the cargo from the source to the destination including any irregular or exceptional conditions thereof,
 - 15
- (3) providing secure interrogation and reporting functions for parties to and parties interested in the transport of the cargo and its security by enabling access to and selective retrieval of the collected and recorded information.

The method preferably further includes generation of alerting reports by processing the collected and recorded information from the monitoring of the cargo transport from the source to the destination and detecting any irregular or exceptional status of the cargo including its sealing. In addition, there is preferably the further step of providing an interrogation function and selective generation of a real time track and trace report to provide the present location and security condition and to provide a history of the transport of the cargo.

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The inspection processes conducted at the source are preferably controlled according to a programmed inspection regime for the nature of the goods.

The step of providing security at the source may further include security screening of personnel having access to the cargo or to facilities at the source and monitoring the personnel activities and movements at the source, and further comparing those activities and movements to programmed activities and movements permitted or expected for the personnel.

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The method may further include selective generation of audit reports relating to security related processes and operations. The generation of audit reports preferably includes selective generation of an audit report relating to personnel and cargo handling procedures and operations at the source.

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BRIEF DESCRIPTION OF THE DRAWINGS

The advantages of the inventive method and installation will be more fully appreciated by reference to the non-limiting possible and preferred features now described with reference to the accompanying drawings. However, it is to be understood
10 that the features illustrated in and described with reference to the drawings are not to be construed as limiting on the scope of the invention. In the drawings:

Figure 1 is a schematic view of a secure premises and facilities and operations therein according to an embodiment of the invention;

Figure 2 is a view of a particular possible installation according to an embodiment of the invention;
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Figure 3 is schematic physical and information flow representation of a secure transport supply chain according to an embodiment of the invention; and

Figure 4 is a schematic flow chart of a secure supply chain system according to an aspect of the present invention.

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DETAILED DESCRIPTION OF THE DRAWINGS

Referring to Fig. 1, there is a shipment information system 20 to store data about particular goods shipments. The system 20 can be interrogated from terminals 21 to retrieve and provide such data at different locations and/or at different times in the
25 shipment transit process.

There is a secure premises 10 where shipments are prepared which includes physical security structures such as fences and walls 11, monitored goods entry points 12, monitored shipment departure points 13, a personnel access security system 14, and monitoring systems indicated schematically by circles for monitoring operations within
30 the premises. The monitoring systems have associated recording data transfer systems for transferring data to be recorded concerning personnel identifications, personnel

movements, personnel activities at the presence, and concerning goods movements and operations at the premises.

An inspections operations section 15 receives goods which are to comprise an outgoing shipment. A computer program inspection monitoring system 16 supervises,
5 directs and/or performs multiple inspection operations at individual inspection stations 17 where different types of inspections are performed and the goods can be routed from one inspection station 17 to another appropriate for the particular types of goods. Data concerning the nature of the inspection processes and results of the inspection processes are transferred to and recorded in the shipment information system 20.

10 A securing and certifying section 25 receives the goods from the inspection section 15 where physical securing processes and technological securing processes are performed to secure and certify the shipment. The technological securing processes include enablement of detection of any tampering with or damage to the physical securing of the shipment or other possible compromise to the security of the shipment.
15 Data concerning the securing and certifying processes and operations are transferred from the securing monitoring system 26 and recorded in the shipment information system 20. The system also includes means 30 to monitor the shipment in transit after leaving the secure premises 10 by identifying the shipment, its location, and the security condition of the shipment. The results of the shipment monitoring operations are
20 transferred to and recorded in the shipment information system 20.

