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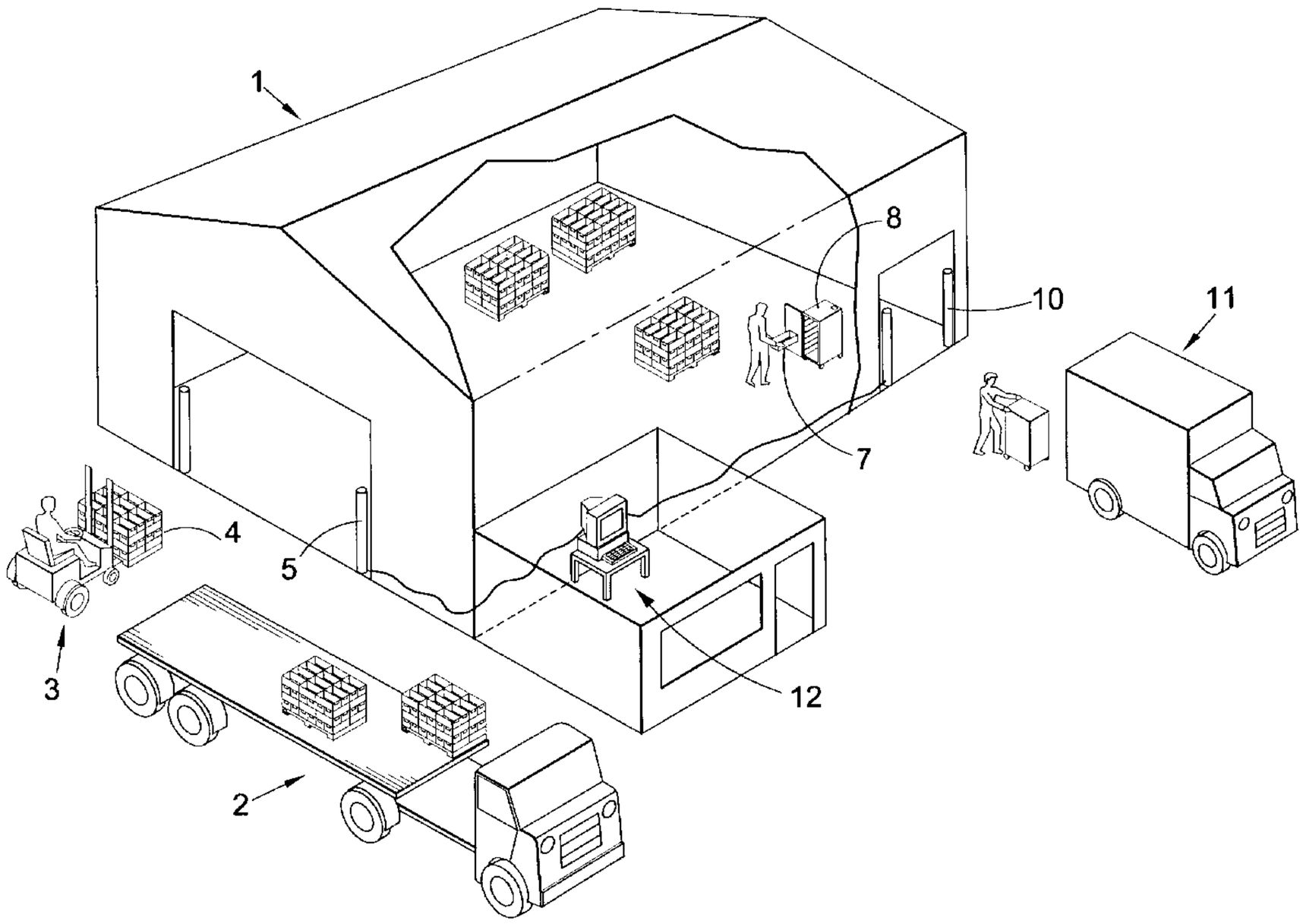

(57) Abrégé/Abstract:
A system for delivering products for human consumption from a manufacturing centre to passenger carrying vehicles comprises packaging the products in a manufacturing centre into carriers. Each carrier carrying a plurality of products. The carriers are delivered in bulk to a distribution centre. At the distribution centre predetermined numbers of carriers are loaded into respective containers for distribution to the passenger carrying vehicles. In transit in the passenger carrying vehicles the products are distributed to the passengers from the containers. A distribution monitoring system monitors the distribution of products by

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(57) Abrégé(suite)/Abstract(continued):
receiving detections of tags fitted to the products or to carriers of the products to identify the location of the product. Measurements of the temperature in the vicinity of the products are received and stored in association with the tag detections as a history of associated location and temperature information for a product in a database. A user can retrieve location and temperature information for a product at a desired time from the database. The system thus provides for a comprehensive quality control audit trail.

ABSTRACT

A system for delivering products for human consumption from a manufacturing centre to passenger carrying vehicles comprises packaging the products in a manufacturing centre into carriers. Each carrier carrying a plurality of products. The carriers are delivered in bulk to a distribution centre. At the distribution centre predetermined numbers of carriers are loaded into respective containers for distribution to the passenger carrying vehicles. In transit in the passenger carrying vehicles the products are distributed to the passengers from the containers. A distribution monitoring system monitors the distribution of products by receiving detections of tags fitted to the products or to carriers of the products to identify the location of the product. Measurements of the temperature in the vicinity of the products are received and stored in association with the tag detections as a history of associated location and temperature information for a product in a database. A user can retrieve location and temperature information for a product at a desired time from the database. The system thus provides for a comprehensive quality control audit trail.

METHOD AND SYSTEM FOR DELIVERING PRODUCTS FOR HUMAN CONSUMPTION

The present invention generally relates to a method and system for delivering products for human consumption from a manufacturing centre to passenger carrying vehicles and a method and system for monitoring and controlling distribution of such products.

On many forms of passenger carrying vehicles it is usual to serve the passengers with a meal. In passenger carrying vehicles where space is a premium e.g. trains and aeroplanes, the food is usually provided for distribution in compact units such as trolleys to allow for easy distribution of food to the passengers.

The logistics of providing food to passenger carrying vehicles to meet the vehicle schedule is complex. This distribution problem is further complicated by the need to comply strictly with hygiene regulations. Further, some food products are fragile and can easily be damaged. The food can require differing temperature environments and handling in order to avoid spoiling or damaging the food and to meet health and safety hygiene requirements. If there is a problem with the food product, as a result in some failure in the distribution process, it would be highly advantageous for the distributor and/or supplier to be able to identify the cause of the failure during the distribution process.

The travel industry is an area where a great deal of time and effort is expended in providing passengers with high quality food. Traditional travel related caterers purchase food ingredients which they cook and prepare in their kitchens. The prepared food is then placed in packaging or onto trays which are loaded into trolleys. Traditionally, the number of trolleys and the number of meals loaded into the trolleys is tailored at the point of manufacture of the food to the requirements of a passenger carrying vehicle to which the food is to be delivered. Thus, traditional travel related caterers require food production facilities in addition to distribution facilities. Although

some products may be bought from food manufacturing centres, this is generally a minor part of the total meal being prepared.

Even when food is provided to passengers in the form of a packaged food item e.g. sandwiches, traditionally, sandwiches are received from a food manufacturer in bulk packaging e.g. cardboard boxes. The food items must then be unpacked and repacked into carriers suitable for fitting into trolleys to go onto the vehicle e.g. aircraft or train.

It is thus an object of the present invention to provide a more efficient distribution system which can incorporate better tracking and controls.

