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(54) **Method of transporting and sorting items such as mail and item transport and sorting system**

(57) The invention relates to a method of transporting and sorting items such as mail, said method comprising the steps of: a) transporting at least one item with one or more initial lanes to an identification position, b) identifying an individual characteristic of said at least one item in said identification position c) transporting said at least one item to a sorting lane of a number of sorting lanes as a result of said identified characteristic, d) collecting said at least one item of one sorting lane in one or more transfer lanes, and e) transporting said at least one item to the initial lanes through one or more return lanes by one or more robot or similar transferring means wherein at least two of said method steps a) to e) are repeated until said at least one item are transferred to a relocation conveyor by the robot for distribution of said item.

The invention also relates to an item transport and sorting system.

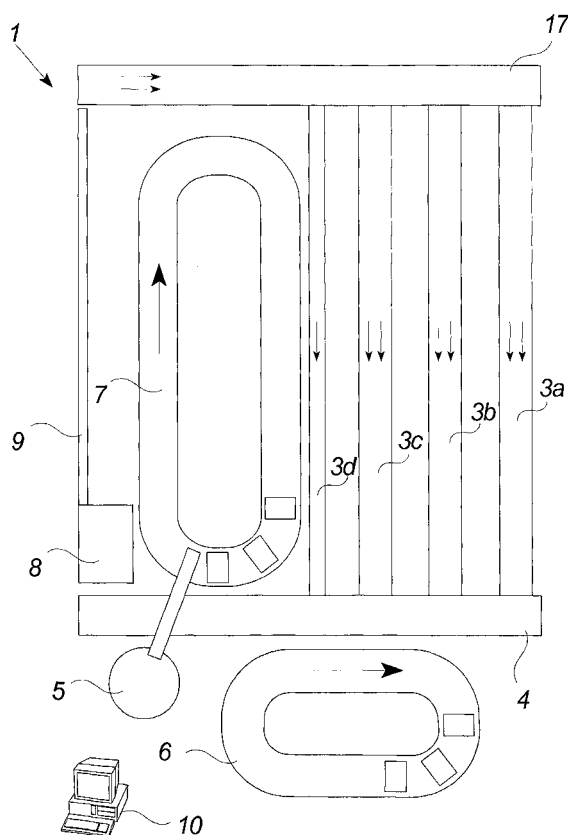


Fig. 2

Description

Background of the invention

[0001] The present invention relates to a method of transporting and sorting items such as mail and item transport and sorting system.

[0002] In a modern mail system the mail is collected locally and sent to a mail-sorting centre. At the centre the mail is sorted into different slots each slot representing a mail district. The sorted mail is forwarded to the relevant district, e.g. daily by truck train or aeroplane, and subsequently distributed by the local mailman to the receiver of the mail.

[0003] In recent years the mail distribution in general and especially the sorting centres have experienced a significant change toward more and more centralization and automation in order to handle more mail. The automation has emerged e.g. OCR to scan the addresses on the mail; computers to bring together mail of given region or district and advanced conveyor systems to transport the sorted mail from entrance to exit of the centre.

[0004] However, the mail sorting centres have a significant disadvantage of being very inflexible in their sorting structure. This results in distribution of inadequate amounts of mail-to-mail districts, requiring more frequent distribution, or alternatively distribution to larger mail districts with subsequent sorting of the mail to smaller districts.

[0005] Further, the systems of the well-known mail sorting centres all send mail directly and continuously to a number of carts at the exit. If a cart is to be emptied the system as such must be stopped in order to remove the cart from the system. This may occur if the cart is full or if the distribution needs to take place for other reasons.

[0006] The coefficient of utilization in the systems is low and at the same time detection of full carts are rather complicated resulting in less than optimal systems.

[0007] An object of the invention is to create a method of sorting items such as mail and an item transportation and sorting system without the above-mentioned drawbacks.

[0008] Another object of the invention is to create a method and system that allow use without frequently stopping the system at emptying or distribution.

