

SYSTEM AND METHOD FOR STORING AND SEQUENCING LUGGAGE ITEMS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This PCT Patent Application claims the benefit of U.S. Patent Application Serial Number 15/289,786 filed on October 10, 2016 entitled “System And Method For Storing And Sequencing Luggage Items”, the entire disclosure of the application being considered part of the disclosure of this application and hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] A system and method for storing and sequencing a plurality of luggage items. More specifically a system and method for automatically storing, and sequencing luggage items according to an associated grouping criterion.

2. Discussion

[0003] When passengers travel via commercial conveyance methods such as on airliners, the conveyance company often allows the passengers to check their luggage items. The conveyance company and their agents, collect, process, transport, and return to the passenger the checked luggage items upon arrival at the final passenger's final destination.

[0004] During processing of the luggage items by the conveyance company, it is often advantageous to group luggage items together based on a grouping criterion, such as a group of passengers traveling together on a shared reservation. Any processing or processing changes due to events such as connections made or missed are generally applicable to all passengers on a shared reservation and therefore routing or storage of the associated luggage can be simplified by grouping that luggage together. Furthermore, luggage items which are sorted and grouped together at one location or step of a trip may be

kept together and routed accordingly at subsequent locations, which may save the time and effort that would otherwise be required to sort and identify those luggage items multiple times at each of the subsequent locations.

[0005] In the current state of the art, stored luggage is managed a number of ways. For example, the stored luggage items may be manually stored in an area designated for holding or storing. Such manual handling methods tend to be labor intensive, prone to worker injury, and prone to manual miss-handling error. For trips having one or more intermediate destinations with changes in conveyances, or stopover locations, luggage is commonly unloaded and resorted at each intermediate destination along the route in addition to an initial sorting at the departure location and a final sorting at the final destination.

[0006] According to another example method, stored luggage items may be sorted to, and accumulated on, long sections of belt conveyor. Each section of belt conveyor may hold a group of luggage items that have common attributes such as flight number or departure time window.

[0007] Certain issues associated with conveyor processing and storage systems of the prior art have been recognized. For example, such systems require substantial floor space and capital investment. Furthermore, the handling of stored bags in large groups obviates the possibility of processing individual bags or smaller groups of bags. Such handling may be necessary when a passenger changes itinerary or when a flight schedule changes unexpectedly. When these events happen, the entire group, or entire belt section, must be re-sorted to separate the desired luggage item(s) from the group. These handling constraints impair the flexibility of these systems.

[0008] In view of the foregoing, there remains a need for improvements to systems and methods for storing and sequencing luggage items.

SUMMARY OF THE INVENTION

[0009] A system for storing and sequencing a plurality of luggage items is provided. The system includes at least one container having a plurality of shelves vertically stacked on top of one another and supported by a first chassis. The system also includes one or more automatic guided vehicles for transporting the containers and/or luggage items and which may also load the luggage items onto the containers. The system includes an entrance conveyor positioned in the loading area and delivers luggage items into the loading area. A first predetermined area is spaced apart from the loading area with a first pathway extending therebetween. The system also includes at least one carrier automatic guided vehicle releasably attachable to the container for transporting the container between the loading area and the first predetermined area and a loading assembly to move the luggage item from the entrance conveyor onto one of the shelves of the container. A control system may be connected to the loading assembly for instructing the loading assembly to move the luggage item from the entrance conveyor onto one of the shelves of the container. The control system may also be wirelessly connected to the carrier automatic guided vehicle for controlling the movement of the carrier automatic guided vehicle along the first pathway.

[0010] A method for storing and sequencing a plurality of luggage items is also provided. The method includes receiving at least one of the luggage items into a loading area from an entrance conveyor; determining a grouping criterion of the luggage item; and providing a plurality of containers each including a plurality of shelves vertically stacked on top of one another. The method also includes sorting the luggage items through the steps of determining by the control system if any of the containers is associated with the grouping criterion of the luggage item and is an available container being in a location proximate to the loading area and having at least one available shelf with capacity to hold the luggage item, and designating by the control system such a container as a preferred container, and if

no such container exists then designating by the control system an available container not associated with the grouping criterion of the luggage item as a preferred container. The method proceeds with the steps of attaching a carrier automatic guided vehicle to the preferred container; loading the luggage item from the entrance conveyor onto an available shelf of the preferred container; and moving the container with the luggage item by the carrier automatic guided vehicle to a first predetermined area. The method steps do not necessarily need to be performed in the order listed. For example, the step of attaching a carrier automatic guided vehicle to the preferred container may be performed either before, after, or during the step of loading the luggage item from the entrance conveyor onto an available shelf of the preferred container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0012] Fig. 1 is a block diagram showing the main areas and components of the system;