This system enables the nature and security processes and operations performed on the goods shipment at the secure premises 10 and throughout subsequent handling and transit operations to be checked and verified in the shipment information system 20 including at the destination 40 of the shipment, enabling certification of the level of security of that shipment.
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In the illustrated and preferred embodiment of Fig. 1, the recording data transfer system comprised by or including the multiple monitoring and data gathering points illustrated by circles is operative to transfer data concerning personnel and goods to an operations archive 22, which is illustrated as part of the shipment information system
30 20 but could be separate, for retrieval of that data for security verification and investigation purposes. At least some of the data concerning personnel and goods comprise data linked to particular identifiable shipments and those linked data are transferred to

and recorded in the shipment information system 20. Also, the linked data desirably includes personnel activities at the premises 10 which are associated with the inspection operations section 15 performed on the goods are included in or which comprise the particular associated identifiable shipment.

5 The particular processes of inspecting goods performed in the inspection operations section 15 will be selected so as to be appropriate for the particular types of goods being handled. For example the inspecting operations would normally be selected from: visual inspections, manual physical examinations, radiological inspections, radioactivity inspections, vapour/trace chemical tests, other chemical analyses, olfactory
10 evaluations (e.g. by trained animals, usually dogs), metal detection, and explosive detection.

The particular type of goods to be included in or to comprise the shipment can be classified prior to or at arrival at the premises 10. The inspection monitoring system 16 may include functionality to select from multiple programmed inspection operations
15 the particular inspection operations appropriate for the classified goods, and may be operable to route the goods through selected inspection stations 17 where the selected inspection operations are performed. The system 16 can record the particular inspection operations and the results thereof at each station and transfer that data for storage in the shipment information system 20.

20 The securing and certifying section 25 as mentioned above performs an electronic securing process as the technological securing process. The system can therefore include functionality of the monitoring and data gathering points indicated by the circles to detect and signal to at least the shipment information system 20 any tampering, interference or damage to the electronic seal.

25 A particular installation 101 is shown in Figure 2. The installation 101 includes a packaging area 110 (outside a fenced area of the installation 101 defined by a fence 105), an arrival zone 120, a secured cargo staging and stuffing area 130, a monitoring and information system 140, a plurality of loading bays 150, a secured container yard area 160 and a despatch zone 170.

30 In the packaging area 110, an item 111 is subjected to an intrusive manual and device enhanced inspection by an operator. The operator is equipped with a handheld data entry device preferably wireless linked to the monitoring and information system

140. Data and information may be entered such as the dimensions and weight of the item, a brief description thereof, the results of radiological, explosive detection, biological and chemical vapour- and residue-trace detection tests. In addition, images of the inspection processes can also be stored through the system. This is stored in the
5 monitoring and information system 140 and used assess the security risk or for purposes of comparison at a later stage in the transport process. The item 111 has a optional non-removable radiofrequency identification (RFID) tag 112 applied to it on its surface or on its external packaging as the case may be. The item 111 is then transported by forklift or other conveying means such as a conveyor belt arrangement to the
10 arrival zone 120.

The arrival zone 120 is within the fence 105 boundaries and includes a RFID signpost 121 to provide the first point within the fenced area 105 whereby the RFID tag 112 and the transfer from the packaging area 110 to the arrival zone 120 may be detected. The RFID signpost 121 is in communication with the monitoring and information
15 system 140.

The cargo area 130 includes camera surveillance in the form of closed circuit television (CCTV) cameras 131 in direct communication with a monitoring display panel in a control room of the installation manned by an operator and preferably, with the monitoring and information system 140 for recordal of images from the cameras
20 131. The cameras have a pan, tilt and zoom capabilities and are operative for 24 hour recording.

In the cargo area 130 the items are loaded according to normal practice in shipping containers and may be stored in the cargo area, depending on demand requirements. When required for despatch, the containers are moved to the transfer bays 150
25 for forwarding to loading onto transport 171 in the secured container yard area 160. A RFID signpost 132 is assigned to each bay 150 and to the vehicle parking areas 180 for further security. The secured container yard area 160 includes at least two RFID readers 162 adapted to keep track of the items 111 and to enable detection of any anomalies in their movements or any breach of the electronic seal. The secured container yard
30 area 160 also is further secured by video surveillance using cameras 161.