In accordance with a first aspect, the present invention provides a distribution monitoring system and method for monitoring the distribution of products for human consumption during the distribution of the products to a point of sale or consumption. The monitoring system receives detections of tags fitted to the products or to carriers of the products either periodically or when the products are relocated. Each tag detection identifies the location of the tag at the time of detection. Measurements of the temperature in the vicinity of the products are received from temperature detecting means. Information on the products and the received tagged detections and temperature measurements are stored as a history of associated location and temperature information for a product in a database. A user interface can then be provided to allow a user to retrieve location and temperature information for a product at a desired time from the database.

Thus this aspect of the present invention provides for full traceability of products during the distribution process to enable the temperature conditions experienced by the products to be determined in order to identify where required temperature conditions for the products may not have been met. Thus a quality control audit trail is provided by the system of this aspect of the present invention enabling faults in the distribution process to be identified.

In one embodiment of the present invention, images or video of the locations are received and stored in association with the location and temperature information. This

allows a user to display the images or video for retrieved location and temperature information thereby enabling the products to be viewed during the history of distribution of the products to enable the identification of a problem in the distribution process. For example, the products could have been damaged due to rough handling during the distribution process and this can be identified from the images or videos stored. Thus the image or video information enhances the information available for the quality control audit trail to enable not just the temperature conditions but also the physical conditions of the products to be monitored during the distribution process.

The present invention encompasses the provision of individual temperature detectors on some of the products or carriers of the products to provide temperature measurements. The temperature measurements can be transmitted from the temperature detector to temperature readers to enable the measurements to be stored in the database. Alternatively, or in addition, temperature sensors linked to the monitoring system directly can be provided in the locations to monitor ambient conditions.

In one embodiment the information stored on a product includes information on temperature conditions for the product and/or an expiry date or time for the product. The monitoring system can include a warning means such as a display for outputting a warning, to warn if the received temperature measurements and tagged detections, when compared with the stored product information, indicate that the temperature is unsatisfactory for the product or the expiry date or time for the detected product has passed. Thus this automated warning system can warn when the quality of the product is unsatisfactory, i.e. the product has been damaged by storage during the distribution process outside the recommended temperature range, or it has been stored beyond its expiry date or time during the distribution process. This enables a rapid identification of the substandard product to enable it to be removed from the distribution process.

This aspect of the present invention can enable products to be tracked right from manufacture through to the point of consumption or sale. The distribution process can involve a central distribution, or a chain of distribution centres, e.g. a hub and spoke distribution system. Thus this aspect of the present invention can encompass a single computer system, or a network of computer systems. The present invention can thus be

implemented using a programmable computer and suitable program code. Program code can be provided to the computer system on any suitable carrier medium such as a storage medium, e.g. floppy disk, hard disk, CD-ROM or programmable memory device, or a transient medium such as an electrical, optical, microwave, magnetic, or radio frequency signal.

In accordance with another aspect, the present invention provides a method of delivering products for human consumption from a manufacturing centre to passenger carrying vehicles. In a manufacturing centre the products are packaged into carriers, where each carrier carries a number of products. The carriers are delivered in bulk e.g. on a palette to a distribution centre. At the distribution centre predetermined numbers of the carriers are loaded into respective containers for distribution to the passenger carrying vehicles. On the passenger carrying vehicles the products are distributed to passengers during transit.

In a preferred embodiment the containers comprise trolleys which are pushed by attendants on the passenger carrying vehicles whilst serving the food and thus carriers are preferably adapted to fit the trolleys.

Thus this aspect of the present invention provides a significant streamlining of the delivery system. The repackaging of the products at the distribution centre is avoided thus saving time and effort and avoiding the wastage of packaging material. In the manufacturing centre, the manufacturer is provided with carriers into which they package the products. The products are thus passed right from the manufacturer to the passenger carrying vehicles and the carriers are returned again to the manufacturer once used. This use of the same carriers for packaging the products from the manufacturer right away to the passenger carrying vehicles simplifies not only the delivery logistics, but also tracking procedures for food products as a means of monitoring compliance with hygiene regulations. Further, the avoidance of repackaging of the food products greatly reduces the risk of damage to the products.

Thus this aspect of the present invention is particularly suited to the distribution of food products which are fragile or subject to hygiene regulations.

In one embodiment the distribution centre comprises a hub distribution centre, which receives the bulk packaged carriers. Spoke distribution centres are provided and are supplied with predetermined numbers of containers by the hub distribution centre. At the spoke distribution centres the number of carriers in respective containers is adjusted in dependence upon the requirements of respective vehicles. The containers are then distributed to the respective passenger carrying vehicles by the spoke distribution centres. Thus in this embodiment the spoke distribution centres can be provided locally to the passenger carrying vehicle transit points. Because the spoke distribution centres only need carry out adjustments to the number of carriers in the containers and/or to adjust the number of containers required for respective passenger carrying vehicles, the spoke distribution centres can be of greatly reduced scale compared to the hub distribution centre. Thus this embodiment has the advantage that for example for the supply of aircraft meals, the airport food distribution centre can be of greatly reduced scale compared to a central hub distribution centre. This greatly reduces the cost of distribution since the cost of real estate in an airport or in the vicinity of an airport is usually much higher than the cost of real estate for a distribution centre provided remotely i.e. a remote hub distribution centre.

The present invention is particularly suited to an electronic ordering and tracking system. Passenger vehicle operators can electronically place an order for products with the caterer. The order can simply identify the number of passengers but can additionally identify special dietary requirements e.g. vegetarian. The order can either be placed directly with the hub distribution centre or it can be placed with a spoke distribution centre. The benefit of placing the order with the spoke distribution centre is that the spoke distribution centre can modify the order to take into account local factors. The hub distribution centre will collate orders placed with the spoke distribution centres and will place an electronic order with the manufacturing centre for a bulk delivery of products in the carriers. If the order for the products is not placed directly with the spoke distribution centres, the hub distribution centre will send electronic data on the number of products required for respective vehicles to the spoke distribution centres. The spoke distribution centre will then determine the number of containers required to enable them to tailor the order for each respective passenger carrying vehicle.

In order to provide for accurate tracking of products, in an embodiment of the present invention the carriers each include a unique electronic tag. At points in the distribution the tags are detected and a computer system receives the detections to track the location and keep a history for each carrier. Thus each carrier of products can be tracked from the manufacturing centre to the passenger carrying vehicle. Further, the bulk delivery of carriers from the manufacturing centre can be provided in one or more bulk carriers which each include an electronic tag. Thus when the bulk delivery is made to the hub distribution centre, the tag of the bulk carrier can be detected instead of having to detect all of the tags of the carriers in the bulk carrier. At the manufacturing centre when the bulk carrier is loaded with carriers, the tags for the bulk carriers can be read and the computer system can store information identifying the identities of the carriers loaded into the bulk carriers. Thus at the hub distribution centre, it is simply necessary to detect the tag of the bulk carrier in order to identify the carriers delivered.

In one embodiment, the carriers each include a temperature detector for detecting temperature in the region of the products and for warning if the detected temperature moves outside predetermined range or threshold. This feature can thus provide for the individual monitoring of carriers to determine their compliance with hygiene regulations. The temperature detector can comprise an electronic detector which can transmit information to the computer system for remote monitoring. Alternatively or in addition, the temperature detector can simply comprise a visible indicator to indicate if the temperature for a carrier has moved outside a predetermined range or threshold.

Another aspect of the present invention provides a method of delivering meals to passenger carrying vehicles in which, at a distribution centre, packaged items are received from food manufacturing centres. The packaged items are assembled on a tray to form a meal unit and the meal units are loaded into trolleys. The trolleys are then distributed to the passenger carrying vehicles for serving to passengers.