[0013] Fig. 2 a top view of a first example embodiment of a loading area according to an aspect of the disclosure;

[0014] Fig. 3A is a side view of a container in accordance with an aspect of the disclosure;

[0015] Fig. 3B is a front view of the container of Fig. 3A;

[0016] Fig. 4A is a top view of a carrier automatic guided vehicle in accordance with an aspect of the disclosure;

[0017] Fig. 4B is a side view of the carrier automatic guided vehicle of Fig. 4A;

[0018] Fig. 4C is a side view of the carrier automatic guided vehicle of Fig. 4A in position under a container;

[0019] Fig. 5 is a perspective view of another carrier automatic guided vehicle of in position under another container in accordance with an aspect of the disclosure;

[0020] Fig. 6A is a top view of a plurality of adjacent and aligned containers with one another in the first direction and with a carrier automatic guided vehicle disposed below each container;

[0021] Fig. 6B is the top view Fig. 6A with the carrier automatic guided vehicles moved away from the adjacent and aligned containers in a second direction;

[0022] Fig. 6C is the top view Fig. 6A with a transport vehicle disposed below the adjacent and aligned containers;

[0023] Fig. 7 is a side view of Fig. 6C, with the transport vehicle disposed below the adjacent and aligned containers;

[0024] Fig. 8A is a top view of a packing automatic guided vehicle in accordance with an aspect of the disclosure;

[0025] Fig. 8B is a side view of the packing automatic guided vehicle of Fig. 8A;

[0026] Fig. 9 is a perspective view of a luggage item being placed upon a packing automatic guided vehicle by an over-the-top conveyor in accordance with an aspect of the disclosure;

[0027] Fig. 10 is a is a perspective view of a luggage item being placed upon a shelf of a container by a packing automatic guided vehicle in accordance with an aspect of the disclosure;

[0028] Fig. 11 is a cut-away side view of a loading assembly in accordance with another aspect of the disclosure that includes a loading conveyor and three platform

conveyors stacked on top of one another and each at the same height of a corresponding shelf of a container; and

[0029] Fig. 12 is a flow diagram of an example method for sorting and sequencing luggage items according to an aspect of the disclosure.

DESCRIPTION OF THE ENABLING EMBODIMENTS

[0030] Referring to the Figures, wherein like numerals indicate corresponding parts throughout the several views, a system and method for storing and sequencing a plurality of luggage items **20** is provided. The example embodiments demonstrate how the subject system and method may be utilized to store and sequence checked-in luggage items **20** in an airport. However, it should be appreciated that the subject system and method can be utilized to store and sequence luggage items **20** in other transportation hubs including, but not limited to, train stations, bus stations and marinas.

[0031] With reference to Figs. 3A and 3B, the system includes at least one container **22** including a plurality of shelves **24** vertically stacked on top of one another and supported by a first chassis **26**. The container **22** may be sized and configured to hold one or more standard sized luggage items **20** on each shelf **24**. Standard sized luggage items **20** may include, for example, suit cases, carry-on type bags or other similarly sized bags. The shelves **24** may, for example, be 58" wide by 34" deep. Other container configurations may also be used, such as ones designed to accommodate oversize luggage items such as golf bags or skis or snowboards. As shown in Fig. 5, the first chassis **26** of the container **22** may include four upright posts **28** holding the shelves **24** in position and with an end panel **30** disposed on an opposite end of each shelf **24**. The end panels **30** may provide structural rigidity to the containers **22** and may help to hold luggage items **20** in place on the shelves **24** when the containers **22** are being moved. One or more of the containers **22** may include a plurality of first wheels **32** so the containers **22** may be manually moved, such as by rolling

without an automatic guided vehicle attached thereto. At least one pair of the first wheels **32** may be pivotable, such as with a swivel caster, to aid in turning the container **22**. At least one of the first wheels **32** may include a brake lock to prevent the container **22** from unintentionally moving, such as rolling on a pitched surface or being inadvertently pushed, such as by wind or jetwash. The containers **22** may also include other features such as a handle to aid in manual movement.

