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(54) **Title:** METHOD AND SYSTEM FOR DISTRIBUTING OBJECTS ON LOCATIONS

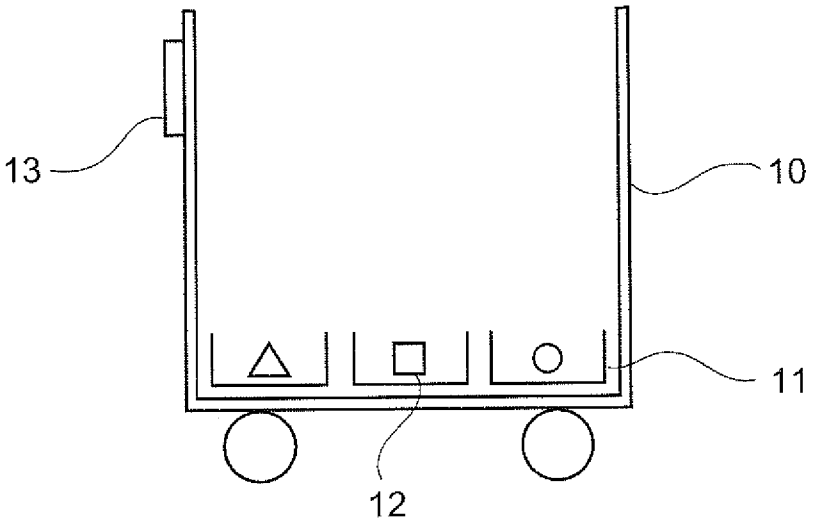


Fig.2

(57) **Abstract:** The invention relates to a method, a system and a computer program for distributing objects on locations, in particular, for distributing components and materials to different locations of an assembly line. Controlling data are provided to control a distribution of the objects (12) on object delivering units (10). A list is generated indicating a sequence, in which the objects (12) have to be located on the object delivering units (10), depending on the controlling data. The objects (12) are placed on the object delivering units (10) in accordance with the list, and the object delivering units (10) are moved to the locations.

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Method and system for distributing objects on locations

container is labelled with a first label indicating the order, which is assigned to the container, and since each object is labelled with a second label indicating the order to which the object corresponds, each object can easily be placed in the corresponding container by comparing the orders of the first label and the second label, wherein the distribution of the objects among the containers and thus among the object delivering units is accelerated.

In a further embodiment according to the invention, groups of controlling data are provided, wherein the groups comprise a ranking, and wherein the list is generated depending on the ranking. The ranking allows to give controlling data of different groups, different ranking positions, wherein, if the control, which is generated by control data of one group, is in conflict with a control, which is generated by control data of another group, the control of the control data of the group comprising the higher ranking position will be used. This weighting of controlling data further improves the adaptability of the distribution process.

It is preferred, that after containers have been located on an object delivering unit, the assignment of the containers to the object delivering unit is registered. Since, after registration, it is known, on which object delivery unit a container and therefore an object is located, this allows to monitor the distribution of the containers and the objects. In particular, the movement of the object delivering units is traced, which improves the monitoring of the distribution process.

In an embodiment according to the invention, to each object delivering unit a status is assigned depending on the location of the object delivering unit, wherein the movement of the object delivering units is restricted to a movement, which comprises only predetermined status transitions. The predetermined status transitions are predetermined such that the distribution process is further improved. Therefore,

by restricting the movement of the object delivering units to these predetermined status transitions, the distribution process is further improved.

It is further preferred, that, before the objects are placed on the object delivering units, the objects are stored in a warehouse at locations, which depend at least on a part of the controlling data. Since the objects are stored in a warehouse at locations, which depend at least on a part of the controlling data, the storage of the objects in the warehouse is adapted to the distribution of the objects among the containers and among the object delivering units. Therefore, the stock removal and the transfer from the warehouse to the containers and the object delivering units is accelerated.