Thus this aspect of the present invention enables a distribution centre to be quite separate to food manufacturing centres. There is no need for example for an airline caterer to have food manufacturing centres. The caterer can simply assemble pre-

prepared food for delivery to the aircraft. The food manufacturing centres can comprise restaurants because of the careful tracking and control procedures, restaurant food can be provided. To complete the restaurant quality food delivered to the passengers, a chef can carry out final preparations on each meal on the passenger carrying vehicle or at the spoke distribution centre.

Embodiments of the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of a distribution centre in accordance with the embodiment of the present invention;

Figure 2 is a diagram of a bulk load of carriers;

Figure 3 is a diagram of a trolley and a carrier;

Figure 4 is a schematic diagram of the hub and spoke distribution system in accordance with an embodiment of the present invention; and

Figure 5 is a schematic diagram of the distribution monitoring system in accordance with an embodiment of the present invention.

Figure 1 schematically illustrates a distribution centre in accordance with a first embodiment of the present invention. Figure 3 illustrates the trolley 8 and carrier 7 in more detail whilst Figure 2 illustrates the bulk delivered containers in more detail.

At a food manufacturing centre, food products are manufactured and packaged e.g. rolls, sandwiches, pies etc. These are then placed in carriers 7 in accordance with an order from a distribution centre 1. The carrier 7 will hold a designated number of any type of food products. Alternatively, the carrier 7 may be required to be filled with a mixture of food products. This is dependent upon the order placed with the food manufacturer. Each carrier 7 has applied to it or incorporated in it a unique electronic tag. The tag can comprise any conventional electronic tag such as an RF tag as will be

understood by a skilled person in the art. The tag can be read by any form of tag reader such as a hand held tag reader or a static tag reader mounted in for example a doorway.

Thus in order to fulfil an order, a food manufacturing centre will package a number of carriers 7 into a bulk order 4 carried by a palette 4a. The palette 4a has mounted thereon or incorporated therein a unique electronic tag 6. Thus, when the bulk order 4 is put together at the food manufacturing centre, the tags 7a of the carriers 7 which form a bulk load 4 are read together with the tag 6 of the palette 4a. This information is read and stored on a computer system and the information is transmitted to a computer system 12 at the distribution centre 1 from which the order for the food products originated. In this way a food manufacturing centre records and tracks food products which leave the centre. The food products in each bulk order 4 are transported by a vehicle 2 to the distribution centre 1. The bulk ordered products 4 are then unloaded by fork lift truck 3 and as they are delivered into the distribution centre 1, a tag reader 5 will detect the palette tag 6 on the palette 4a. The tag detections are transmitted to the computer system 12 in which the detected palette tag 6 can be matched to the identities of the carriers 7 carried on the palette 4a. Thus the reading of the palette tag 6 avoids the necessity for attempting to read each of the tags 7a on each of the carriers 7. Alternatively however each of the tags 7a could be detected in order to compare the expected load on the palette 4a with the load that the food manufacturing centre alleges to have delivered.

Where the products are subject to strict hygiene regulations and require refrigeration for example, the lorry 2 will comprise a refrigeration unit and within the distribution centre 1, the bulk orders 4 will be stored in refrigerated conditions. In order to monitor the temperature, each carrier 7 can include a temperature monitor with the tag 7a. The temperature monitor can provide a warning if the temperature range rises above that required for the food product. The monitor can comprise an electronic arrangement for transmitting a signal to the computer system 12 to allow the remote monitoring of the conditions of the carriers 7. Alternatively or in addition, a simple arrangement can comprise a visible indicator e.g. a liquid crystal strip which will register and display a warning if the temperature rises above a threshold. The warning will remain even after the temperature has dropped to point out that the food products in the carrier 7 were

exposed to high temperatures for a predetermined period of time sufficient to raise a hygiene issue.

Within the distribution centre 1, the carriers 7 are unloaded from the palette 4a and loaded into trolleys 8. The number of carriers 7 loaded into the trolleys 8 and the number of trolleys 8 will depend upon the order placed for a passenger carrying vehicle. An order can be fulfilled by loading the appropriate number of trolleys 8 with the appropriate number of carriers 7 which contain the appropriate number of products. Thus the trolleys 8 are loaded onto a truck 11 for distribution to the passenger carrying vehicles, the trolleys 8 pass through a tag detector 10 to detect the tags of the carriers 7 being delivered. The tag detections are received by the computer system 12 in order to track the movement of the carriers 7. Thus in this way the movement of the carriers 7 in and out of the distribution centre 1 can be detected.

The truck 11 will provide the required conditions for the delivery of the food products e.g. it will comprise a refrigeration unit and will deliver the trolleys 8 to the passenger carrying vehicle. In such circumstances the distribution centre 1 comprises the sole distribution centre. In an alternative embodiment the distribution centre 1 comprises the hub distribution centre which receives the products directly from the food manufacturing centre. The hub distribution centre will then distribute the product to spoke distribution centres. Thus in Figure 1 the trolleys 8 are filled with carriers 7 and the truck 11 delivers the trolleys 8 to the spoke distribution centres. Within the spoke distribution centres, the number of carriers 7 within the trolleys 8 is adjusted as necessary in order to accurately fulfil the order from the passenger vehicle operator.

It can thus be seen from Figure 1 that food products delivered from the food manufacturing centre are not repackaged. The carriers 7 are simply redistributed into trolleys 8. This greatly reduces the handling of the food products thereby making it easier to comply with hygiene regulations. Further, there is no requirement to repackage the products and there is thus no wastage of packing material or time and money expended in wasted repackaging. Further, the use of a single carrier from the point of manufacture to the point of use on the passenger carrying vehicle facilitates better control and tracking of delivery.

In addition to the tags on the carriers 7 and the palettes 4a, tags 9 can also be provided on the trolleys 8. This enables the trolleys 8 to be tracked. It can also enable the tag detector 10 to simply detect the trolley 8 passing thereby. If the tags 7a of the carriers 7 are read when the trolley 8 is loaded, and matched with the tag 9 of the trolley, the computer system 12 will have a record of the carriers 7 loaded in the trolleys 8. Thus the detection of the tags 9 of the trolleys 8 and the tag detector 10 is sufficient for the computer system to know which carriers 7 have been loaded on the truck 11.

Figure 4 is a schematic diagram of the hub and spoke distribution system in which there are three hubs 20, 21, 22 provided at separate locations and is connected by high speed communication lines 23a and 23b for the exchange of data therebetween. Each hub 20, 21, 22 is connected to a spoke distribution centre 40a, 40b, 41a, 41b, 42a, 42b, 42c and 42d respectively. A food manufacturing centre 30 is connected to each of the hubs 20, 21 and 22 via a communication line 25.

In this embodiment each spoke distribution centre is located at or near an airport or train station to provide airline or rail catering facilities. At each spoke orders can be received from airlines or rail operators being served in respect of food to be provided for specific journeys. This information can be electronically received and is passed from the spokes to the respective hub distribution centres 20, 21 and 22. The hub distribution centres 20, 21 and 22 will collate all of the orders in order to form a bulk order for groups which is transmitted to the food manufacturer 30. When the goods are delivered by the food manufacturer 30 to the hub distribution centres 20, 21 and 22, the hub distribution centres 20, 21 and 22 use the information received from the spoke distribution centres i.e. the orders from the airlines or rail operators in order to determine how to distribute the products to the spoke distribution centres. Thus within the hub distribution centres 20, 21, 22 the bulk orders received from the food manufacturers 30 are split and distributed to the spoke distribution centres. As described hereinabove with reference to Figure 1, this redistribution is carried out by placing the carriers 7 into trolleys 8 so that the spoke distribution centres simply have to adjust the number of carriers 7 required for each flight. The spoke distribution centre needs to carry out no repackaging or even movement of carriers 7 into different stored units.