[0032] The system also includes one or more automatic guided vehicles **34, 36** for transporting the containers **22** and/or luggage items **20** and which may also load the luggage items **20** onto the containers **22**. It should be appreciated that other types of material handling devices **38, 40**, e.g., conveyors, belts, and human driven vehicles, may be utilized in certain operations of the system. As will be discussed in greater detail below, each of the automatic guided vehicles **34, 36** are programmed to automatically, i.e., without a human driver, to move through the loading area **42** based on instructions provided by a control system **44**. It should be appreciated that any number of automatic guided vehicles **34, 36** could be utilized and it is advantageously easy to add and remove automatic guided vehicles **34, 36** to/from the loading area **42**. It should also be appreciated that the containers **22** may be moved and loaded/unloaded manually as needed.

[0033] As shown in Fig. 2, a series of pathways **46, 48** are disposed on the ground of the loading area **42** on which the automatic guided vehicles **34, 36** are configured to follow based on instructions provided by the control system **44**. The pathways **46, 48** include numerous segments that extend to different parts of the loading area **42** and which may extend outside of the loading area **42** to other predetermined areas **50, 52**. The other predetermined areas **50, 52** may include, for example, a storage area, an inspection station, and an unloading area. The pathways **46, 48** may include designated handoff locations **54** where the luggage items **20** may be transferred to the containers **22**. The pathways **46, 48**

may take various forms including, but not limited to, magnetic markers or wires on the floor. Further, the pathways **46, 48** may be electronically mapped into software of the control system **44** such that the automatic guided vehicle may be programmed to automatically move along programed segments of the pathways **46, 48** via coordinate mapping using GPS or other technologies.

[0034] As shown in Figs. 1 and 2, the system includes an entrance conveyor **56** positioned in the loading area **42** which delivers luggage items **20** into the loading area **42**. In the example embodiments, the entrance conveyor **56** is a belt-style conveyor which ultimately extends from a check-in area of the airport. As such, the entrance conveyor **56** delivers baggage items into the loading area **42** that have been checked-in by passengers. It should be appreciated that the entrance conveyor **56** may receive luggage items **20** from other locations. A first predetermined area **50** is spaced apart from the loading area **42** with a first pathway **46** extending between the loading area **42** and the first predetermined area **50**. The system also includes at least one carrier automatic guided vehicle **34** releasably attachable to the container **22** for transporting the container **22** between the loading area **42** and the first predetermined area **50** and a loading assembly **58** to move the luggage item **20** from the entrance conveyor **56** onto one of the shelves **24** of the container **22**. A control system **44** may be connected to the loading assembly **58** for instructing the loading assembly **58** to move the luggage item **20** from the entrance conveyor **56** onto one of the shelves **24** of the container **22**. The control system **44** may also be wirelessly connected to the carrier automatic guided vehicle **34** for controlling the movement of the carrier automatic guided vehicle **34** along the first pathway **46** between the loading area **42** and the first predetermined area **50**.

[0035] According to an aspect and as shown in Fig. 2, one or more of the shelves **24** of the containers **22** may include a pair of opposite sides **60** and the loading assembly **58**

may be configured to move the luggage item **20** onto one of the shelves **24** of the container **22** with the loading assembly **58** adjacent to either of the opposite sides **60**.

[0036] As best shown in Figure 4A – 4C, the carrier automatic guided vehicles **34** each include a second chassis **62**, a plurality of second wheels **64** that are connected to the second chassis **62** for establishing rolling movement of the carrier automatic guided vehicle **34**, and a support surface **66** disposed on the second chassis **62** for removably supporting one of the containers **22**. The support surface **66** may, for example, engage and lift the container **22** vertically to support the container **22** off of the ground. It should be appreciated that other configurations of the carrier automatic guided vehicles **34** could be utilized. For example, the carrier automatic guided vehicles **34** could be configured to push or pull the containers **22** rather than carry the containers **22**.

[0037] According to an aspect and as shown in Figs. 6A, 6B, 6C and 7, the system may also include a transport vehicle **68** configured to move a plurality of containers **22** together. As shown in the Figures, the transport vehicle **68** may lift and move the plurality of containers **22** in a first direction **70** with the containers **22** being adjacent and aligned with one another in the first direction **70**. It should be appreciated that other configurations of the transport vehicle **68** could be utilized. For example, the transport vehicle **68** could be configured to push or pull the containers **22** rather than carry the containers **22**.