When authorisation to despatch the item 111 is provided according to the monitoring and information system 140, the item 111 is stuffed into a container. When

the container is full, it is electronically sealed and then loaded onto a transport vehicle 171 which then exits the installation 101 via the despatch zone 170. The despatch zone 170 includes RFID signposts 172 to register departures according to the RFID tags attached to each item 111.

5 The monitoring and information system 140 may be located on or off site. The monitoring and information system 140 is driven by dedicated computer software. The monitoring and information system 140 may be used to control and monitor the operations of a plurality of installations 101. Where the monitoring and information system 140 is off-site, there may be a server 141 on site to improve data flow efficiencies and
10 monitoring and information system 140 response times. The monitoring system will generate exception reports and alerts whenever there is any security breach or tampering of the electronic seal at any point of the supply chain. The monitoring and information system 140 is useful to generate the necessary manifests and other official documentation required to support the passage of the item through customs. The
15 monitoring and information system 140 may also be used to create security summaries of items 111 or containers in which they are to be shipped to satisfy recipients of the low security risk of such deliveries. The monitoring and information system 140 may also be used to create an audit trail to ensure proper tracking and traceability of the item 111 or containers should the item 111 or the container be wrongly delivered or other-
20 wise misplaced.

The installation 101 of the preferred embodiment is part of a typical wider secure supply chain 200 shown in Fig. 3.

The secure supply chain 200 includes the installation 101 as the origin of the item 111 to be transported. It further typically includes road transport from the supply
25 installation 101 to an origin or home port 210, a transshipment port 220, a destination port 230, a distribution centre 240, a retailer's or an importer's store support centre 250 and the ultimate destinations such as retail stores 260.

Throughout the entire chain 200 at each centre 210-260, there is provided feedback means such as RFID readers and signposts. These feedback means are effective
30 to deliver data of the progress of the RFID tag 112 and the integrity of the electronic seal. The skilled addressee will be familiar with the variety of ways in which such communications can be effected, such as by maintenance of LAN or WAN computer

network, whether communication signals are carried by landline, satellite transmission, landlines, or a combination of these. The arrows 201 between the centres 210-260 indicate physical transport flows, whereas the arrows 202 between the monitoring and information system 140 and the centres 210-260 indicate information or data flows.

5 It can be seen that the monitoring and information system 140 can be used to track and trace in real time each item 111 or the container conveyed under the system and to ensure the security of the item 111 or the container and the safety of the recipients.

10 It will be seen that the preferred processes and systems of the present invention as described and illustrated can provide a comprehensive and versatile system for secure supply chain management. It involves a combination of processes, infrastructure and software that verifies and secures cargo and ensures it is secure at origin, provides information throughout the shipment transit from source to destination and particularly validates that the cargo along the supply chain is safe upon arrival at destination.

15 When considered as an entire system for enhancing the presumption of security of cargo, the system can provide a supply chain management solution from source to destination by providing security at the source and information from the source and from intermediate operations through to the destination. Therefore it is possible to provide visibility of the processes and enhance manifest integrity through the supply chain.

20 In particular, the source or origin of the goods can be constituted by facilities at a manufacturer, warehouse, or secure facility. The system can provide for audit of inbound processes, audit of outbound processes, inspection and container stuffing services, technological or E-sealing services and preparation of cargo for shipment. The system can provide an automated C-TPAT compliance process to certify the shipment
25 at the origin.

The system also provides for collation of information from all sources through the supply chain including information from the origin of the goods or cargo, information from freight forwarders, information from ports, information from shipping, and information from and reports to customs. The system can therefore enable provision of
30 a service of collating a required body of information for parties to and parties interested in the supply chain process.

The enhanced presumption of security of the cargo throughout the supply chain and particularly ensuring safety at the destination is enabled by providing visibility and ensuring manifest integrity through the supply chain, including monitoring and recording the cargo status at origin, status at the freight forwarder, status at the port, status
5 during shipping, and status at destination. A real time secure track and trace service can be provided by the system.