The above mentioned objects are further achieved by a system for distributing different objects on locations, wherein the system comprises:

- means for providing controlling data to control a distribution of the objects on object delivering units,
- means for generating a list indicating a sequence, in which the objects have to be located on the object delivering units, depending on the controlling data.

Preferentially the system is adapted to perform one or several of the above mentioned preferred steps and embodiments of the method for distributing objects on locations according to the invention.

The above mentioned objects are further archived by a computer program for distributing different objects on locations for carrying out the steps of

- providing controlling data to control a distribution of the objects on object delivering units,
- generating a list indicating a sequence, in which the objects have to be located on the object delivering units, depending on the controlling data,

when the computer program is run on a computer, wherein the computer program comprises:

- first program code means for providing controlling data to control a distribution of the objects on object delivering units and
- second program code means for generating a list indicating a sequence, in which the objects have to be located on the object delivering units, depending on the controlling data.

Preferentially the computer program is adapted to perform one or several of the above mentioned preferred steps and embodiments of the method for distributing objects on locations according to the invention.

BRIEF DESCRIPTION OF THE FIGURES

Embodiments of the invention will be descript with respect to following figures:

Fig. 1 shows schematically an embodiment of a system for distributing objects on locations,

Fig. 2 shows schematically an object delivering unit with containers and objects,

Fig. 3 shows schematically a container containing an object, and

Fig. 4 shows a flowchart of an embodiment of a method for distributing objects on locations according to the invention.

PREFERRED EMBODIMENTS OF THE INVENTION

Fig. 1 shows an embodiment of a system 1 for distributing objects on locations. The system 1 for distributing objects on locations comprises a management system 2,

which is, for example, a SAP-system, which performs, for example, inventory management and missing object management. The management system 2 provides also orders.

An order describes preferentially one or a group of assembling steps, which are needed to assemble a part of, for example, an aircraft. The order comprises preferentially further the time, at which the assembling steps have to be performed, and the objects, which are needed to perform, these assembling steps. Objects are, in particular, components, which are needed to assemble the aircraft.

The system 1 for distributing objects on locations further comprises a distribution system 3, which determines the distribution of the objects among containers and among object delivering units. The management system 2 is connected to the distribution system 3 to transfer the orders from the management system 2 to the distribution system 3. The distribution system 3 comprises means 4 for providing controlling data to control a distribution of the objects on object delivering units. The distribution means is preferentially a computer, and the means for providing controlling data is preferentially a data bank.

The locations, at which the objects have to be distributed, are preferentially classified into stations and building sites. Each station comprises several building sites. For example, if an aircraft is assembled along a assembling line, the stations can be distributed along the assembling line indicating different larger assembling regions, and at each station several building sites can be present, wherein each building site indicates a smaller assembling region being a part of the larger assembling region.

The controlling data can comprise first data, which group orders and therefore objects, which have to be used at the same station, together resulting in first groups. Depending on these first data a list will be generated such that objects of different first groups are placed on different object delivering units.

The controlling data can comprise second data, which indicate the time at which the order has to be performed, and therefore the delivering time at which the corresponding objects have to be at the corresponding station or building site. These second data are preferentially determined from the orders. Depending on these second data a list will be generated such that objects having different delivering times will be placed on different object delivering units.

The controlling data can further comprise third data, which group building sites resulting in second groups and which assign the orders received from the management system 2 to the different second groups of building sites. A second group can also comprise only one building site. Objects, which correspond to orders assigned to different second groups of building sites, are preferentially not allowed to be placed on the same object delivering unit. Thus, depending on the third data a list will be generated, wherein objects of different second groups are distributed on different object delivering units.

The controlling data can comprise fourth data, which group the orders depending on the technical assembling field resulting in third groups, wherein orders and therefore objects, which correspond to these orders, of different third groups, i.e., which correspond to different technical assembling fields, are not allowed to be placed on the same object delivering unit. Thus, depending on the fourth data, the list will be generated accordingly. Different technical assembling fields are for example, hydraulical, electrical and mechanical assembling.