The invention

[0009] The invention relates to a method of transporting and sorting items such as mail, said method comprising the steps of:

- a) transporting at least one item with one or more initial lanes to an identification position,
- b) identifying an individual characteristic of said at

least one item in said identification position

c) transporting said at least one item to a sorting lane of a number of sorting lanes as a result of said identified characteristic,

d) collecting said at least one item of one sorting lane in one or more transfer lanes by one or more robot or similar transferring means, and

e) transporting said at least one item to the initial lanes through one or more return lanes

wherein at least two of said method steps a) to e) are repeated until said at least one item are transferred to a relocation conveyor for distribution of said item.

[0010] Hereby it is possible to direct the full load of a sorting lane to the transfer lanes, being ready to be transferred by robot to a cart e.g. of the distribution or temporary storage conveyor.

[0011] The full load of the sorting lane may correspond to the capacity of a cart, and thus the cart being instantly ready for emptying or distribution. As the transfer to the cart is performed as a limited, discrete and well-defined transfer, and not a continuous transfer, the full cart may e.g. be removed from the conveyor without stopping the system.

[0012] Preferably, as stated in claim 2, said at least one item transfer to the relocation conveyor may be performed to one dedicated cart out of a number of carts in said relocation conveyor.

[0013] Preferably, as stated in claim 3, one or more rules or algorithms may define the relation between said at least one item, sorting lanes and/or number of carts.

[0014] Advantageously, as stated in claim 4, one or more rules or algorithms may define the time of transfer to said relocation conveyor.

[0015] Preferably, as stated in claim 5, the number of sorting lanes may be changed in response to the item load controlled by said one or more rules or algorithms.

[0016] The invention also relates to an item transport and sorting system, said system comprising

one or more initial lanes transporting at least one item to an identification position,

identification means for identifying an individual characteristic of said at least one item in said identification position,

one or more sorting lanes for sorting said items, one or more transfer lanes for receiving a number

of sorted items from said one or more sorting lanes,

one or more return lanes for returning items to said one or more initial lanes,

at least one relocation conveyor for distribution of said items, and

at least one robot or similar transferring means for transferring said sorted items from said one or more transfer lanes to said one or more return lanes or said at least one relocation conveyor.

[0017] Hereby, it is possible to establish a system advantageous in performing said abovementioned method.

[0018] It shall be emphasised that the phase "return lanes" shall be understood as an optional link between the transfer and initial lanes and may be of any particular length e.g. a direct connection between the lanes or certain length defined by such circumstances as physical limitations, lower restrictions for curvatures or the like.

[0019] Advantageously, as stated in claim 7, said items may be a number of boxes or stacks of boxes preferably containing mail.

[0020] Preferably, as stated in claim 8, said characteristics of the items may be barcodes, included microchips or the like and said identification means are one or more barcode readers, microchip readers or the like readers.

[0021] Preferably, as stated in claim 9, each of said sorting lanes may be divided into a buffer lane section and a distribution lane section.

[0022] Preferably, as stated in claim 10, said buffer lane section and said distribution lane section may hold a limited number of boxes e.g. between 10 and 50 preferably between 5 and 35 such as 12 boxes and between 25 and 35 such as 32 boxes, respectively.

[0023] Advantageously, as stated in claim 11, said system may also comprise at least one temporary storage conveyor for storage of one or more items in a number of carts.

[0024] Preferably, as stated in claim 12, said at least one relocation conveyor may comprise a number of free changeable carts preferably positioned on conveyor platforms such as one cart on one platform.

[0025] Preferably, as stated in claim 13, said system may further include computer control means that may operate in accordance with one or more rules or algorithms.

The figures

[0026] The invention will now be described in details with reference to the drawings, in which

fig. 1 schematically illustrates a transport and sorting system according to the invention,

fig. 2 illustrates the system of fig. 1 in more details,

fig. 3 illustrates a preferred embodiment of the transport and sorting system,

fig. 4 illustrates the system of fig. 3 in more details,

fig. 5 illustrates a section view A-A of the system in fig. 3,

fig. 6 illustrates a section view E-E of the system in fig. 3,

fig. 7 illustrates a sorting tree structure, and

fig. 8 illustrates a flow diagram of a preferred embodiment of the invention.

Detailed description

[0027] Fig. 1 schematically illustrates a transport and sorting system 1 according to the invention.

[0028] The system comprises an initial lane 2 in which items enter such as boxes each comprising mail addressed for the same mail district. The mail has been sorted into the boxes before entering the system at the initial lane e.g. by a corresponding automatic mail sorting system.