The management system can address and provide solutions for a broad and comprehensive range of functions and operations including:

administration, such as system administration, system monitoring, human re-
10 sources management,

inspection services including intrusive inspections, metal detection, gamma or x-ray scanning, explosives detection, vapour/trace detection, acoustic detection, etc.

process control and auditing, including inbound processes, inspection processes, outbound processes, E-sealing processes, auditing processes,

15 physical security and visibility, including smartcard access, biometric identification, motion detection, CCTV, intrusive detection and alarm, guard patrol systems, vehicle access and control.

Figure 4 of the drawings shows schematically a flow chart of supply chain processes, operations, goods movements, monitoring operations and data collection and
20 output. These components and operations of the supply chain system according to the invention can be understood from the preceding descriptions read in conjunction with the flow chart itself.

Throughout the specification and claims the word “comprise” and its derivatives are intended to have an inclusive meaning rather than an exclusive meaning unless the
25 context requires otherwise.

It will be appreciated by skilled persons that many modifications and variations may be made to the embodiments described herein without departing from the spirit and scope of the invention.

It will be seen that advantages of the system of the present invention for participants in the supply chain can include efficient monitoring and control of cargo shipments arising from abilities of the system to real time status and detailed shipment information, exception handling and real time notifications, cargo flow visibility, con-
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tinuous shipment or container monitoring, on line generation of shipping documentation, key performance indicator (KPI) reports (to aid statistical analyses and decisions), interfacing with external systems. The provision of C-TPAT compliant reports and security verifications can enable faster customs clearances with attendant economic benefits.

5 fits.

CLAIMS

1. A method of providing and verifying security of goods shipments, the method including the processes of:

providing a shipment information system for storing data about particular identifiable goods shipments, the system being capable of interrogation to retrieve and provide such data from different interrogation locations and/or at different times in the shipment transit process,

providing a secure premises for preparation of shipments, the secure premises including physical security structures, a personnel access security system, monitoring systems for monitoring operations within the premises, and recording data transfer system for transferring data to be recorded concerning personnel identifications, personnel movements, personnel activities at the premises, and concerning goods movements and operations at the premises,

inspecting goods to comprise a shipment at the secure premises, including performing at least one, and usually multiple, inspection operations under supervision of a computer programmed inspection monitoring system,

recording in the shipment information system data concerning the nature of the inspection processes and the results of the inspection processes,

securing and certifying the shipment of goods at the secure premises including performing physical securing processes, and performing technological securing processes to enable detection of any tampering with or damage to the physical securing of the shipment or other possible compromise to the security of the shipment,

recording in the shipment information system data concerning the securing and certifying processes,

monitoring the shipment in transit after leaving the secure premises by identifying the shipment, identifying the location of the shipment, and identifying the security condition of the shipment, and

recording in the shipment information system data concerning the results of the shipment monitoring operations,

whereby the nature and security processes and operations performed on the goods shipment at the secure premises and throughout subsequent handling and transit operations can be checked and verified in the shipment information system including at

the destination of the shipment enabling certification of the level of security of that shipment.

2. A method according to Claim 1 wherein the recording data transfer system is operative to transfer data concerning personnel and goods to an operations archive for retrieval of that data for security verification and investigation purposes.

3. A method according to Claim 2 wherein at least some of the data concerning personnel and goods comprise data linked to particular identifiable shipments and those linked data are transferred to and recorded in the shipment information system.

4. A method according to Claim 3 wherein the linked data include personnel activities at the premises which are associated with the inspection operations performed on the goods which are included in or which comprise the particular associated identifiable shipment.

5. A method according to any one of Claims 1 to 4 wherein the process of inspecting goods includes multiple inspection operations selected from:
visual inspections, physical examinations, radiological inspections, radioactivity inspections, vapour/trace chemical tests, chemical analyses, olfactory evaluations, metal detection, and explosive detection.