It is also preferred, that the controlling data comprise data, which group predetermined orders and therefore objects because of other reasons together resulting in fourth groups, for example, because these orders have to be carried out by one person or because the objects are needed at neighboring building sites. It is preferred, that it is not allowed to place orders and therefore the corresponding

objects of different groups on the same object delivering unit. The list will be generated accordingly.

The controlling data can further comprise fifth data, which assign to each container an object delivering unit of a predetermined size. Furthermore, the fifth data can comprise the rule, that containers assigned to an object delivery unit of a larger size have to be placed on the object delivering units before a container is placed assigned to a smaller object delivering unit.

The control data can further comprise sixth data grouping orders and therefore objects together, which have to be placed in the same container.

Furthermore, the controlling data can comprise seventh data indicating orders, wherein the objects, which correspond to these orders, have to be placed in one container only.

The distribution system 3 further comprises a means 5 for generating a list indicating a sequence, in which the objects have to be located on the object delivering units, depending on the controlling data. The generated list is transferred to an output device 6, which outputs the generated list.

The system 1 for distributing objects on locations further comprises at least one warehouse management system 7a, 7b, which receives from the distribution system 3 the information, which orders have to be carried out and therefore which objects are needed at which time. The warehouse management system 7a, 7b determines, at which locations the required objects are placed within the corresponding warehouses 8a, 8b. The required objects are removed from the warehouse and labelled with a second label which is generated by a corresponding label generation device 9a, 9b. This second label comprises information concerning the corresponding order, for example, an order identification number. The objects, which have been removed

from the warehouse and labelled with the second label, are transported to a loading site, at which object delivering units are loaded with containers and with the required objects.

Fig. 2 shows schematically an object delivering unit 10, which has been loaded with containers 11, wherein the containers 11 contain the required objects 12. The object delivering unit 10 can be any known transporter which is suited to transport the containers and the required objects to the different locations. The object delivering units comprise third labels 13, which identify each object delivering unit 10 unambiguously.

Fig. 3 shows schematically a container 11 containing an required object 12. The container 11 is labelled with a first label 15 and the object 12 is labelled with the second label 14. The first label 15 comprises information indicating unambiguously to which order the container 11 corresponds. The second label 14 comprises information indicating unambiguously to which order the required object 12 corresponds. Therefore, if the object 12 has been placed within the container 11 correctly, the orders indicated by the first label 15 and the second label 14 are identical.

An embodiment of a method for distributing objects on locations according to the invention will now be described in more detail with respect to a flowchart shown in Fig. 4.

In step 101 objects are placed in the warehouse 8a, 8b, wherein the location of the objects within the warehouse is registered by the warehouse management system 7a, 7b. It is preferred that the information, which objects have to be placed within the warehouse, is inputted into the warehouse management system 7a, 7b, wherein the warehouse management system 7a, 7b determines, at which locations within the warehouse 7a, 7b the objects have to be placed. For the determination of the

locations, at which the objects should be placed within the warehouse 8a, 8b, the warehouse management system 7a, 7b uses preferentially at least a part of the controlling data to adapt the later removal from the warehouse and the transfer from the warehouse to the loading site to the distribution process, in particular, to the process of distributing different components of an aircraft among different stations and building sites. For example, objects, which have to be placed on one object delivering unit or within one container according to the controlling data, are preferentially placed at neighboring locations and/or on one means for transferring these objects from the warehouse to the loading site, for example, on one skid or within one bag.

In step 102 the distribution system 3 receives orders from the management system 2. In step 103 the means 4 for providing controlling data provides controlling data, which can control the distribution of the objects on the object delivering units. The means 5 for generating a list generates in step 104 a list indicating a sequence, in which the objects have to be located on the object delivering units, depending on the provided controlling data, in particular, depending on the above mentioned first to seventh data.

In this embodiment the list indicates the sequence, in which the objects have to be placed on the object delivering units, by indicating a sequence, in which containers have to be located on the object delivering units, wherein to each container an order is assigned and wherein in each container the objects or the object of the assigned order have to be placed. Thus, in this embodiment the means 5 for generating a list generates a list indicating a sequence, in which containers, which are assigned to the orders, have to be located on the object delivering units.