[0038] According to an aspect shown in Figs. 8A, 8B, 9 and 10, the loading assembly **58** may include a packing automatic guided vehicle **36** having a fourth chassis **72** and a first transfer device **38** supported by the fourth chassis **72** for holding a luggage item **20** and for moving the luggage item **20** onto a shelf **24** of the container **22**; the packing automatic guided vehicle **36** may also include a lifting mechanism **74** interconnecting the fourth chassis **72** and the first transfer device **38** and providing vertical movement of the first transfer device **38** relative to the fourth chassis **72** for aligning the first transfer device

38 with one of the shelves **24** of the container **22**. As shown in Fig. 8B, the lifting mechanism **74** may include, for example, a scissor mechanism. The first transfer device **38** may include, for example, a belt conveyor, a roller conveyor, or a pusher device.

[0039] The packing automatic guided vehicle **36** may further include a coupling means for releasably coupling the packing automatic guided vehicle **36** with the container **22** to prevent relative motion therebetween. The coupling means may, for example, take the form of a pin or latch. As shown in Fig. 9, a luggage item **20** may be transferred from the entrance conveyor **56** and onto to the packing automatic guided vehicle **36** using an over-the-top style loading conveyor **76**.

[0040] According to another aspect and as shown in Fig. 11, the loading assembly **58** may include a plurality of platform conveyors **78** disposed in vertically stacked relationship with one another with each of the platform conveyors **78** disposed at the same height as a corresponding one of the shelves **24** of the container **22**. The loading assembly **58** may further include a loading conveyor **76** extending from the entrance conveyor **56** and pivotable relative to the entrance conveyor **56** for alignment with one of the platform conveyors **78** for moving the luggage item **20** from the entrance conveyor **56** onto one of the platform conveyors **78**. A plurality of second transfer devices **40** each associated with a corresponding one of the platform conveyors **78** may move the luggage item **20** from the platform conveyor **78** onto the corresponding one of the shelves **24** of the container **22**. The second transfer devices **40** may include, for example, a belt conveyor, a roller conveyor, or a pusher device.

[0041] A method for storing and sequencing a plurality of luggage items **20** having an associated grouping criterion is also provided. The method includes **100** receiving at least one of the luggage items **20** into a loading area **42** from an entrance conveyor **56**; **102** determining the grouping criterion of the luggage item **20** by the control system **44**; and **104**

providing a plurality of containers **22** each including a plurality of shelves **24** vertically stacked on top of one another. The method also includes steps for sorting the luggage items **20** by **106** determining by the control system **44** if any of the containers **22** is associated with the grouping criterion of the luggage item **20** and is an available container **22** being in a location proximate to the loading area **42** and having at least one available shelf with capacity to hold the luggage item **20**, and **108** designating by the control system **44** such a container **22** as a preferred container **22**, and if no such container **22** exists then **110** designating by the control system **44** an available container **22** not associated with the grouping criterion of the luggage item **20** as a preferred container **22**. The method may include associating the container **22** by the control system **44** with the grouping criterion of the luggage item **20**. The method further includes the step of **112** attaching a carrier automatic guided vehicle **34** to the preferred container **22**. The method proceeds with the steps of **114** loading the luggage item **20** from the entrance conveyor **56** onto an available shelf of the preferred container **22**; and **116** moving the container **22** with the luggage item **20** by the carrier automatic guided vehicle **34** to a first predetermined area **50**. The step of **116** moving the container **22** with the luggage item **20** by the carrier automatic guided vehicle **34** to a first predetermined area **50** may be performed after the control system **44** determines that all of the shelves **24** of that container **22** are loaded with luggage items **20**. The control system **44** may also initiate step of **116** moving the container **22** with the luggage item **20** by the carrier automatic guided vehicle **34** to a first predetermined area **50** as a result of the occurrence of a transfer criteria such as, for example, if the flight associated with that grouping criteria is scheduled for final loading before takeoff or the expiration of a holding criteria, such as, for example, if a predetermined period of time has elapsed since any luggage items **20** associated with a group of travelers traveling on a shared reservation have entered the system.

[0042] According to an aspect of the invention, the method may also include the step of moving the container **22** with the luggage item **20** to a second predetermined area **52**. For example, luggage items **20** which are grouped according to a common flight which is not scheduled for departure until some distant time in the future may be initially sent to first predetermined area **50** which is a storage area, and at the desired time for further processing, such as loading onto the common flight, the container **22** with the luggage item **20** may then be moved to the second predetermined area **52** which may be a loading area **42** for moving the luggage item **20** onto the common flight. As discussed above, the method steps may be performed in an order different than the order described herein.