In an alternative embodiment, the airlines can place orders directly with the hub distribution centres 20, 21 and 22. The benefit of the receiving orders from the spoke distribution centres is that the spoke distribution centres can take into account local factors. For example, it may be known that because of a pricing policy, although a number of passengers have booked flights, not all passengers will turn up for those flights. Thus although the airline may request food for each passenger, it may not be necessary to supply that number. The order can thus be adjusted accordingly.

In another embodiment of the present invention, where meals are provided to passengers on a tray, each tray is assembled into a meal unit within the distribution centre 1. The tray will comprise the carrier 7 and the trays will be individually loaded into the trolley 8 in the conventional manner. However, in the distribution centre 1 there is provided no food manufacturing capability. Food is delivered pre-packaged from a remote food manufacturing centre. In the distribution centre 1 the received packaged food items are assembled onto a tray in order to assemble a meal unit. In this way, there is no handling of food except in packaged form within the distribution centre. In this way specialist food manufacturing centres can be utilised for manufacturing food and the distribution centre merely needs to assemble the food into meal units. This enables restaurants to be used as food manufacturing centres. The distribution centre will simply assemble the restaurant cooked food. The handling of the food within the distribution centre 1 is reduced and so long as the temperature of the food items is carefully controlled and monitored and the date of the food items is carefully monitored, the necessary hygiene regulations can be met.

Figure 5 is a schematic diagram of a distribution monitoring system in accordance with an embodiment of the present invention.

At the heart of the system is a monitoring computer system 12 to receive and process all input information. A communications link 19 is provided which can comprise any conventional type of communications link to enable product information from manufacturers to be entered. This enables a product manufacturer to transmit information on the products to the distribution monitoring system when the products

have been shipped to the distributor. The product information can be loaded into a database of history information 18 by the monitoring computer system 12. The product information can include a description of the product, a description of the temperature conditions under which the product should be kept, e.g. below 4°C, and an expiry date for the product. Also, information on how the product should be handled or kept and any other necessary information can be provided. This information will aid quality control during the distribution of the products.

The products are provided in carriers 7 with tags 7a. The tags 7a incorporate a temperature sensor and transmitter therein to enable the ambient temperature of the products to be detected and transmitted. The tag detectors 5 and 10 described with reference to Figure 1 are connected to the monitoring computer system 12 to provide tag detections detecting when the tags pass by and thus enter a location. This provides for the tracking of the tags and the tag detections are entered into the database of history information 18 by the monitoring computer system 12. Also temperature measurements by the temperature monitor of the tags 7a are sensed by temperature readers 16 provided at locations within the distribution centre. The temperature measurements received by the temperature readers 16 are stored in association with the tag detections in the database of history information 18 by the monitoring computer system 12.

Video cameras 14 are also provided at locations in the distribution centre in order to provide images or video of locations in the distribution centre. The images or video are stored in the database of history information 18 by the monitoring computer system 12 so that there is an association between the time of tag detections and the images or video recorded.

In addition to the temperature monitors in the tags 7a, temperature sensors 15 can be provided in locations in the distribution centre. These enable temperature conditions in the locations to be detected, and this information can be stored in the database of history information 18 by the monitoring computer system 12. The temperature sensors 15 can be provided in case carriers 7 which do not have temperature monitors built into the tags 7a. The temperature sensors 15 provide an overall temperature measurement for a location and are thus less accurate than the temperature measurements performed on the

carriers 7 themselves. The use of temperature sensors 15 at the locations does however reduce the cost and can be used instead of, or to supplement the temperature measurements from monitors associated with the tags 7a.

The distribution monitoring system is also provided with a user terminal 17 operable by a person of administrative capacity in order to monitor the distribution of products. The user's terminal 17 provides a user interface to allow a user to access the database of history information 18 to trace the location of a product with time, to determine the temperature experienced by the product at each location, and to view images or video of the location when the product is in that location. In this way a user can identify when unsatisfactory temperature conditions were experienced by the product by viewing the temperature information, or they can identify when unsatisfactory handling occurred by viewing the associated image or video for a location when the product is in that location. This enables a visual inspection of the handling of the goods to identify when goods were damaged, or when quality was compromised for hygiene reasons. For example, this enables a user to identify where something may have gone wrong during the distribution process causing a customer to suffer food poisoning. The distribution monitoring system provides for a quality control audit trail.

The distribution monitoring system can also provide for automatic warning when the quality of the product falls below that required during the distribution process. The information on the product received over the communications link 19 from the manufacturer can include information on the temperature conditions for storage of the product. This is stored in the database of history information 18. The monitoring computer system 12 can use the received temperature measurements (from the temperature sensors 15 or from the sensors in the tags 7a) in combination with the tag detections to compare the temperatures being experienced by a product with the temperature recommended for storage for the product by the manufacturer. If the detected temperature moves outside the manufacturer's recommended range, a warning can be generated on the user terminal 17 to warn an operator that the quality of a product has been compromised. The warning need not be raised immediately the temperature of the product strays outside the recommended range, it may require the temperature to stray outside the recommended range for a predetermined period before

the warning is generated. This is because the temperature variation outside the manufacturer's recommended temperature range for a short period of time may not compromise the quality of the products.

Although the present invention has been described herein above with reference to specific embodiments, it will be apparent to a skilled personnel in the art that modifications lie within the spirit and scope of the present invention.

For example, although the present invention has been described with reference to food items, the present invention is applicable to any food or drink items and particularly to food and drink items which are fragile or subject to hygiene regulations.

In the embodiments tags are described for the containers. Any suitable active or passive tag or unique identifying system can be used which can be electronically read e.g. a bar code, a microchip or RF tag. Although in the embodiments fixed tag detectors are used, the present invention is applicable to any type of tag detector including mobile tag detectors. Further, although in the embodiments tags are used which can be read from a distance, the present invention is applicable to tags which can only be read at short range e.g. a bar code. The present invention preferably however uses tags which can be read at a distance (i.e. remotely) to make handling and tracking of the products and carriers during the distribution more practical.

CLAIMS:

1. A distribution monitoring system for monitoring the distribution of products for human consumption during the distribution of the products to a point of sale or consumption, the system comprising:

tag detection receiving means for receiving detections of tags fitted to the products or to carriers of the products periodically and/or when the products are relocated, each tag detection identifying the location of the tag at the time of detection;

temperature measurement receiving means for receiving measurements of the temperature in the vicinity of the products from temperature detecting means;

storing means for storing information on the products, and the received tag detections and temperature measurements as a history of associated location and temperature information for a product in a database; and

tracing means to allow a user to retrieve location and temperature information for a product at a desired time from the database.

2. A distribution monitoring system according to claim 1, including image receiving means for receiving images or video of the locations, wherein the storing means is adapted to store the images or video in association with the location and temperature information, and said tracing means is adapted to allow a user to display the images or video for retrieved location and temperature information.

3. A distribution monitoring system according to claim 1 or claim 2, including temperature detecting means for arrangement on the product or the carrier for providing the measurements of the temperature.

4. A distribution monitoring system according to any preceding claim, wherein the information stored for a product includes information on temperature conditions for the product and/or an expiry date or time for the product, the system including warning means for outputting a warning if the received temperature measurements and tag detections when compared with the stored product information indicate that the temperature is unsatisfactory for the product or the expiry date or time for the detected product has passed.