[0029] In the preferred embodiment each item may enter as one box or as a stack of boxes corresponding to one item.

[0030] A box includes a barcode that identifies the box, the content and the belongings of the box in the system. Further, the barcode is used to recognize the orientation of the box.

[0031] In the initial lane 2 the barcode of the items is read by identification means such as a barcode reader and used to identify the latter lanes to direct the boxes toward e.g. in the sorting lanes.

[0032] In a further embodiment the boxes may each comprise a microchip readable by a microchip reader positioned at the initial lane 2. The microchip comprises information regarding identification of the correct address or destination of the box in the system e.g. the sorting lane that the box should use. Even further, other identification means beside barcodes or microchips may be used in order to separate one box from another.

[0033] From the initial lanes 2 the boxes are transferred to different sorting lanes 3 in relation to their barcode. Every barcode corresponds to a sorting lane ensuring that every box is directed toward a specific sorting lane.

[0034] In a sorting lane boxes are successively gathered with the same or similar barcodes until the system transfers the boxes in the lane to a lane of the transfer lanes 4.

[0035] In connection with the transfer lanes a robot is positioned with gripping means 5. The robot grips a number of boxes from a lane in the transfer lane and lifts them to one of three positions. The robot may be replaced with similar transfer means capable of transferring items from one position to another.

[0036] The first position is a relocation conveyor 6 in which the boxes may be distributed out of the system e.g. by forwarding the boxes or the content of the boxes to a mail district for the end distribution to the mail receiver.

[0037] The second position is a temporary storage conveyor in which the boxes may be stored until they are ready to reenter the system at the third position. One of the functionalities of the temporary storage conveyor

may thus be considered as a buffer storage of a significant size allowing a number of items to be temporarily stored before reentering or leaving the system.

[0038] The third position is an entry 9 of the return lanes 8 returning the boxes to the initial lanes 1 and thus allowing the boxes to be sorted again.

[0039] The relocation conveyor 6 may also be used to enter boxes from the outside e.g. from other exterior sorting systems or centers into the system in which the robot may perform the movement from the conveyor further into the system e.g. the entry of the return lanes.

[0040] The movement of the boxes is controlled by computer control means 10. The computer is connected to the barcode readers or a similar identification reader, to position and orientation detection means of the boxes and other control and security means of the system in order to control the system.

[0041] Fig. 2 illustrates the system of fig. 1 in more details. Especially, it is shown how the sorting lanes include seven lanes in a first of more levels (not illustrated in the figure). The seven lanes are placed two and two together 3a, 3b, 3c and one lane by itself 3d.

[0042] The single lane 3d may be an "error lane" collecting boxes that do not fit into the system for some reason e.g. due to unreadable barcodes or the like. The boxes may be transported out of the system at a favorable time.

[0043] The robot 5 is shown with a robot arm schematically indicating the work range of the robot and the sections of the conveyors and the entry in which the boxes may be handled by the robot.

[0044] Further, it is shown how the relocation conveyor 6 comprises a number of conveyor carts (only illustrated with a limited number in the figure). The carts move around in a circle allowing the robot to gain access to a particular cart and deliver a number of boxes on a level in the cart. A cart may comprise a number of levels for holding boxes e.g. 8 levels in which the robot comprises detector means searching the levels and detecting the levels holding boxes in situations where the cart is not totally filled with boxes. The search may be performed from the top and down, and successively emptying the levels of the cart as filled levels are detected.

[0045] The carts also move past the relocation position in which boxes may leave or enter the system as explained above.

[0046] The relocation conveyor preferably holds a fixed number of carts such as 13 carts. However, the on- or offloading of boxes may be performed by taking one cart out of the conveyor rotation and replacing it with another.

[0047] Thus, the relocation conveyor 6 may receive boxes or even carts with boxes from other sorting systems or centers e.g. in order to be further sorted. The carts may be entered onto the conveyor without stopping the system as the carts are freely mounted on platforms of the conveyor (as will be explained more detailed in connection with fig. 4).

[0048] Further, it is shown how the temporary storage conveyor 7 also comprises a number of conveyor carts that move around in a circle.