[0043] According to an aspect of the invention, the containers **22** may include first wheels **32** and the method may include the step of moving the container **22** manually and without a carrier automatic guided vehicle **34** being attached to the container **22**. This may be advantageous if one or more luggage items **20** require special processing outside of the normal automated process. This manual movement of the containers **22** may also allow them to be manually moved throughout a facility including areas where an automatic guided vehicle is not suitable, for example, in elevators, in passenger concourses, etc. and may be used by passengers or by airport or security personnel for baggage storage, transit, pickup or drop-off. For example, in cases where additional baggage claim capacity is required, such as for large events or peak travel seasons, containers **22** may be provided in a designated area, such as for passenger drop-off or pickup of luggage items **20**. This may allow for an airport to accommodate those cases requiring additional baggage claim capacity without requiring expensive permanent infrastructure, such as extra claim belt conveyors which would remain unused most of the time.

[0044] According to an aspect of the invention, the shelves **24** may each have two opposite sides **60**, and the method may include the step of loading the luggage item **20** onto

an available shelf of the preferred container **22** further includes loading the luggage item **20** onto the available shelf of the preferred container **22** from either one of the two opposite sides **60**.

[0045] The method step of loading the luggage item **20** onto an available shelf of the preferred container **22** may include moving the luggage manually onto an available shelf of the preferred container **22**.

[0046] According to one embodiment, the method may also include the use of a loading assembly **58** with a packing automatic guided vehicle **36** having a fourth chassis **72**, a first transfer device **38**, and a lifting mechanism **74** interconnecting the fourth chassis **72** and the first transfer device **38** and providing vertical movement of the first transfer device **38** relative to the fourth chassis **72**. In using the packing automatic guided vehicle **36**, the method step of loading the luggage item **20** onto an available shelf of the preferred container **22** may include moving the luggage item **20** from the entrance conveyor **56** onto the first transfer device **38** of the packing automatic guided vehicle **36**. As shown in Fig. 9, the step of loading the luggage item **20** onto to the packing automatic guided vehicle **36** may be performed by an over-the-top style loading conveyor **76**.

[0047] The method may proceed with the step of moving the packing automatic guided vehicle **36** along a second pathway **48** to a position adjacent to the preferred container **22**. As shown in Fig. 2, this position adjacent may include the preferred container **22** being located at a designated handoff location **54**. The method may further include moving the first transfer device **38** into vertical alignment with a selected one of the shelves **24** of the container **22** with the lifting mechanism **74**; and moving the luggage item **20** from the packing automatic guided vehicle **36** onto the selected shelf **24** of the preferred container **22** with the first transfer device **38**. The method may also include the step of coupling the packing automatic guided vehicle **36** with the preferred container **22** to prevent

relative motion therebetween prior to moving the luggage item **20** from the packing automatic guided vehicle **36** onto the selected shelf **24** of the preferred container **22** with the first transfer device **38**.

[0048] According to another embodiment, the method may include using a loading assembly **58** having a plurality of platform conveyors **78** disposed in a vertically stacked relationship with one another with each of the platform conveyors **78** disposed at the same height as one of the shelves **24** of the container **22**, a loading conveyor **76** extending from the entrance conveyor **56** and pivotable relative to the entrance conveyor **56** for alignment with each of the platform conveyors **78**, and a plurality of second transfer devices **40** each disposed at the same height as a corresponding one of the platform conveyors **78**. In using the platform conveyors **78**, the method step of loading the luggage item **20** onto an available shelf of the preferred container **22** may include pivoting the loading conveyor **76** into alignment with a platform conveyor **78** corresponding to the available shelf; moving the luggage item **20** from the entrance conveyor **56** to the selected one of the platform conveyors **78** with the loading conveyor **76**; and moving the luggage item **20** from the selected one of the platform conveyors **78** onto the available shelf of the preferred container **22** with the second transfer device **40**.

[0049] According to an aspect of the invention, the grouping criterion may be based upon the luggage items **20** belonging to one or more passengers traveling together with a shared reservation.

[0050] According to another aspect of the invention, the grouping criterion may be based upon processing requirements of the luggage items **20**. Several examples of processing requirements of the luggage items **20** are described in more detail below.

[0051] According to another aspect of the invention, the processing requirements of the luggage items **20** include a security inspection or a customs inspection. For example, all

luggage designated for a security or customs inspection, which may depend on the destination region or country, may be grouped together to all be moved to the associated inspections area.

