CLAIMS

1. A method of tracking the passage of items from an arrival point to a departure point in a hub and spoke item handling system, comprising the steps of:

acquiring information about the identity of the items, the arrival and departure parameters for the item and the topology of the location through which the item may pass between arrival and departure;

for each item, defining a path though the handling system from a plurality of valid paths and storing details of that path, the path including a plurality of checkpoints at which the item is identified and recorded;

at each checkpoint, determining a status of each item based on the time of arrival of each item at the checkpoint compared to a target time of arrival, the items each being assigned one of a plurality of statuses including an indication of whether the item is at risk of not arriving at the departure point by a required time;

where an item is assigned an at risk status, determining an alternative path through the system, and communicating the alternative path to a controller.

2. A method according to claim 1, wherein the items comprise baggage.

3. A method according to claim 2, wherein the location is an airport and the arrival point is the arrival of an item of baggage on an incoming flight and the departure point is the departure of the item of baggage on an outbound flight, wherein each item of baggage has a unique identifier, and wherein the determining the status of each item comprises scanning the unique identifier at one of a plurality of scan locations and comparing the time at which the item is scanned to a time at which the item is expected to be scanned at that scanning location.

4. A method according to claim 3, wherein the unique identifier for each item of baggage comprises origin and destination airport codes.

5. A method according to claim 3, wherein the arrival and departure parameters comprise scheduled, estimated and actual flight arrival and departure times, arrival and departure gates.

6. A method according to claim 3, wherein the topology of the location comprises the topology of the airport and the step of defining a path through the handling system

comprises selecting a path from one of a plurality of stored possible paths through the airport baggage handling system, each path having been defined by identifying and listing the process activities required to transfer the item of baggage from an arriving flight on a first airline at a first location at the airport to a departing flight on a second airline at a second location at the airport and assigning and assigning an average time for transit between activities for each path.

7. A method according to claim 6, wherein the assigning of activities includes assigning mandatory activities and optional activities.

8. A method according to claim 3, wherein the at risk status assigned to an item of baggage is one of a plurality of risk statuses each indicating a different likelihood of the item of baggage failing to arrive at the departure point before the departure time.

9. A method according to claim 1, comprising assigning a recovered status to a bag when a subsequent checkpoint indicates that the bag is no longer at risk.

10. A method according to claim 8, comprising, after the departure of a flight, for each item of baggage for that flight having an at risk status between the arrival and departure points, assigning a further status indicating whether or not the item was loaded onto the flight.

11. A method according to claim 10, wherein where the further status indicates that the item was loaded onto the flight, indicating whether or not there was any intervention in the passage of the item through the baggage handling system.

12. A method according to claim 10, wherein the further status is recorded for subsequent analysis.

13. A method according to claim 6, wherein each activity of a path comprises at least one step and a checkpoint.

14. A method according to claim 6, wherein the step of determining an alternative path comprises determining a path which omits some of the activities of the selected path for the bag.

15. A method according to claim 15, wherein at least a portion of the alternative path is performed by an operator.

16. A system for tracking the passage of items from an arrival point to a departure point in a hub and spoke item handling system, comprising:

an item processor for acquiring and processing information about the identity of the items;

an arrival and departure processor for acquiring and processing information about the arrival and departure parameters for the item;

a rules engine operating on a topology of the location through which the item may pass between arrival and departure to define a plurality of paths through the location and for selecting one of the plurality of paths for a given item;

a store for storing item identity data provided from the item processor, arrival and departure parameters provided from the rules engine, and location topology information including the plurality of paths;

a user application for communicating data relating to arrival and departure parameters and items to a system user; and

a plurality of checkpoints arranged along the paths, each checkpoint including a scanner for scanning items to provide item identity and time of arrival information to the rules engine to determine a status of each item based on the time of arrival of each item at the checkpoint compared to a target time of arrival, the items each being assigned one of a plurality of statuses by the rules engine including an indication of whether the item is at risk of not arriving at the departure point by a required time;

wherein when an item is assigned an at risk status, the rules engine determines an alternative path through the system, and communicates the alternative path to the user.

17. A system according to claim 16, comprising a status agent communicating with the store and the rules engine for receiving item identity information updates and arrival and departure parameter updates from the rules engine and communicating those updates to the store.

18. A system according to claim 16, wherein the items comprise baggage.

19. A system according to claim 18, wherein the location is an airport and the arrival point is the arrival of an item of baggage on an incoming flight and the departure point is the departure of the item of baggage on an outbound flight, wherein each item of baggage has a unique identifier, and wherein the scanner at each checkpoint scans the items of baggage to retrieve the unique identifier at one of a plurality of scan locations and communicate the identity to the rules engine together with the time of the scan, and the rules engine compares

the time at which the item is scanned to a time at which the item is expected to be scanned at that scanning location.

20. A system according to claim 19, wherein the unique identifier for each item of baggage comprises origin and destination airport codes.

21. A system according to claim 19, wherein the arrival and departure parameters comprise scheduled, estimated and actual flight arrival and departure times, arrival and departure gates.