[0049] Fig. 3 illustrates a preferred embodiment of different aspects of the transport and sorting system.

[0050] The initial lanes 1 are illustrated, and as it appears the lanes comprise two lanes positioned side by side in the illustrated level. The lanes comprise a number of pushing means P ensuring that boxes may travel from one lane to another. The first pushing means allow a box to be moved from one lane in the initial lanes to another and the latter pushing means allow the boxes to be pushed onto the sorting lanes.

[0051] The pushing means may be a metal plate underneath the boxes in which the plates are lifted in one side, resulting in the box sliding sideways of the plate. Further, the pushing means may be a linear electric, hydraulic or pneumatic actuator positioned at the side of the lanes, ready to push the boxes sideways e.g. onto the sorting lanes.

[0052] The initial lanes and the rest of the lanes may also comprise drive means D for driving the rollers of the lanes, allowing the boxes to move forward in a controlled manner. Further, the initial lanes may initially comprise rotation means in order to rotate a box that has entered a lane with an incorrect orientation e.g. in relation to reading the barcode on the box.

[0053] A dotted line A-A is positioned next to the initial lanes and illustrates the position of a first section view illustrating the initial lanes in more details. The section view is shown in fig. 5.

[0054] Further, a dotted line E-E is positioned next to the sorting lanes and illustrates the position of a second section view illustrating the sorting lanes in details. The section view is shown in fig. 6.

[0055] The figure also illustrates the relocation conveyor in more details, showing that the conveyor carts are positioned on top of separate platforms. The platforms are secured to the conveyor in a manner, which allows them to follow the conveyor around in a circle without leaving it. At the same time the carts are movably positioned on the platforms.

[0056] The action radius of the robot 5 is illustrated with a circle touching a section of the return lane entry and the relocation conveyor 6 as well as the transfer lanes 4.

[0057] Fig. 4 illustrates the transport and sorting system in more details.

[0058] Especially, it appears how the pushing means P are positioned opposite a corresponding sorting lane 3a-3d.

[0059] Also, it appears how the return lanes comprise rotation means R for rotating an incorrect orientated box before entering the system at the initial lanes.

[0060] Fig. 5 illustrates a section view A-A of the transport and sorting system in fig. 3.

[0061] The view particularly shows the initial lanes 2 seen from the side. The initial lanes comprise an initial

lane section 11 that expands into four parallel lane sections, first to fourth sections 14-17, through first to third redirection means 12, 13, 18. The redirection means may be lane parts that in the end can be lifted from one of the four lane sections to another allowing a box to travel from the initial lane section 11 to any of the four sections.

[0062] The four lane sections (from the side) and the initial lanes (seen from the top) together establish a number of lanes that a box may enter e.g. $4 \times 2 = 8$ lanes.

[0063] The initial lane 11 holds a barcode or a microchip reader ensuring that the boxes are recorded when they enter the system. The reading of the barcode or microchip establishes which of the two lanes in the initial lanes and which of the four lane sections that the box enters. When the box reaches an end stop in its lane, pushing means may move it to the corresponding sorting lane.

[0064] Fig. 6 illustrates a section view E-E of the transport and sorting system in fig. 3.

[0065] The view particularly shows the sorting lanes 3 seen from the side. The lanes are divided into two parts; buffer and distribution lane sections each comprising three level buffers 19-21 and level sorting lane sections 22-24. The buffer lane sections are positioned next to the initial lanes and receive boxes from these. The distribution lane sections are positioned next to the transfer lanes and transfer boxes to these lanes.

[0066] The distribution lane section has preferably a limitation in how many boxes it may or will receive e.g. 32 two boxes in the same lane section. When the limit is reached or the distribution lane section is transferring boxes, the corresponding buffer lane section buffers the boxes until the distribution lane section is ready to accept boxes again.

[0067] Further, the buffer lane may pile boxes until the limited number of boxes is reached e.g. 32 boxes, and after this transfer the boxes move to the distribution lane section. The boxes in the distribution lane section are thus immediately ready to be emptied.

[0068] The number of lanes above and next to each other can be picked freely in order to establish a requested capacity and functionality of the system. The lanes may e.g. only be next to each other allowing the use of high stacks of boxes.