[0052] According to another aspect of the invention, the processing requirements of the luggage items **20** include the luggage items **20** being associated with a common departure time window. For example, all luggage designated for departures more than hours in the future may be grouped together to be sent to a long-term storage area. As another example, all luggage designated for departure times less than a predetermined period of time may be flagged for priority processing and may have an associated grouping criterion set that allows for those luggage items **20** to be processed with minimal delays to increase the chances of the luggage items **20** making it on the associated aircraft.

[0053] According to another aspect of the invention, the processing requirements of the luggage items **20** include the luggage items **20** being associated with a first transportation means having a common destination; and the common destination being a final destination and the luggage items **20** being designated to be made available for claim at the common destination. In other words, not being designated for transfer by the conveyance company to a second transportation means such as a connecting flight. This type of grouping may simplify processing at the common destination by allowing, for example, all of the luggage items **20** designated for claim at the common destination to be placed in one or more cargo crates which may be sent directly to a claims area without the need for separating out luggage items **20** bound for connecting flights upon arrival at the common destination.

[0054] According to another aspect of the invention, the processing requirements of the luggage items **20** include the luggage items **20** being associated with a first transportation means having a common first destination; and the luggage items **20** being

designated for transfer to a second transportation means upon arrival at the common first destination. This aspect is similar to the aspect described above and may also provide a similar benefit of simplified processing at the common first destination. As an example, this type of grouping may provide for all of the luggage items **20** designated for transfer to another flight at the common destination to be placed in one or more cargo containers **22** which may be sent directly to a transfer sorting area without the need for separating out luggage items **20** bound for passenger claim upon arrival at the common first destination.

[0055] According to another aspect of the invention, the processing requirements of the luggage items **20** also include the luggage items **20** being designated for a common intermediate destination following the common first destination. Like the example above, processing of the luggage items **20** at the common first destination may be simplified by having all of the luggage items **20** which are bound for a common intermediate destination being grouped together. By being grouped together, the luggage items **20** bound for a common intermediate destination may be transferred as a single group to the flight bound for that intermediate destination. This transfer together may eliminate the step of processing those individual luggage items **20** at the common intermediate destination.

[0056] According to a further aspect of the invention, the processing requirements of the luggage items **20** may also include the luggage items **20** being designated for a common final destination following the common first destination. Similar to the examples above, the luggage items **20** above may be grouped and processed together through any number of intermediate steps without needing to process the individual luggage items **20** all the way through to the common final destination where that group of luggage items **20** may be transferred together to a baggage claim area for passenger pickup.

[0057] As best shown in Figs. 6A, 6B and 6C, the method may also include steps for moving a plurality of containers **22** together by a transport vehicle **68**. Those steps may

include: moving one of the containers **22** with a carrier automatic guided vehicle **34** adjacent to another one of the containers **22** such that the containers **22** are aligned in a first direction **70** as adjacent and aligned containers **22**; disengaging the carrier automatic guided vehicle **34** from the one of the containers **22** and moving the carrier automatic guided vehicle **34** free of the one of the containers **22** in a second direction **84** transverse to the first direction **70**. The method may conclude with the steps of engaging the adjacent and aligned containers **22** with a transport vehicle **68** and moving the adjacent and aligned containers **22** together with the transport vehicle **68** in the first direction **70**. In the example shown in Figs. 6A, 6B and 6C, the transport vehicle **68** is an automatic guided vehicle which lifts to support the adjacent and aligned containers **22** similar to the way that the carrier automatic guided vehicles **34** may move each container **22** individually.

[0058] Obviously, many modifications and variations of the present invention are possible in light of the above teachings and may be practiced otherwise than as specifically described while within the scope of the appended claims. These antecedent recitations should be interpreted to cover any combination in which the inventive novelty exercises its utility. The use of the word "said" in the apparatus claims refers to an antecedent that is a positive recitation meant to be included in the coverage of the claims whereas the word "the" precedes a word not meant to be included in the coverage of the claims.