5. A distribution monitoring method for monitoring the distribution of products for human consumption during the distribution of products to a point of sale or consumption, the method comprising:

receiving detections of tags fitted to the products or to carriers of the products periodically and/or when the products are relocated, the tag detections identifying the location of the tag at the time of detection;

receiving measurements of the temperature in the vicinity of the products from temperature detecting means;

storing information on the products, and the received tag detections and temperature measurements as a history of associated location and temperature information for a product in a database; and

providing an interface for allowing a user to retrieve location and temperature information for a product at a desired time from the database.

6. A distribution monitoring method according to claim 5, including receiving images or video of the locations, storing the images or video in association with the location and temperature information, and allowing a user to display the images or video for retrieved location and temperature information.

7. A distribution monitoring method according to claim 5 or claim 6, wherein temperature detecting means are arranged on the product or the carrier for providing the measurements of the temperature.

8. A distribution monitoring method according to any one of claims 5 to 7, wherein the information stored for a product includes information on temperature conditions for the product and/or an expiry date or time for the product, the method including outputting a warning if the received temperature measurements and tag detections when compared with the stored product information indicate that the temperature is unsatisfactory for the product or the expiry date or time for the detected product has passed.

9. A distribution monitoring system for monitoring the distribution of products for human consumption during the distribution of products to a point of sale or consumption, the system comprising:

a memory storing computer code; and

a processor for reading and implementing the computer code in the memory;

wherein the computer code comprises computer code for controlling the processor to:

receive detections of tags fitted to the products or to carriers of the products periodically and/or when the products are relocated, the tag detections identifying the location of the tag at the time of detection;

receive measurements of the temperature in the vicinity of the products from temperature detecting means;

store information on the products, and the received tag detections and temperature measurements as a history of associated location and temperature information for a product in a database; and

provide an interface to allow a user to retrieve location and temperature information for a product at a desired time from the database.

10. A distribution monitoring system according to claim 9, wherein the computer code comprises computer code for controlling the processor to: receive images or video of the locations, store the images or video in association with the location and temperature information, and provide an interface to allow a user to display the images or video for retrieved location and temperature information.

11. A distribution monitoring system according to claim 9 or claim 10, including temperature detectors for arrangement on the products or the carriers for providing the measurements of the temperature.

12. A distribution monitoring system according to any one of claims 9 to 11, wherein the information stored for a product includes information on temperature conditions for the product and/or an expiry date or time for the product, and the computer code comprises computer code for controlling the processor to: output a warning if the received temperature measurements and tag detections when compared

with the stored product information indicate that the temperature is unsatisfactory for the product or the expiry date or time for the detected product has passed.

13. A carrier medium carrying computer code for controlling a computer to carry out the method of any one of claims 5 to 8.

14. A method of delivering products for human consumption from a manufacturing centre to passenger carrying vehicles, the method comprising:

in a manufacturing centre, packaging the products into carriers, each carrier carrying a plurality of products;

delivering the carriers in bulk to a distribution centre; and

at the distribution centre, loading predetermined numbers of the carriers into respective containers for distribution to the passenger carrying vehicles enabling the products to be distributed to passengers on the passenger carrying vehicle in transit.

15. A method according to Claim 14 wherein the containers comprise trolleys and the carriers are adapted to fit the trolleys.

16. A method according to Claim 14 or Claim 15 wherein the distribution centre comprises a hub distribution centre, the method including distributing predetermined numbers of containers from the hub distribution centre to respective spoke distribution centres, and at the spoke distribution centres adjusting the numbers of carriers in respective said containers in dependence upon the requirements for respective passenger carrying vehicles and distributing the containers to the respective passenger carrying vehicles.

17. A method according to any one of Claims 14 to 16 wherein the containers are distributed to the passenger carrying vehicles from the distribution centre, and the predetermined number of carriers loaded into respective containers is dependant upon the required number for respective passenger carrying vehicles.

18. A method according to Claim 15 wherein the containers are distributed to the passenger carrying vehicles from the distribution centre, and the predetermined number

of carriers loaded into respective containers is dependant upon the required number for respective passenger carrying vehicles.

19. A method according to Claim 16 or Claim 17 including receiving an electronic order at the hub distribution centre for products from product distributors who distribute the products to the passengers on the passenger carrying vehicle and placing an electronic order with the manufacturing centre for a bulk delivery of products in the carriers; and receiving electronic data at the spoke distribution centres on the number of products required for respective passenger carrying vehicles and determining the number of containers required.

20. A method according to Claim 18 wherein the electronic order for products is received first by respective spoke distribution centres and passed on to the hub distribution centre, the spoke distribution centres being able to adjust the number of products in the order according to local circumstances.

21. A method according to any one of Claims 14 to 20 wherein said carriers each include an electronic tag, the method including detecting the tags at predetermined points during delivery, transmitting data on the detections to a computer system to track the location and keep a history for each carrier.

22. A method according to Claim 21 wherein the carriers are delivered in at least one bulk carrier to the distribution centre, the at least one bulk carrier including an electronic tag, the tag is detected at the manufacturing centre and at the distribution centre, the detections are transmitted to a computer system to track the delivery of the bulk carrier, and when the bulk carrier is loaded with carriers at the manufacturing centre, information on the carriers loaded in the bulk carrier is transmitted to the computer system.

23. A method according to Claim 21 or Claim 22 wherein the carriers each include a temperature detector for detecting ambient temperature, the temperature detector warning if the detected temperature moves outside a predetermined range or threshold.

24. A method according to any one of Claims 14 to 23 wherein the products are fragile or subject to hygiene regulations.

25. A delivery tracking system for tracking the delivery of products for human consumption from a manufacturing centre to passenger carrying vehicles, the system comprising:

a plurality of carriers, each carrier having a unique electronic tag and being adapted to carry a plurality of products for human consumption;

tag detectors located at the manufacturing centre and at a distribution centre for detecting the tags;

a computer system for receiving tag detections and for tracking the delivery of the products and delivery history for each carrier .

26. A delivery tracking system according to Claim 15 including tag detectors for detecting carriers delivered to the passenger carrying vehicles.

27. A delivery tracking system according to Claim 25 or Claim 26 wherein each carrier includes a temperature detector for detecting temperature in the region of the product and for generating warning when the temperature moves outside a predetermined temperature range or threshold, and the computer system is adapted to receive any warnings and record the time of the warnings for carriers.

28. A delivery tracking system according to any one of Claims 25 to 27 wherein the carriers are adapted to fit trolleys for distributing the products to passengers on the passenger carrying vehicle in transit.

29. A method of delivering meals to passenger carrying vehicles; the method comprising:

at a distribution centre, receiving separately packaged items from food manufacturing centres;

assembling the separately packaged items on a tray to form a meal unit, and loading the meal units into trolleys; and

distributing the trolleys to the passenger carrying vehicles.

30. A method according to Claim 29 wherein the food manufacturing centres comprise restaurants, the method including carrying out final preparation on each meal unit on the passenger carrying vehicle by a chef before serving to the passengers.

31. A method according to Claim 29 or Claim 30 including controlling the ambient temperature of the food from delivery from the food manufacturing centres to delivery to the passenger carrying vehicles.

32. A carrier for use in the method of Claim 15 comprising:

a structure having a base and sides, the sides having grooves therein for co-operation with ridges on the inside walls of trolleys to hold the carriers; and

a unique electronically readable tag.