This list is generated preferentially by using the above mentioned controlling data. For example, if the first data of the controlling data are used, the list is generated such, that objects, which have to be used at the same station, are placed on the same

object delivering unit. And, if, for example, the seventh data of the controlling data are used, objects, which correspond to an order, which is specified in these seventh data, are placed within one container.

The controlling data are ranked such that, if, for example, the first data of the controlling data are in conflict with the second data of the controlling data, the second data of the controlling data will be used to generate the list, and not the first data. With respect to the first data to the seventh data of the controlling data, the data comprising a higher ordinal number overrule the data having a lower ordinal number.

After the list has been generated, the list is outputted on the output device 6. The output is preferentially a list of first labels, wherein each label comprises information indicating unambiguously one order. In particular, each label comprises a bar code identifying unambiguously an order. The first label comprises preferentially further information indicating the location, for example, the building site, to which a container has to be transported, and the type of the container, which has to be used for the order indicated on the first label. Different type of containers can comprise different dimensions, different rigidity, a different shape etc.. The assignment between different objects and different types of containers is predetermined and stored in a data bank on the distribution system 3. Thus, since the orders comprise objects, to each order a type of container can be assigned and printed on the first label, which corresponds to the objects of this order.

The generated list comprises marks indicating that the next container of the list has to be placed on a new object delivering unit. Such a mark is preferentially set between two first labels of the list generated in step 104, if the delivering time of the orders corresponding to these two first labels is different, or if the orders corresponding to these first labels have to be carried out at different second groups of building sites, which are defined by the third data of the controlling data, or if the orders

corresponding to these first labels correspond to different third groups, which are defined by the fourth data of the controlling data.

The outputted first labels are attached to containers of the type indicated on these first labels, and in step 106 the containers are placed on an object delivering unit until a mark indicates, that a new and empty object delivering unit has to be used for the next containers of the generated list. The distribution system 3 generates also a third label, which is outputted by the output device 6. The third label is attached to the object delivering unit, on which the containers have been placed. The third label comprises preferentially the location, for example, the building site, to which the containers and therefore the object delivering unit have to be moved. Furthermore, the third label comprises preferentially the time, at which the object delivering unit has to be at the location, i.e., the delivering time.

After the containers have been placed on an object delivering unit, it is registered on the distribution system, which containers are placed on the object delivering unit. The containers are preferentially identified by consecutive numbers, which correspond to the position within the list generated in step 104. On each first label this consecutive number is shown. Furthermore, each object delivering unit comprises the third label identifying the object delivering unit unambiguously. Preferentially, the containers on the object delivering unit are registered by registering the consecutive numbers of the containers and of the information on the third label identifying the object delivering unit. Since containers are identified by consecutive numbers, the containers on an object delivering unit can be registered by registering the two containers, which have been placed as the first container and the last container on the object delivering unit. It is preferred, that the registration is carried out by using bar codes, which are located on the first and the third labels and which represent at least the consecutive number and the object delivering unit, for example, an object delivering unit number identifying the object delivering unit unambiguously.

In step 108 the orders are sent from the distribution system 3 to the warehouse management system 7a, 7b.

In step 109 the warehouse management system 4 determines from the orders, which objects have to be removed from the warehouse, and the warehouse management system 4 determines, at which locations these objects are placed within the warehouse 8a, 8b.

In step 110 the objects determined by the warehouse management system 7a, 7b are removed from the warehouse. Furthermore, for each object a second label is generated, which comprises the order to which the corresponding object belongs to. Each object is labelled with the corresponding second label.

In step 111 the labelled objects are transferred to a loading site, at which the object delivering units comprising the containers are located.

In step 112 the objects are placed in the corresponding containers by comparing the orders on the first and the third labels. In order to place an object in the corresponding container, only the order, for example, the order number, on the third label attached to the object has to be identified, and the object has to be placed in the container, whose first label indicates the same order, in particular, the same order number.