What is claimed is:

1. A method for storing and sequencing a plurality of luggage items, said method comprising:
 - receiving a luggage item into a loading area from an entrance conveyor;
 - determining a grouping criterion of the luggage item;
 - providing a plurality of containers each including a plurality of shelves being vertically stacked on top of one another and supported by a first chassis;
 - determining by a control system if any container within the plurality of containers is associated with the grouping criterion of the luggage item and is an available container being in a location proximate to said loading area and having at least one available shelf with capacity to hold the luggage item;
 - designating by the control system an available container that is associated with the grouping criterion of the luggage item as a preferred container;
 - designating by the control system an available container not associated with the grouping criterion of the luggage item as the preferred container if no container of the plurality of containers is determined to be both an available container and associated with the grouping criterion of the luggage item;
 - attaching a carrier automatic guided vehicle to the preferred container;
 - loading the luggage item from the entrance conveyor onto an available shelf of the preferred container; and
 - moving the container with the luggage item by the carrier automatic guided vehicle along a first pathway to a first predetermined area.
2. The method as set forth in claim 1 further including the step of moving the container with the luggage item to a second predetermined area.
3. The method as set forth in claim 1 wherein the container includes first wheels; and the method further includes the step of moving the container manually and without a carrier automatic guided vehicle being attached to the container.
4. The method as set forth in claim 1 wherein the shelves each have two opposite sides, and wherein the step of loading the luggage item onto an available shelf of the preferred container further includes:

loading the luggage item onto the available shelf of the preferred container from either one of the two opposite sides.

5. The method as set forth in claim 1 wherein the step of loading the luggage item onto an available shelf of the preferred container further includes:

moving the luggage manually onto an available shelf of the preferred container.

6. The method as set forth in claim 1 further including a loading assembly that includes a packing automatic guided vehicle having a fourth chassis, a first transfer device, and a lifting mechanism interconnecting the fourth chassis and the first transfer device and providing movement of the first transfer device relative to the fourth chassis;

wherein the step of loading the luggage item onto an available shelf of the preferred container further includes:

moving the luggage item from the entrance conveyor onto the first transfer device of the packing automatic guided vehicle;

moving the packing automatic guided vehicle along a second pathway and adjacent to the preferred container;

moving the first transfer device into alignment with a selected one of the shelves of the container with the lifting mechanism; and

moving the luggage item from the packing automatic guided vehicle onto the selected shelf of the preferred container with the first transfer device.

7. The method as set forth in claim 6 wherein the method further includes the step of coupling the packing automatic guided vehicle with the preferred container to prevent relative motion therebetween prior to moving the luggage item from the packing automatic guided vehicle onto the selected shelf of the preferred container with the first transfer device.

8. The method as set forth in claim 1 further including a loading assembly including a plurality of platform conveyors disposed in a vertically stacked relationship with one another with each of the platform conveyors disposed at the same height as one of the shelves of the container, a loading conveyor extending from the entrance conveyor and pivotable relative to the entrance conveyor for alignment with each of the platform conveyors, and a plurality of second transfer devices each disposed at the same height as a corresponding one of the platform conveyors;

wherein the step of loading the luggage item onto an available shelf of the preferred container further includes:

pivoting the loading conveyor into alignment with a selected one of the platform conveyors corresponding to the available shelf;

moving the luggage item from the entrance conveyor to the selected one of the platform conveyors with the loading conveyor; and

moving the luggage item from the selected one of the platform conveyors onto the available shelf of the preferred container with the second transfer device.

9. The method as set forth in claim 1 wherein the grouping criterion is based upon the luggage items belonging to one or more passengers traveling together with a shared reservation.

10. The method as set forth in claim 1 wherein the grouping criterion is based upon processing requirements of the luggage items.

11. The method as set forth in claim 10 wherein the processing requirements of the luggage items include a security inspection or a customs inspection.

12. The method as set forth in claim 10 wherein the processing requirements of the luggage items include the luggage items being associated with a common departure time window.

13. The method as set forth in claim 10 wherein the processing requirements of the luggage items include the luggage items being associated with a first transportation means having a common destination; and

the common destination being a final destination and the luggage items being designated to be made available for claim at the common destination and not being designated for transfer to a second transportation means.

14. The method as set forth in claim 10 wherein the processing requirements of the luggage items include the luggage items being associated with a first transportation means having a common first destination; and

the luggage items being designated for transfer to a second transportation means upon arrival at the common first destination.

15. The method as set forth in claim 14 wherein the processing requirements of the luggage items also include the luggage items being designated for a common intermediate destination following said common first destination.

16. The method as set forth in claim 14 wherein the processing requirements of the luggage items also include the luggage items being designated for a common final destination following said common first destination.

17. The method as set forth in claim 1 wherein the method further includes the step of moving a plurality of containers together by a transport vehicle.