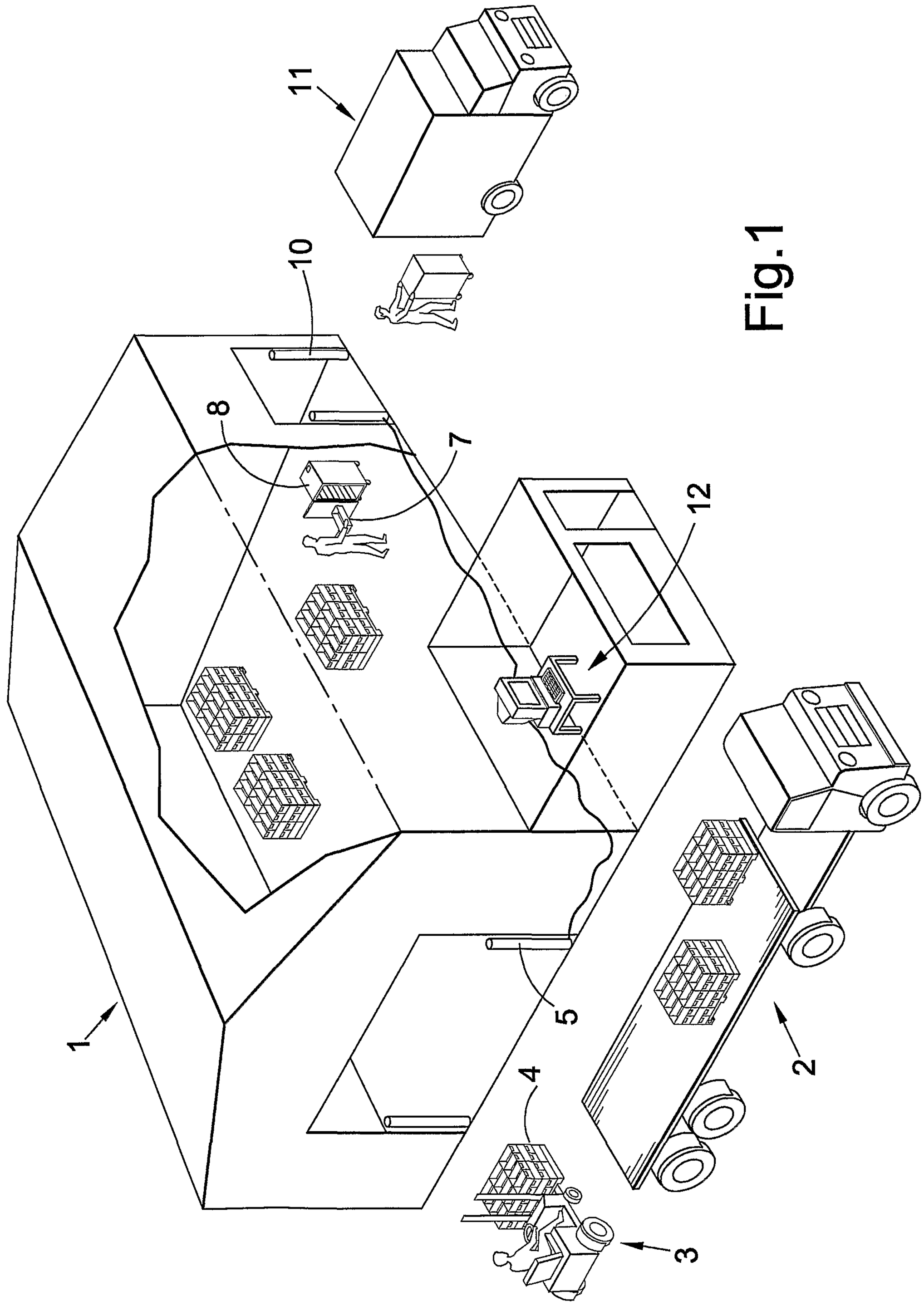

Fig.1

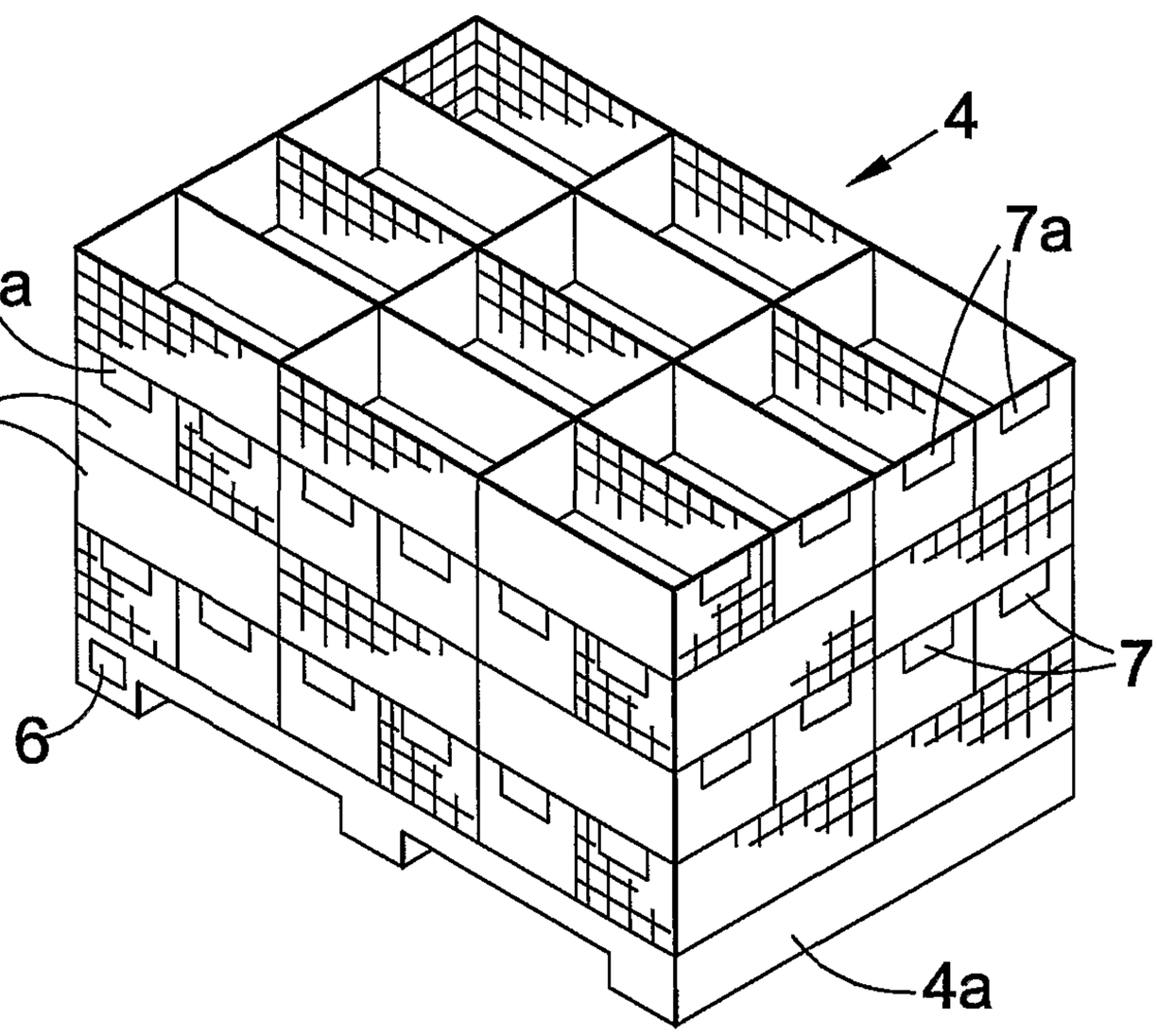

Fig.2

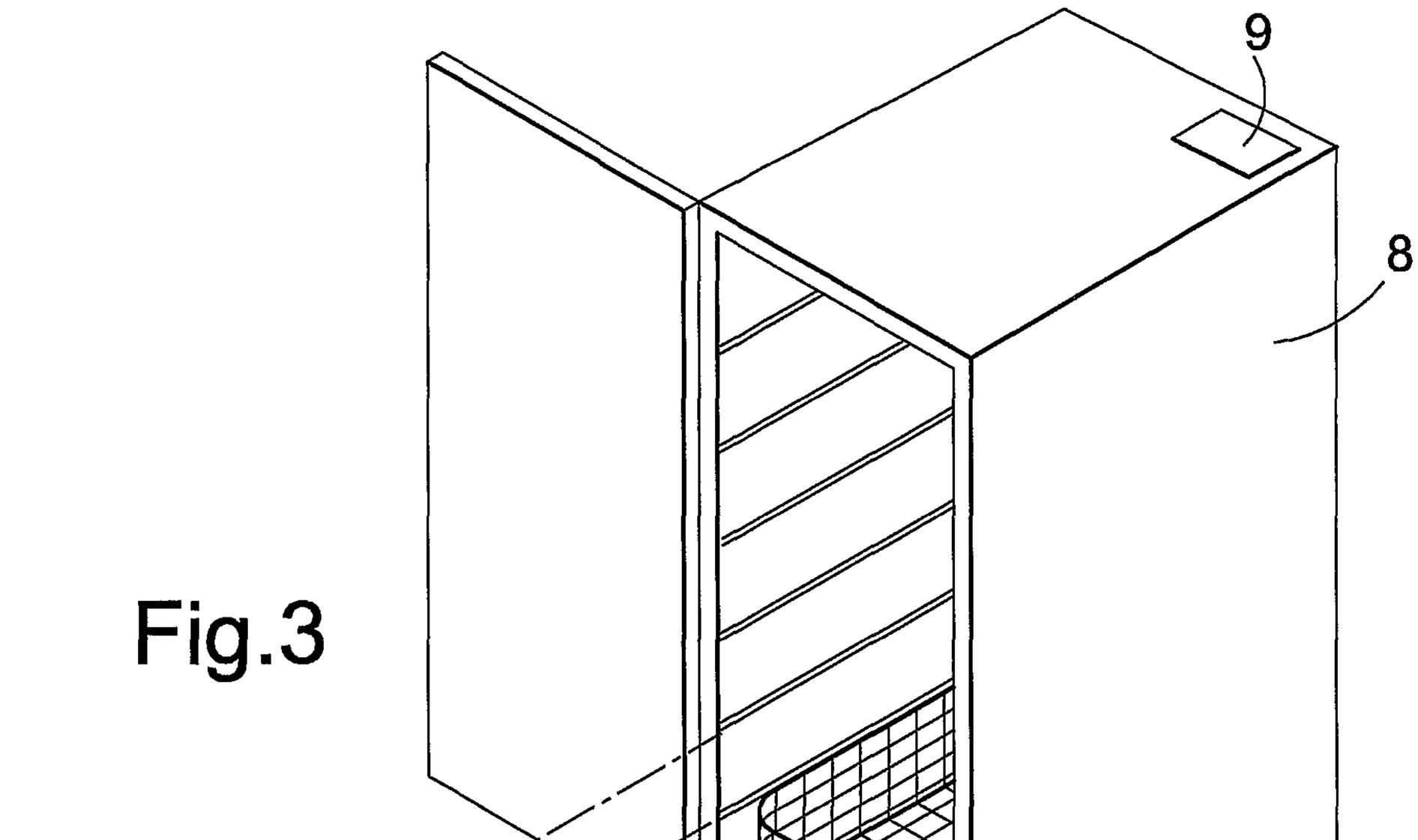
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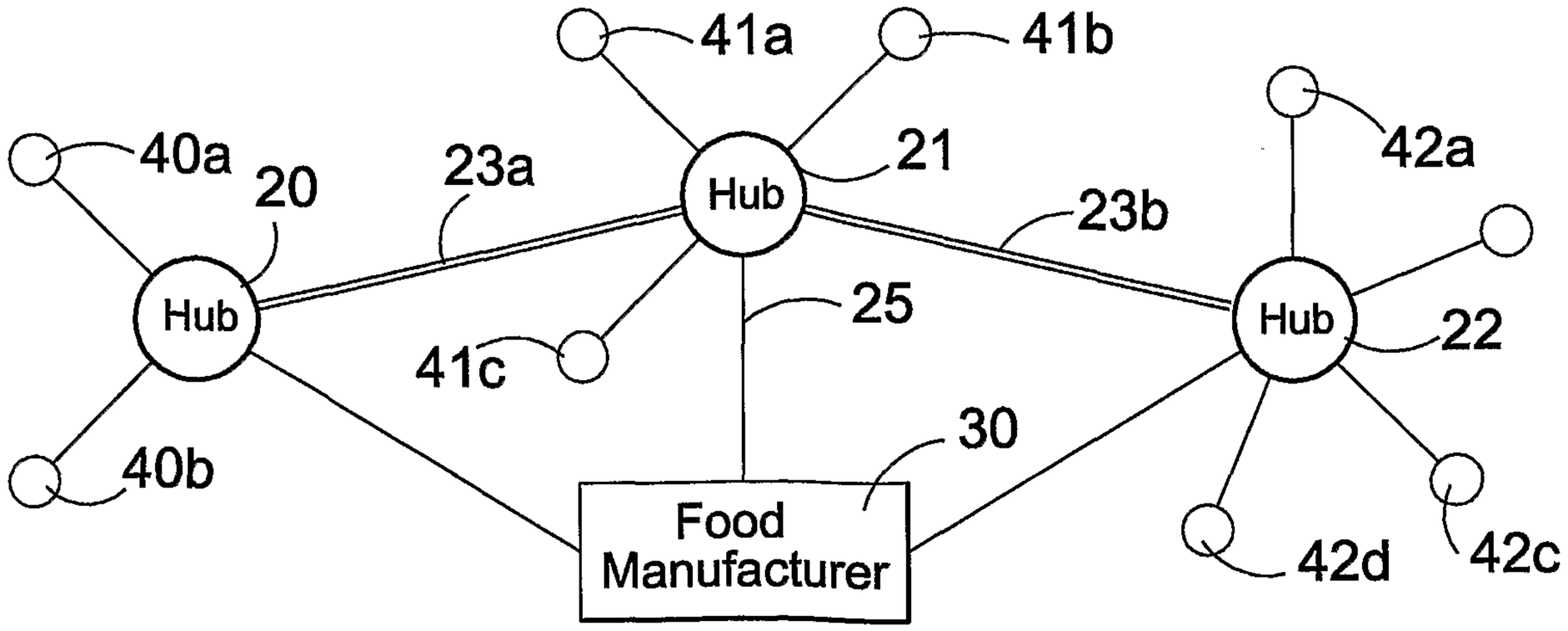