22. A system according to claim 19, wherein the topology of the location comprises the topology of the airport and the rules engine determines a path through the handling system from the plurality of paths stored in the store, wherein each path comprises a series of process activities required to transfer the item of baggage from an arriving flight on a first airline at a first location at the airport to a departing flight on a second airline at a second location at the airport and assigning and an average time for transit between activities for each path.

23. A system according to claim 22, wherein the activities include mandatory activities and optional activities.

24. A system according to claim 19, wherein the at risk status assigned to an item of baggage by the rules engine is one of a plurality of risk statuses each indicating a different likelihood of the item of baggage failing to arrive at the departure point before the departure time.

25. A system according to claim 16, wherein the rules engine is configured to assign a recovered status to a bag when a subsequent checkpoint indicates that the bag is no longer at risk.

26. A system according to claim 25, wherein the rules engine is configured to assign, after the departure of a flight, for each item of baggage for that flight having an at risk status assigned between the arrival and departure points, a further status indicating whether or not the item was loaded onto the flight.

27. A system according to claim 26, wherein, the rules engine is configured, where the further status indicates that the item was loaded onto the flight, to indicate whether or not there was any intervention in the passage of the item through the baggage handling system.

28. A system according to claim 26, comprising a further store for storing the further status information for subsequent analysis.

29. A system according to claim 22, wherein each activity of a path comprises at least one step and a checkpoint.

30. A system according to claim 22, wherein the alternative path determined by the rules engine omits some of the activities of the selected path for the bag.

31. A method of tracking the passage of items from an arrival point to a departure point in a hub and spoke item handling system, comprising the steps of:

defining a set of configuration data comprising a set of paths an item may take from the arrival point to the departure point, a set of processes an item must undergo in each path, each process comprising at least one step and an item scan to determine the identity of the item and the time at which it is scanned, and a set of transits for each path, each transit comprising a start and an end scan point, an average time between the start and end scan points and the position of the transit in the path;

for each item passing through the system, acquiring event information relating to the item, the event information relating to the identity of the item, item scans, and its arrival and departure;

in response to event information, determining at a processor whether an item is at risk of failing to arrive at the departure point by a predetermined time and for any item determined to be at risk; and

if an item is determined to be at risk, assigning a different path having different transits to the item.

32. A method according to claim 31, wherein the assigned different path is suggested to a user,

33. A method according to claim 31, wherein the items are items of baggage, the arrival point is a flight arrival at an airport and the departure point is a flight departure from the airport, and wherein item event information is provided as baggage information messages which are converted to baggage events and arrival and departure data is provided as flight information message which are converted to flight events. The baggage events and flight events being processed by a rules engine.

34. A method according to claim 33, wherein flight information messages are provided as a continuous stream and comprise flight creation messages for new flights and flight update messages for amendments to existing flights.

35. A method according to claim 33, wherein baggage information messages are received as a continuous stream and a status is assigned to active bags that relate to an active inbound and outbound flight, each active bag having a bag operation process and a specified path.

36. A method according to claim 35, wherein each bag is initially assigned a cold status indicating that it is not at risk and is assigned one of a plurality of at risk statuses in response to an identified problem between the scan location at which the bag was last seen and a current transit.

CLAIMS

1. A method of tracking the passage of items from an arrival point to a departure point in a hub and spoke item handling system, comprising the steps of:

acquiring information about the identity of the items, the arrival and departure parameters for the item and the topology of the location through which the item may pass between arrival and departure;

for each item, defining a path though the handling system from a plurality of valid paths and storing details of that path, the path including a plurality of checkpoints at which the item is identified and recorded;

at each checkpoint, determining a status of each item based on the time of arrival of each item at the checkpoint compared to a target time of arrival, the items each being assigned one of a plurality of statuses including an indication of whether the item is at risk of not arriving at the departure point by a required time;

where an item is assigned an at risk status, determining an alternative path through the system, and communicating the alternative path to a controller.

2. A method according to claim 1, wherein the items comprise baggage, the location is an airport and the arrival point is the arrival of an item of baggage on an incoming flight and the departure point is the departure of the item of baggage on an outbound flight, wherein each item of baggage has a unique identifier, and wherein the determining the status of each item comprises scanning the unique identifier at one of a plurality of scan locations and comparing the time at which the item is scanned to a time at which the item is expected to be scanned at that scanning location.

3. A method according to claim 2, wherein the topology of the location comprises the topology of the airport and the step of defining a path through the handling system comprises selecting a path from one of a plurality of stored possible paths through the airport baggage handling system, each path having been defined by identifying and listing the process activities required to transfer the item of baggage from an arriving flight on a first airline at a first location at the airport to a departing flight on a second airline at a second location at the airport and assigning and assigning an average time for transit between activities for each path.

4. A method according to either claim 2 or 3, wherein the at risk status assigned to an item of baggage is one of a plurality of risk statuses each indicating a different likelihood of the item of baggage failing to arrive at the departure point before the departure time.