In step 113 the object delivering unit is moved to the location indicated on the third label attached to the object delivering unit. During the movement of the object delivering unit the path of the object delivering unit is traced such that the actual position of the object delivering unit can be determined by the distribution system 3. In particular, the object delivering unit comprises a transponder, which communicates with a communication unit of the distribution system to determine the actual position of the object delivering unit. Alternatively, the system 1 for

distributing objects on locations comprises several position inputting sites, which have to be passed by the object delivering unit, wherein at each position inputting site it is registered by a position inputting system, that the object delivering unit is located at the respective position inputting site. The position inputting system transfers the position information to the distribution system 3 in order to trace the movement of the object delivering unit. The position inputting system can comprise a scanner, which scans a bar code on the third label attached on the object delivering unit, which identifies the object delivering unit unambiguously.

It is preferred that to each object delivering unit a status is assigned depending on the location of the object delivering unit. For example, before the loading procedure at the loading site is carried out, the object delivering unit can have the status 0. If the object delivering unit is filled with containers and located at the loading site, the object delivering unit can have the status 1. If the object delivering unit is located between the loading site and the destination location, for example, the building site indicated on the third label, the status can be 2. If the object delivering unit is located at the destination location, the status can be 3, and if the object delivering unit is empty and on the way back to the loading site, the status can be 4. These statuses are only examples. In accordance with the invention, also other statuses can be defined which depend on the location of the object delivering unit. During the movement of the object delivering unit the transitions between different statuses are observed by the distribution system 3. The movement is restricted to predetermined status transitions only. If the object delivering unit performs a status transition, which is not allowed, the distribution system 3 outputs a signal indicating that the movement of the object delivering unit is incorrect and that the movement has to be corrected.

In step 114 the object delivering unit has reached the final destination, for example, the building site, indicated on the third label attached to the object delivering unit, and the objects can be used to carry out the assembling steps described in the order indicated on the first label attached to the respective container.

The steps 101 to 114 are, for sure, not carried out by only one object delivering unit and only one order, but for an arbitrary number of orders and a number of object delivering units, which is needed to distribute the objects identified by the orders to the locations at the delivering time, which are also identified by the order.

In accordance with the invention, the objects can also be placed on the object delivering units without using containers, i.e., the objects can directly be placed on the object delivering units, or some objects can be placed within containers placed on the object delivering units and some objects can be directly placed on the object delivering units.

In accordance with the invention, the list can indicate a sequence, in which the objects have to be located on the object delivering units, without using the containers, or the list can indicate a sequence, in which the objects have to be located on the object delivering units, wherein for some objects this sequence is indicated by indicating for some objects a sequence, in which containers have to be located on the object delivering units, wherein to each container at least one object is assigned, which has to be placed in the container, and by indicating for some other objects a sequence, in which the objects have to be located on the object delivering units directly.

Claims

1. A method for distributing objects on locations, said method comprising following steps:

- providing controlling data to control a distribution of the objects (12) on object delivering units (10),
- generating a list indicating a sequence, in which the objects (12) have to be located on the object delivering units (10), depending on the controlling data,
- placing the objects (12) on the object delivering units (10) in accordance with the list,
- moving the object delivering units (10) to the locations.

2. The method of claim 1,

wherein the list indicates the sequence, in which the objects (12) have to be placed on the object delivering units (10), by indicating a sequence, in which containers (11) have to be located on the object delivering units (10), wherein to each container (11) at least one object is assigned, which has to be placed in the container (11).

3. The method of claim 2,

wherein orders are defined, which comprise objects, and wherein to each container (11) at least one object (12) is assigned by assigning to each container (11) at least one order.

4. The method of claim 3,

wherein, after generating the list, each container (11), which is indicated by the list, is labelled with a first label (15) indicating the order, which is assigned to the container (11),

wherein each object (12) is labelled with a second label (14) indicating the order to which the object (12) corresponds.