Fig.3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41b
40a
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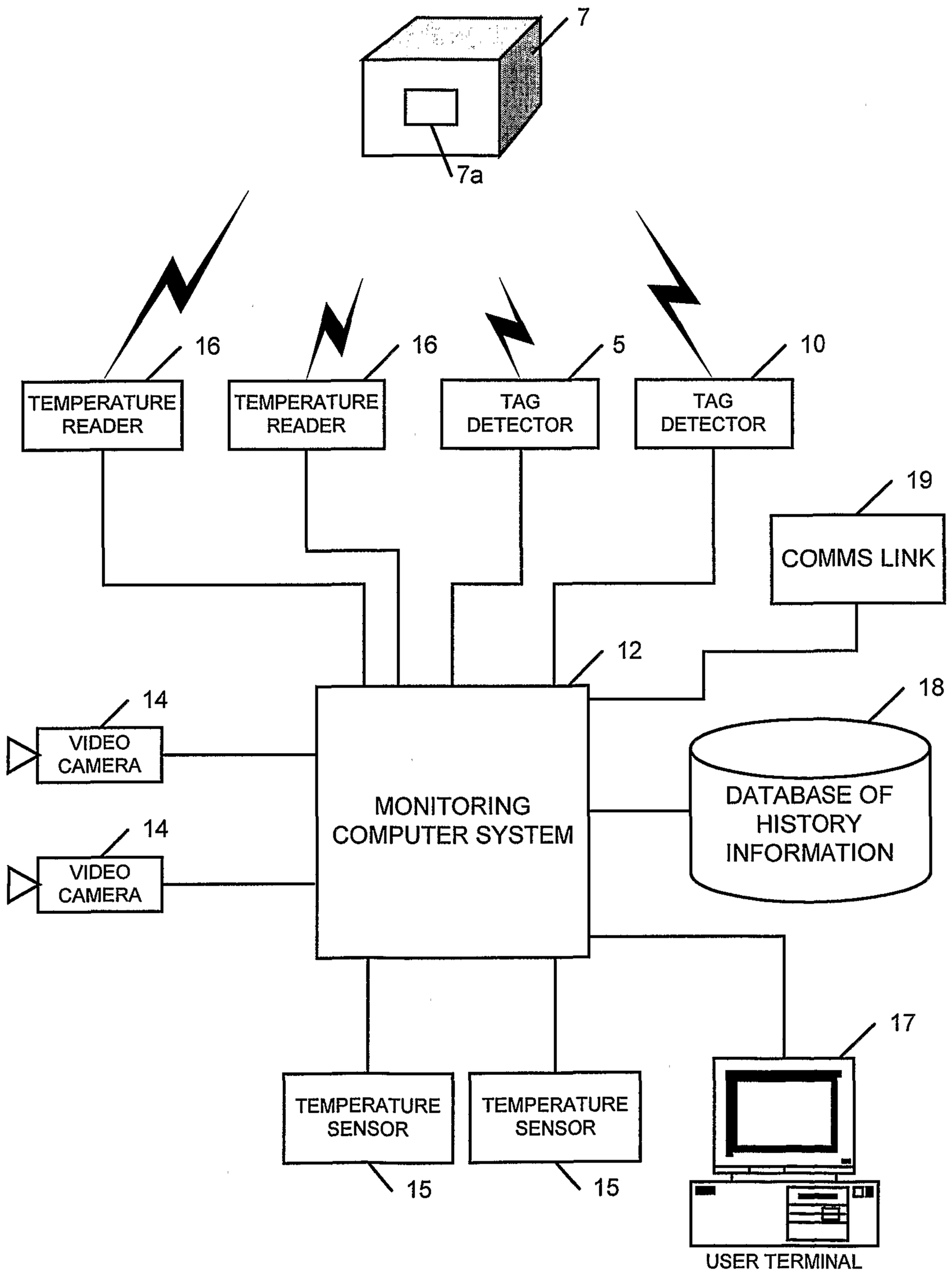
23a
Hub
21
23b
42a
Hub
Hub
25
22
41c
40b
30
Food
Manufacturer
42d
42c