[0069] Fig. 7 illustrates a sorting three structure showing the possibility of sorting items a number of times. The items or boxes may travel through the transport and sorting system, ending in a sorting lane together with similar boxes. The boxes of the lane may finally be directed to the return lane and latter entering the system again. At the second time through the system the boxes may be sorted out into a number of sorting lanes e.g. meeting new boxes in the lanes. At the third time through the system the boxes may once again be sorted out into a number of sorting lanes e.g. meeting more new boxes in the lanes and so on. Finally the boxes in one sorting lane may be sorted in such a manner that the content

of the boxes may correspond e.g. to a very narrow mail district. Further, the sorting may be performed until a limited number of boxes are reached such as 32 boxes which are transferred e.g. to the distribution conveyor for further distribution.

[0070] The dotted lines illustrate a level ending one full circle through the system and each string in the tree illustrates a number of boxes being sorted one more time at each level.

[0071] The information informing the system about the box's path through the sorting system comes from the reading of the specific barcode or the like of the box. The information may e.g. inform the sorting system that the box (item X) is heading for sorting lane Y and later cart no. Z of the distribution conveyor.

[0072] Fig. 8 illustrates a flow diagram 25 of a preferred embodiment of the invention.

[0073] The flow diagram starts with a flow block 26 corresponding to the entrance of the boxes into the initial lanes.

[0074] The next block 27 corresponds to the boxes being sorted to a number of sorting lanes after being barcode read.

[0075] After this block the system decides whether the boxes of a sorting lane should leave the system to be distributed (illustrated with block 28) or should stay.

[0076] If the result is that the boxes stay in the system, it is to be decided whether the boxes should be sorted one more time or should enter the temporary storage conveyor (illustrated with block 29).

[0077] If the result is that the boxes should be sorted one more time the flow diagram starts from the beginning once more.

[0078] Otherwise, the boxes are transferred to the conveyor until the system decides that the boxes have to leave. At departure it is decided whether the boxes have to leave the system and be distributed or sorted once more.

[0079] The software of the computer control means 10 comprises a number of algorithms and rules controlling the general functionality of the sorting system and especially the functionality of the sorting.

[0080] An example of a sorting rule may include the definition of which different barcodes of items or similar identification means should end up in the same distribution cart. The different carts each comprise their own rule defining the relevant barcodes.

[0081] The sorting system may comprise numerous algorithms and rules for the elements of the system, however only one algorithm or rule of an element should be active at a time. At the initial barcode or similar identification means reading of the box the software of the system decides which rule to be used in connection with the box and hereafter activates the rule. If the type of barcode already has been dedicated to a sorting lane the box is at once directed toward the lane, otherwise a free sorting lane is dedicated to the rule. This immediately results in that the succeeding boxes comprising

the rule are directed to this particular sorting lane.

[0082] The rule may in the embodiment of e.g. fig. 2 direct the box to one of three "final" destinations within the system - the distribution conveyor 5 (for distribution outside the system), the temporary storage conveyor 7 or the return lanes 8.

[0083] The rules may actively empty a sorting lane to one of the destinations, e.g. a user ordering the emptying of the lane. Further, the rules may simply comprise an algorithm reacting on inputs such as the number of boxes in a sorting lane, the time of day or the like.

[0084] An example of a situation in which a user decides to deactivate one job and activate another (comprising a number of new rules) involves the following steps:

[0085] If the boxes of the relevant sorting lane have the distribution conveyor as destination the lane is immediately transferred to the conveyor regardless of the number of boxes in the lane.

[0086] If the destination is the temporary storage conveyor or the return lanes, it is examined whether all the boxes comply with the new rule or not. If they do they are kept in the lane, otherwise they are transferred to the return lane for further sorting.

[0087] For every cart in the temporary storage conveyor it is investigated whether the boxes of the cart comply with a rule or not. If every box of a cart complies with a rule they are transferred to the return lanes as long as the rule does not destine the boxes for the temporary storage conveyor. If the boxes do not comply with a rule the cart is emptied onto the return lane.

[0088] Some rules of a job are preferably given a higher priority in relation to other rules. Hereby, it is especially possible to enhance the box emptying of elements at job shifts e.g. emptying the carts of the temporary storage conveyor by giving it priority, dedicating the robot for this purpose, and thus quickly be prepared for temporary storage of boxes with the new rules.