6. A method according to any one of Claims 1 to 5 and further including the process of classifying the particular type of goods to be included in or to comprise the shipment and selecting from multiple programmed inspection operations at least one inspection operation appropriate for such goods, the method further including the step of routing the goods through selected inspection stations at the secure premises where the selected inspection operations are performed, and recording the particular inspection operations and the results thereof at each station in the shipment information system.

7. A method according to any one of Claims 1 to 6 and further including the process of performing an electronic securing process as the technological securing process, the method including the process of detecting and signalling to at least the shipment information system any tampering, interference or damage to the electronic
5 seal.

8. A system for providing and verifying security of goods shipments, the system including:

a shipment information system for storing data about particular identifiable
10 goods shipments, the system being capable of interrogation to retrieve and provide such data at different locations and/or different times in the shipment transit process,

a secure premises for preparation of shipments, the secure premises including physical security structures, a personnel access security system, monitoring systems for monitoring operations within the premises, and a recording data transfer system for
15 transferring data to be recorded concerning personnel identifications, personnel movements, personnel activities at the premises, and concerning goods movements and operations at the premises,

means for inspecting goods to comprise a shipment at the secure premises by performing at least one inspection process on the goods under supervision of a com-
20 puter programmed inspection monitoring system,

means for recording in the shipment information system data concerning the nature of the inspection processes and the results of the inspection processes,

means for securing and certifying the shipment of goods at the secure premises including physical securing means, and performing technological securing means to
25 enable detection of any tampering with or damage to the physical securing of the shipment or other possible compromise to the security of the shipment,

means for recording in the shipment information system data concerning the use of the securing and certifying means in connection with the particular shipment,

means for monitoring the shipment in transit after leaving the secure premises
30 by identifying the shipment, identifying the location of the shipment, and identifying the security condition of the shipment, and

means for recording in the shipment information system data concerning the results of the operation of the shipment monitoring means,

whereby the nature and security processes and operations performed on the goods shipment at the secure premises and throughout subsequent handling and transit operations can be checked and verified in the shipment information system including at the destination of the shipment enabling certification of the level of security of that shipment.

9. An installation for the secure preparation, optional storage, and despatch of a goods shipment to be transported, the installation including:

- a) a secure packing facility where the contents and/or details of the goods are verified and recorded, the shipment is sealed and an identification marker such as a tag is applied to the shipment;
- b) an inspection facility whereby the shipment is subjected to a non-intrusive inspection prior to and/or following sealing;
- c) visual monitoring means capable of scanning the secure packing and inspection facilities;
- d) identification detection means capable of identifying the location of the identification marker within and upon leaving the installation; and
- e) a monitoring and information system storing and selectively outputting information and/or data from:
 - i) the verification and recordation of the contents and/or details of the goods;
 - ii) the identification detection means; and
 - iii) optionally exceptions and alerts arising from the nature of the goods or shipment or from the verification, recordation, inspection or marker identification processes.

10. An installation according to claim 9, wherein the monitoring and information system operates in real-time and the information and data which is output or displayed by the monitoring and information system reflects the current status of the

shipment and its progress through the installation as well as throughout the subsequent supply chain.

11. An installation according to claim 9 or 10, wherein the monitoring and
5 information system is a computer system controlled by dedicated software and is adapted to coordinate the passage of the goods and to monitor the goods' progress through the installation as well as throughout the subsequent supply chain.

12. An installation according to any one of claims 9 to 11, wherein the
10 monitoring and information system is a computer system customizable controlled by dedicated software and provides a menu of shipment security services or selectable according to a customer's individual requirements (or of any participant in the supply chain).

13. An installation according to any one of claims 9 to 12, wherein the
15 identification marker is a radiofrequency identification (RFID) tag applied to the shipment.

14. An installation according to any one of claims 9 to 13, wherein the non-
20 intrusive inspection includes a radiological inspection.