18. The method as set forth in claim 17 further including the steps of moving one of the containers with a carrier automatic guided vehicle adjacent to another one of the containers such that the containers are aligned in a first direction as adjacent and aligned containers;

disengaging the carrier automatic guided vehicle from the one of the containers and moving the carrier automatic guided vehicle free of the one of the containers in a second direction transverse to the first direction; and

engaging the adjacent and aligned containers with a transport vehicle and moving the adjacent and aligned containers together with the transport vehicle in the first direction.

19. A system for storing and sequencing a plurality of luggage items having an associated grouping criterion, said system including:

at least one container including a plurality of shelves being vertically stacked on top of one another;

a loading area including an entrance conveyor for receiving the luggage items into said loading area;

a first predetermined area spaced apart from the loading area;

at least one first pathway extending between said loading area and said first predetermined area;

at least one carrier automatic guided vehicle releasably attachable to said container for transporting said container between said loading area and said first predetermined area;

a loading assembly disposed in said loading area and configured to move the luggage item from said entrance conveyor onto one of said shelves of said container;

a control system connected to said loading assembly for instructing said loading assembly to move the luggage item from said entrance conveyor onto one of said shelves of said container;

said control system wirelessly connected to said carrier automatic guided vehicle for controlling the movement of said carrier automatic guided vehicle along said first pathway between said loading area and said first predetermined area;

wherein said control system is configured to determine if the at least one container is associated with the grouping criterion of the luggage item;

wherein said control system is configured to determine if the at least one container is an available container being in a location proximate to said loading area and having at least one available shelf with capacity to hold the luggage item;

wherein said control system is configured to designate an available container that is associated with the grouping criterion of the luggage item as a preferred container; and

wherein said control system is configured to designate an available container not associated with the grouping criterion of the luggage item as the preferred container if no containers of the plurality of containers are determined to be both an available container and associated with the grouping criterion of the luggage item.

20. The system as set forth in claim 19 wherein the container further includes a plurality of first wheels and is configured to be manually moved without an automatic guided vehicle attached thereto.

21. The system as set forth in claim 19 wherein each of said shelves of said container further includes a pair of opposite sides and said loading assembly is configured to move the luggage item onto one of said shelves of said container with the loading assembly adjacent to either of the opposite sides.

22. The system as set forth in claim 19 further including a transport vehicle configured to move a plurality of containers together.

23. A system for storing and sequencing a plurality of luggage items having an associated grouping criterion, said system including:

at least one container including a plurality of shelves being vertically stacked on top of one another;

a loading area including an entrance conveyor for receiving the luggage items into said loading area;

a first predetermined area spaced apart from the loading area;

at least one first pathway extending between said loading area and said first predetermined area;

at least one carrier automatic guided vehicle releasably attachable to said container for transporting said container between said loading area and said first predetermined area;

a loading assembly disposed in said loading area and configured to move the luggage item from said entrance conveyor onto one of said shelves of said container;

a control system connected to said loading assembly for instructing said loading assembly to move the luggage item from said entrance conveyor onto one of said shelves of said container;

said control system wirelessly connected to said carrier automatic guided vehicle for controlling the movement of said carrier automatic guided vehicle along said first pathway between said loading area and said first predetermined area;

wherein said loading assembly includes a packing automatic guided vehicle having a fourth chassis and a first transfer device supported by said fourth chassis for holding a luggage item and for moving said luggage item onto one of said shelves of said container;

said packing automatic guided vehicle further including a lifting mechanism interconnecting said fourth chassis and said first transfer device and providing movement of said first transfer device relative to said fourth chassis for aligning said first transfer device with one of said shelves of said container; and

said first transfer device being moveable for moving the luggage item from said first transfer device onto said shelf of said container.

24. The system as set forth in claim 23 wherein said packing automatic guided vehicle further includes a coupling means for releasably coupling the packing automatic guided vehicle with the container to prevent relative motion therebetween.

25. The system as set forth in claim 19 wherein said loading assembly includes a plurality of platform conveyors disposed in vertically stacked relationship with one another with each

of said platform conveyors disposed at the same height as a corresponding one of said shelves of said container; and

said loading assembly further including a loading conveyor extending from said entrance conveyor and pivotable relative to said entrance conveyor for being aligned with one of said platform conveyors for moving the luggage item from said entrance conveyor onto one of said platform conveyors, and a plurality of second transfer devices each associated with a corresponding one of said platform conveyors for moving the luggage item onto said corresponding one of said shelves.