5. The method of one of the preceding claims,
wherein groups of controlling data are provided, wherein the groups comprise a ranking, and wherein the list is generated depending on the ranking.

6. The method of one of the claims 2 to 5,
wherein, after containers (11) have been located on an object delivering unit (10), the assignment of the containers (11) to the object delivering unit (10) is registered.

7. The method of one of the preceding claims,
wherein the movement of the object delivering units (10) is traced.

8. The method of one of the preceding claims,
wherein to each object delivering unit (10) a status is assigned depending on the location of the object delivering unit (10), wherein the movement of the object delivering units (10) is restricted to a movement, which comprises only predetermined status transitions.

9. The method of one of the preceding claims,
wherein, before the objects (12) are placed on the object delivering units (10), the objects (12) are stored in at least one warehouse (7a, 7b) at locations, which depend at least on a part of the controlling data.

10. A system for distributing different objects on locations, said system comprises:
- means (4) for providing controlling data to control a distribution of the objects on object delivering units (10),
- means (5) for generating a list indicating a sequence, in which the objects (12) have to be located on the object delivering units (10), depending on the controlling data.

11. A computer program for distributing different objects on locations for carrying out the steps of

- providing controlling data to control a distribution of the objects (12) on object delivering units (10),
- generating a list indicating a sequence, in which the objects (12) have to be located on the object delivering units (10), depending on the controlling data,

when the computer program is run on a computer, said computer program comprises:

- first program code means for providing controlling data to control a distribution of the objects (12) on object delivering units (10) and
- second program code means for generating a list indicating a sequence, in which the objects (12) have to be located on the object delivering units (10), depending on the controlling data.