15. An installation according to any one of claims 9 to 14, wherein the non-
intrusive inspection includes tests for traces of explosives, or chemical or biological
agents.

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16. An installation according to any one of claims 9 to 15, wherein the visual monitoring means includes video surveillance cameras.

17. An installation according to any one of claims 9 to 16, wherein the in-
30 stallation is divided into packing, storage and despatch zones and each said zone includes at least one of said identification marker detection means.

18. An installation according to claim 17, wherein the identification marker is an RFID tag and the identification marker detection means is a RFID signpost, capable of registering the presence of a particular RFID tag.

5 19. An installation according to any one of claims 9 to 18, wherein the monitoring and information system is operable to generate shipping manifests, exception reports or alerts.

20. A method for the secure preparation and despatch of a goods shipment
10 to be transported once processed in an installation, the method including the steps of:

- a) verifying and recording the contents and/or details of the goods in a monitoring and information system;
- b) securely packing the goods;
- c) sealing the shipment to maintain the integrity of the shipment during the
15 transport process;
- d) applying an identification marker such as a tag to the shipment;
- e) subjecting the shipment to a non-intrusive inspection;
- f) visually scanning the locations through which the goods and shipment progress in the installation using visual monitoring means;
- 20 g) scanning for the identification marker using an identification marker detection means to locate and monitor the identification marker within the installation; and
- h) monitoring the information and data relating to the shipment by association with the identification marker through a monitoring and information system
25 capable of storing and selectively outputting information and/or data from steps a) and g).

21. A method according to claim 20, further including the step of transporting the shipment through one or more exchange centres and to an ultimate destination,
30 wherein the data recorded in the monitoring and information system creates an audit trail for the shipment.

22. A method according to claim 21, wherein the one or more exchange centres include a port for international transfer of goods.

23. A method of enhancing presumption of security of cargo through a supply chain from a source to a destination comprising:

- (1) conducting secure cargo handling and transportation by
 - (i) providing security at the source by
 - (a) validating the cargo and conducting inspection processes appropriate for the nature of the cargo, and
 - (b) providing physical and/or technological sealing of the cargo,
 - (ii) providing security during transport of the cargo from the source to the destination by monitoring of location, progress, and conditions of sealing of the cargo during that transport,
- (2) collecting and recording information for monitoring and validating security of the cargo including
 - (i) monitoring and recording the nature and results of the cargo validating and inspection processes,
 - (ii) monitoring and recording details of the sealing of the cargo, and
 - (iii) recording details of the monitoring of the location, progress and conditions of sealing of the cargo from the source to the destination including any irregular or exceptional conditions thereof,
- (3) providing secure interrogation and reporting functions for parties to and parties interested in the transport of the cargo and its security by enabling access to and selective retrieval of the collected and recorded information.

24. A method as claimed in claim 23 and further including generation of alerting reports by processing the collected and recorded information from the monitoring of the cargo transport from the source to the destination and detecting any irregular or exceptional status of the cargo including its sealing.

25. A method as claimed in claim 23 or 24 and further including providing an interrogation function and selective generation of a real time track and trace report to provide the present location and security condition and to provide a history of the transport of the cargo.

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26. A method as claimed in any one of claims 23 to 25 wherein the inspection processes conducted at the source are controlled according to a programmed inspection regime for the nature of the goods.

10 27. A method as claimed in any one claims 23 to 26 wherein the step of providing security at the source further includes:

(c) security screening of personnel having access to the cargo or to facilities at the source and monitoring the personnel activities and movements at the source, and further comparing those activities and movements to
15 programmed activities and movements permitted or expected for the personnel.

28. A method as claimed in any one of claims 23 to 27 and further including selective generation of audit reports relating to security related processes and opera-
20 tions.

29. A method as claimed in claim 28 wherein the generation of audit reports includes selective generation of an audit report relating to personnel and cargo handling procedures and operations at the source.

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