[0089] Software may comprise a number of rules dedicated to different sections or elements of the system. Further, different rules may apply to different periods in the sorting process e.g. one rule at the first time through the system and another the second time. Preferably, the rules of a day are joined into one single job, which is stored in the storage of the computer means 10.

[0090] The software of the computer control means 10 also includes a number of presentations and control possibilities for the users.

[0091] The possibilities are shown for the users on a computer screen in a Graphical User Interface comprising a number of main views.

[0092] The main views may preferably show the elements of the sorting system e.g.

1. Initial lanes e.g. including sub-elements such as the individual lanes, drive means etc.

2. Sorting lanes e.g. including sub-elements such as the individual lanes, drive means etc.

3. Transfer lanes e.g. including sub-elements such as the individual lanes, drive means etc.

4. Robot with gripping means

5. Relocation conveyor e.g. including the status of every cart empty/not empty and their individual position

6. Temporary storage conveyor e.g. including the status of every cart empty/not empty and their individual position

7. Return lanes e.g. including sub-elements such as the individual lanes, drive means etc.

and the relation between the elements. The elements of the main views may preferably be part of a tree structure allowing the user to navigate down through an element and corresponding sub-elements.

[0093] The views may also show the general status of the elements in the system e.g. a general message of good functionality or error in a lane or conveyor. In order to investigate the messages further or simply to receive information regarding the elements in the system, a more detailed view may be requested e.g. by activating graphical icons of the GUI (in which the icon functionality will be known from standard computer operating systems).

[0094] The lanes and especially the sorting lanes may be illustrated with different colours e.g. for each lane, each horizontal layer or each vertical layer.

[0095] Colours may also be used in connection with different types of messages illustrating their importance e.g. a red colour indicating error messages and a green colour indicating normal functionality. The different messages and especially error and warning messages are stored in computer logs together with approval of the message.

[0096] Each conveyor cart may also comprise an indication, such as an arrow, illustrating the next actions e.g. the emptying of the cart to another part of the system or the distribution of the cart from the conveyor.

[0097] Further, different information or data may be displayed in a popup view on the GUI when the user highlights or in a similar way activates the GUI, e.g. by positioning the mouse pointer on an icon or another graphical element representing an element of the sorting system.

[0098] The views may also show the actual job being performed by the sorting system. The views may include status information, sorting rules or algorithms and so on. The views may also inform a user of the present position of an item, such as a box, in the sorting system.

[0099] The information of the views may e.g. be read, changed and stored in storage means, such as hard disc storage, by authorized workers. The change may comprise the acts of activating or deactivating jobs or elements of the sorting system. The changes may be changes affecting the entire system, elements or even sub-elements and thus primarily affecting the functionality of a specific element. The changes may be for im-

mediate or later use in the system. Further, the stored information may be transferred to other locations e.g. by on-line communication or off-line communication e.g. by the use of CD-ROM's or the like.

[0100] Further, specially authorized workers may gain access to special views allowing changes in the more fundamental set-up or jobs including different parameters of the sorting system.

[0101] Preferably, the changes may only be performed when the particular element of the system is deactivated.

[0102] The number of sorting lanes is preferably higher than the load usually requires. This allows redundancy in the system in a situation of hardware failure e.g. if one sorting lane fails, the load of the lane may quickly be rerouted to one of the additional lanes.

[0103] Bringing in additional sorting lanes or removing less needed lanes may also meet further, significant load changes.

[0104] The rerouting may be performed by the system software as an automatic response to input from surveillance sensors in the system or performed manually by the operator.

[0105] It should be emphasized that the system may sort other items beside mail e.g. a number of different items sorted into a preferred series and packaged before distribution. An example may be sorting a number of different parts of a self-assembly furniture and filling them into a container before distribution.