Fig.4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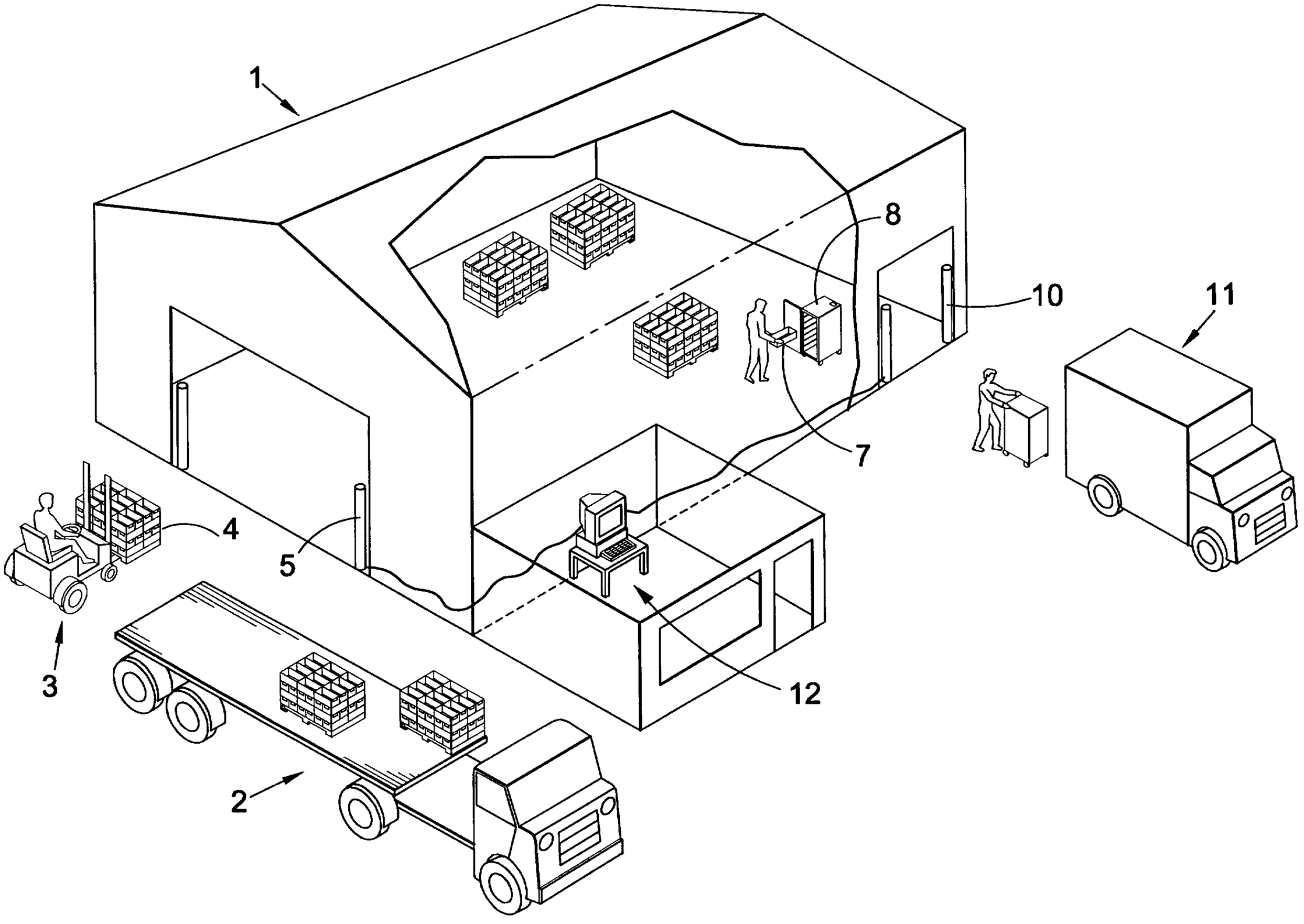
TEMPERATURE READER
TEMPERATURE READER
TAG DETECTOR
TAG DETECTOR
19
COMMS LINK
12
14
VIDEO CAMERA
14
VIDEO CAMERA
MONITORING COMPUTER SYSTEM
18
DATABASE OF HISTORY INFORMATION
TEMPERATURE SENSOR
TEMPERATURE SENSOR
15
15
17
USER TERMINAL

Fig. 5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