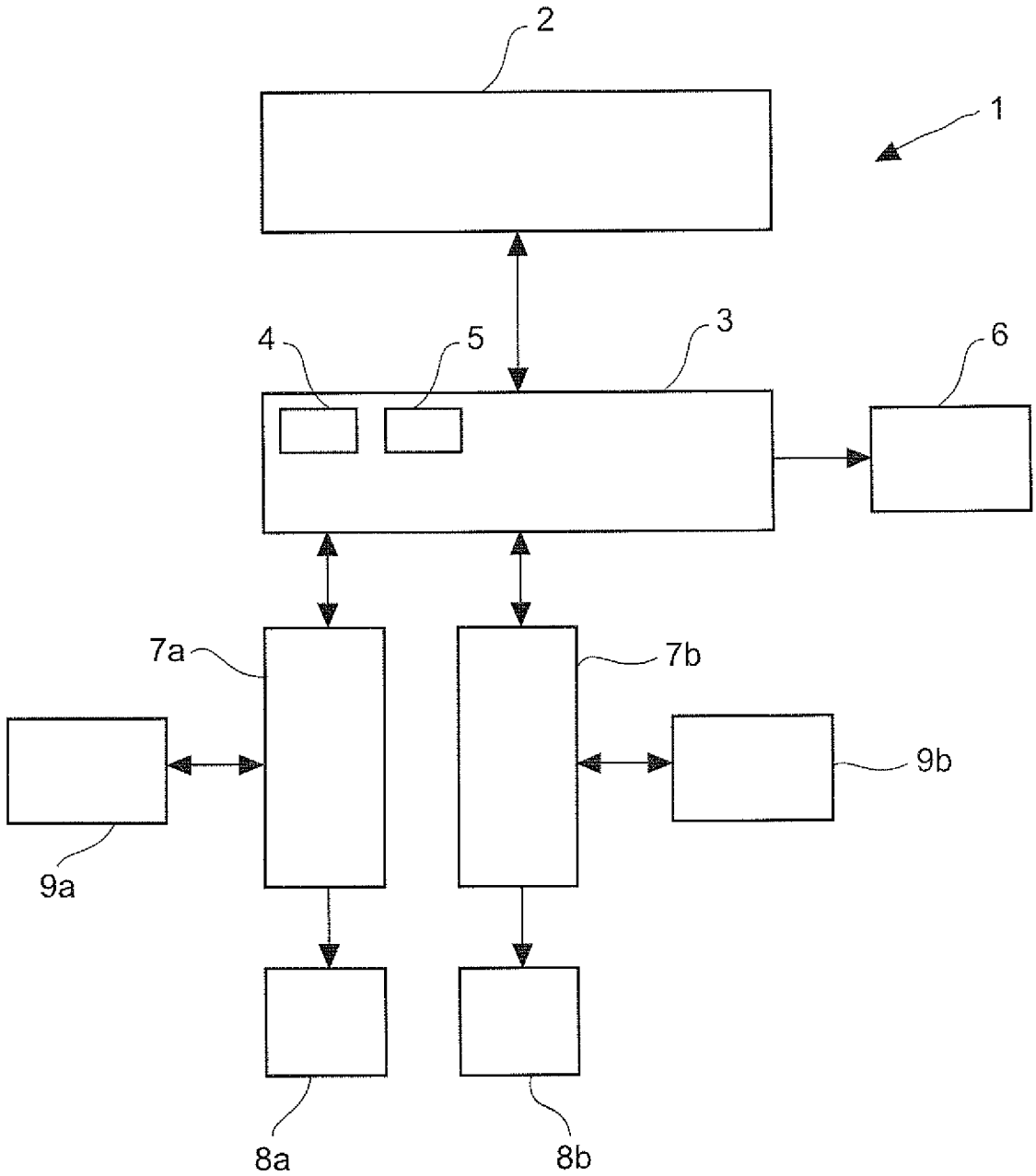


Fig.1

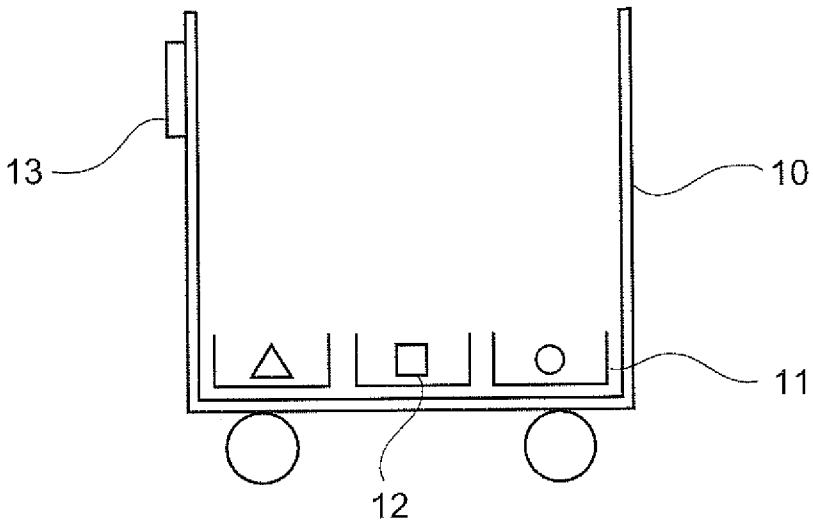


Fig.2

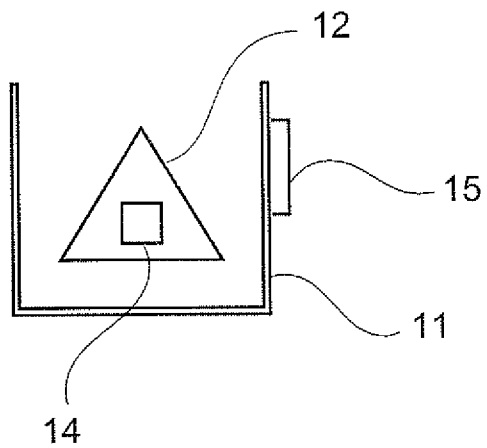


Fig.3

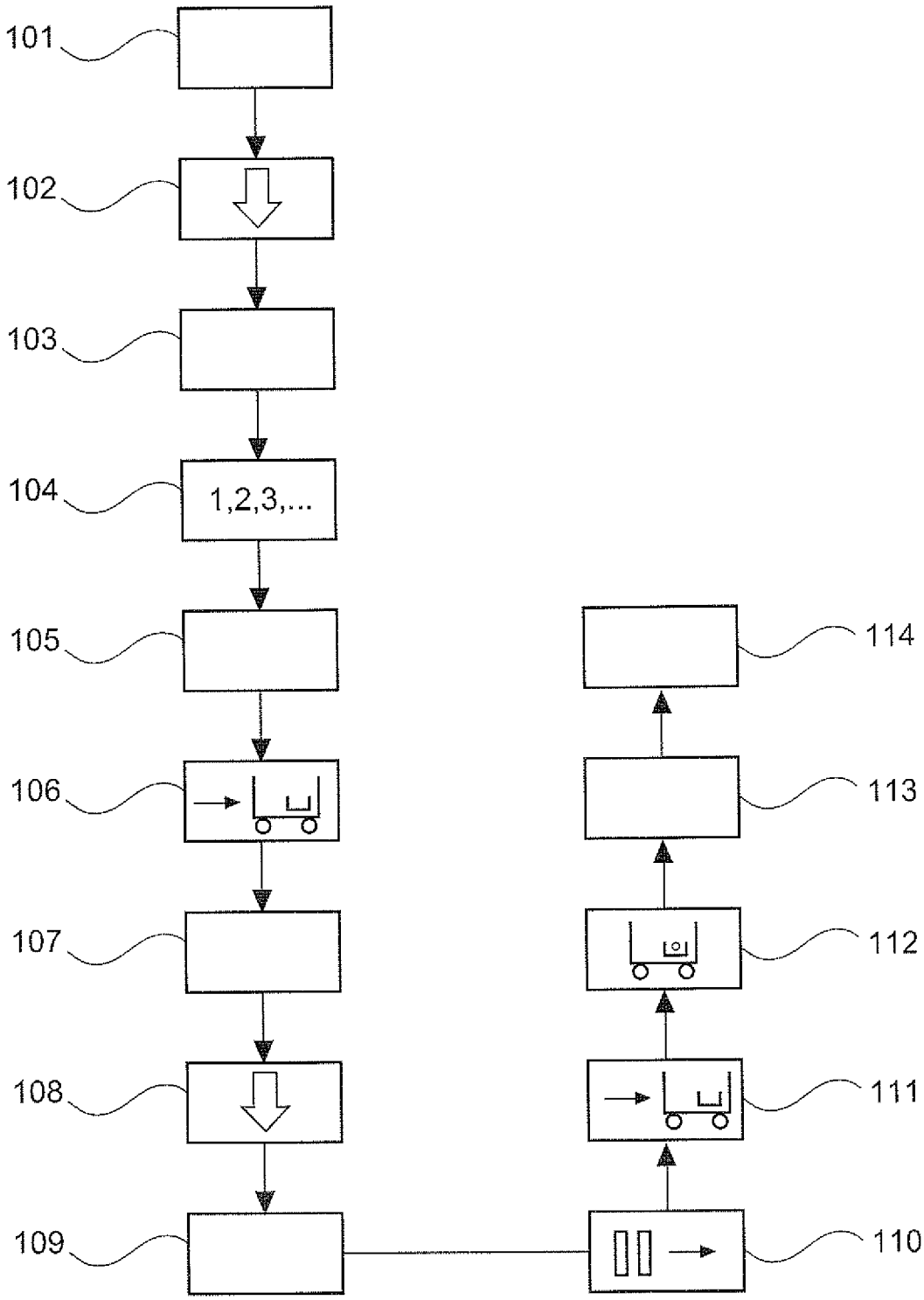


Fig.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/063018

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06Q10/00 G06Q50/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
L	The technical aspects identified in the present application (Art. 15 PCT) are considered part of common general knowledge. Due to their notoriety no documentary evidence is found to be required. For further details see the accompanying Opinion and the reference below. XP002456414 abstract	1-11

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
3 July 2008	25/07/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Mülthaler, Evelyn