5. A method according to any one of claims 1 to 4, comprising assigning a recovered status to an item when a subsequent checkpoint indicates that the item is no longer at risk.

6. A method according to either claim 4 or 5, comprising, after the departure of a flight, for each item of baggage for that flight having an at risk status between the arrival and departure points, assigning a further status indicating whether or not the item was loaded onto the flight.

7. A method according to claim 6, wherein where the further status indicates that the item was loaded onto the flight, indicating whether or not there was any intervention in the passage of the item through the baggage handling system.

8. A system for tracking the passage of items from an arrival point to a departure point in a hub and spoke item handling system, comprising:

an item processor for acquiring and processing information about the identity of the items;

an arrival and departure processor for acquiring and processing information about the arrival and departure parameters for the item;

a rules engine operating on a topology of the location through which the item may pass between arrival and departure to define a plurality of paths through the location and for selecting one of the plurality of paths for a given item;

a store for storing item identity data provided from the item processor, arrival and departure parameters provided from the rules engine, and location topology information including the plurality of paths;

a user application for communicating data relating to arrival and departure parameters and items to a system user; and

a plurality of checkpoints arranged along the paths, each checkpoint including a scanner for scanning items to provide item identity and time of arrival information to the rules engine to determine a status of each item based on the time of arrival of each item at the checkpoint compared to a target time of arrival, the items each being assigned one of a

plurality of statuses by the rules engine including an indication of whether the item is at risk of not arriving at the departure point by a required time;

wherein when an item is assigned an at risk status, the rules engine determines an alternative path through the system, and communicates the alternative path to the user.

9. A system according to claim 8, comprising a status agent communicating with the store and the rules engine for receiving item identity information updates and arrival and departure parameter updates from the rules engine and communicating those updates to the store.

10. A system according to either claim 8 or 9, wherein the items comprise baggage, the location is an airport and the arrival point is the arrival of an item of baggage on an incoming flight and the departure point is the departure of the item of baggage on an outbound flight, wherein each item of baggage has a unique identifier, and wherein the scanner at each checkpoint scans the items of baggage to retrieve the unique identifier at one of a plurality of scan locations and communicate the identity to the rules engine together with the time of the scan, and the rules engine compares the time at which the item is scanned to a time at which the item is expected to be scanned at that scanning location.

11. A system according to claim 10, wherein the topology of the location comprises the topology of the airport and the rules engine determines a path through the handling system from the plurality of paths stored in the store, wherein each path comprises a series of process activities required to transfer the item of baggage from an arriving flight on a first airline at a first location at the airport to a departing flight on a second airline at a second location at the airport and assigning and an average time for transit between activities for each path.

12. A system according to either claim 10 or 11, wherein the at risk status assigned to an item of baggage by the rules engine is one of a plurality of risk statuses each indicating a different likelihood of the item of baggage failing to arrive at the departure point before the departure time.

13. A system according to any one of claims 8 to 12, wherein the rules engine is configured to assign a recovered status to an item of baggage when a subsequent checkpoint indicates that the item of baggage is no longer at risk.

14. A system according to claim 13, wherein the rules engine is configured to assign, after the departure of a flight, for each item of baggage for that flight having an at risk status

assigned between the arrival and departure points, a further status indicating whether or not the item was loaded onto the flight.

15. A system according to claim 14, wherein, the rules engine is configured, where the further status indicates that the item was loaded onto the flight, to indicate whether or not there was any intervention in the passage of the item through the baggage handling system.

16. A method of tracking the passage of items from an arrival point to a departure point in a hub and spoke item handling system, comprising the steps of:

defining a set of configuration data comprising a set of paths an item may take from the arrival point to the departure point, a set of processes an item must undergo in each path, each process comprising at least one step and an item scan to determine the identity of the item and the time at which it is scanned, and a set of transits for each path, each transit comprising a start and an end scan point, an average time between the start and end scan points and the position of the transit in the path;

for each item passing through the system, acquiring event information relating to the item, the event information relating to the identity of the item, item scans, and its arrival and departure;

in response to event information, determining at a processor whether an item is at risk of failing to arrive at the departure point by a predetermined time and for any item determined to be at risk; and

if an item is determined to be at risk, assigning a different path having different transits to the item.

17. A method according to claim 16, wherein the items are items of baggage, the arrival point is a flight arrival at an airport and the departure point is a flight departure from the airport, and wherein item event information is provided as baggage information messages which are converted to baggage events and arrival and departure data is provided as flight information message which are converted to flight events, the baggage events and flight events being processed by a rules engine.

18. A method according to claim 17, wherein flight information messages are provided as a continuous stream and comprise flight creation messages for new flights and flight update messages for amendments to existing flights.

19. A method according to either claim 17 or 18, wherein baggage information messages are received as a continuous stream and a status is assigned to active bags that relate to an

active inbound and outbound flight, each active bag having a bag operation process and a specified path.

20. A method according to claim 19, wherein each bag is initially assigned a cold status indicating that it is not at risk and is assigned one of a plurality of at risk statuses in response to an identified problem between the scan location at which the bag was last seen and a current transit.