List of reference number for the figures

[0106]

1.	Item transportation and sorting system	35
2.	Initial lanes	
3, 3a-3d.	Sorting lanes	
4.	Transfer lanes	
5.	Robot with gripping means	
6.	Relocation conveyor	40
7.	Temporary storage conveyor	
8.	Return lanes	
9.	Return lane entry	
10.	Computer control means	
11.	Initial lane section	45
12.	First redirecting means	
13.	Second redirecting means	
14.	First level initial lane	
15.	Second level initial lane	
16.	Third level initial lane	50
17.	Fourth level initial lane	
18.	Third redirecting means	
19.	Third level buffer lane sections	
20.	Second level buffer lane sections	
21.	First level buffer lane sections	55
22.	First level sorting lane sections	
23.	Second level sorting lane sections	
24.	Third level sorting lane sections	

25.	Sorting tree structure
26.	Item X
27.	Enter the initial lanes - flow block
28.	Read bar code and direct items ... - flow block
29.	Distribution of items - flow block
30.	Temporary storage - flow block
C1, C2.	Conveyor cart
D.	Drive means
P.	Pushing means
R.	Rotation means
T1.	Buffer lane sections
T2.	Distribution lane sections

Claims

- Method of transporting and sorting items such as mail, said method comprising the steps of:
 - transporting at least one item with one or more initial lanes to an identification position,
 - identifying an individual characteristic of said at least one item in said identification position
 - transporting said at least one item to a sorting lane of a number of sorting lanes as a result of said identified characteristic,
 - collecting said at least one item of one sorting lane in one or more transfer lanes by one or more robot or similar transferring means, and
 - transporting said at least one item to the initial lanes through one or more return lanes

wherein at least two of said method steps a) to e) are repeated until said at least one item are transferred to a relocation conveyor for distribution of said item.
- Method of transporting and sorting items according to claim 1, wherein said at least one item transfer to the relocation conveyor is performed to one dedicated cart out of a number of carts in said relocation conveyor.
- Method of transporting and sorting items according to claim 2, wherein one or more rules or algorithms define the relation between said at least one item, sorting lanes and/or number of carts.
- Method of transporting and sorting items according to any of the claims 2 or 3, wherein one or more rules or algorithms define the time of transfer to said relocation conveyor.

5. Method of transporting and sorting items according to any of the claims 1 to 4, wherein the number of sorting lanes is changed in response to the item load controlled by said one or more rules or algorithms. 5
6. Item transport and sorting system (1), said system comprising one or more initial lanes (2) transporting at least one item to an identification position, identification means for identifying an individual characteristic of said at least one item in said identification position, one or more sorting lanes (3; 3a-3d) for sorting said items, one or more transfer lanes (4) for receiving a number of sorted items from said one or more sorting lanes, one or more return lanes (8, 9) for returning items to said one or more initial lanes, at least one relocation conveyor (6) for distribution of said items, and at least one robot (5) or similar transferring means for transferring said sorted items from said one or more transfer lanes to said one or more return lanes or said at least one relocation conveyor. 10 15 20 25
7. Item transport and sorting system (1) according to claim 6, **characterised in that** said items are a number of boxes or stacks of boxes preferably containing mail. 30
8. Item transport and sorting system (1) according to claim 6 or 7, **characterised in that** said characteristics of the items are barcodes, included microchips or the like and said identification means are one or more barcode readers, microchip readers or the like readers. 35
9. Item transport and sorting system (1) according to any of the claims 6 to 8, **characterised in that** each of said sorting lanes (3; 3a-3d) is divided into a buffer lane section (T1) and a distribution lane section (T2). 40 45
10. Item transport and sorting system (1) according to claim 9, **characterised in that** said buffer lane section (T1) and said distribution lane section (T2) holds a limited number of boxes e.g. between 10 and 50 preferably between 5 and 35 such as 12 boxes and between 25 and 35 such as 32 boxes, respectively. 50
11. Item transport and sorting system (1) according to any of the claims 6 to 10, **characterised in that** said system also comprises at least one temporary storage conveyor (7) for storage of one or more items in a number of carts (C2). 55
12. Item transport and sorting system (1) according to any of the claims 6 to 11, **characterised in that** said at least one relocation conveyor comprises a number of free changeable carts (C1) preferably positioned on conveyor platforms such as one cart on one platform.
13. Item transport and sorting system (1) according to any of the claims 6 to 12, **characterised in that** said system further includes computer control means (10) that may operate in accordance with one or more rules or algorithms.

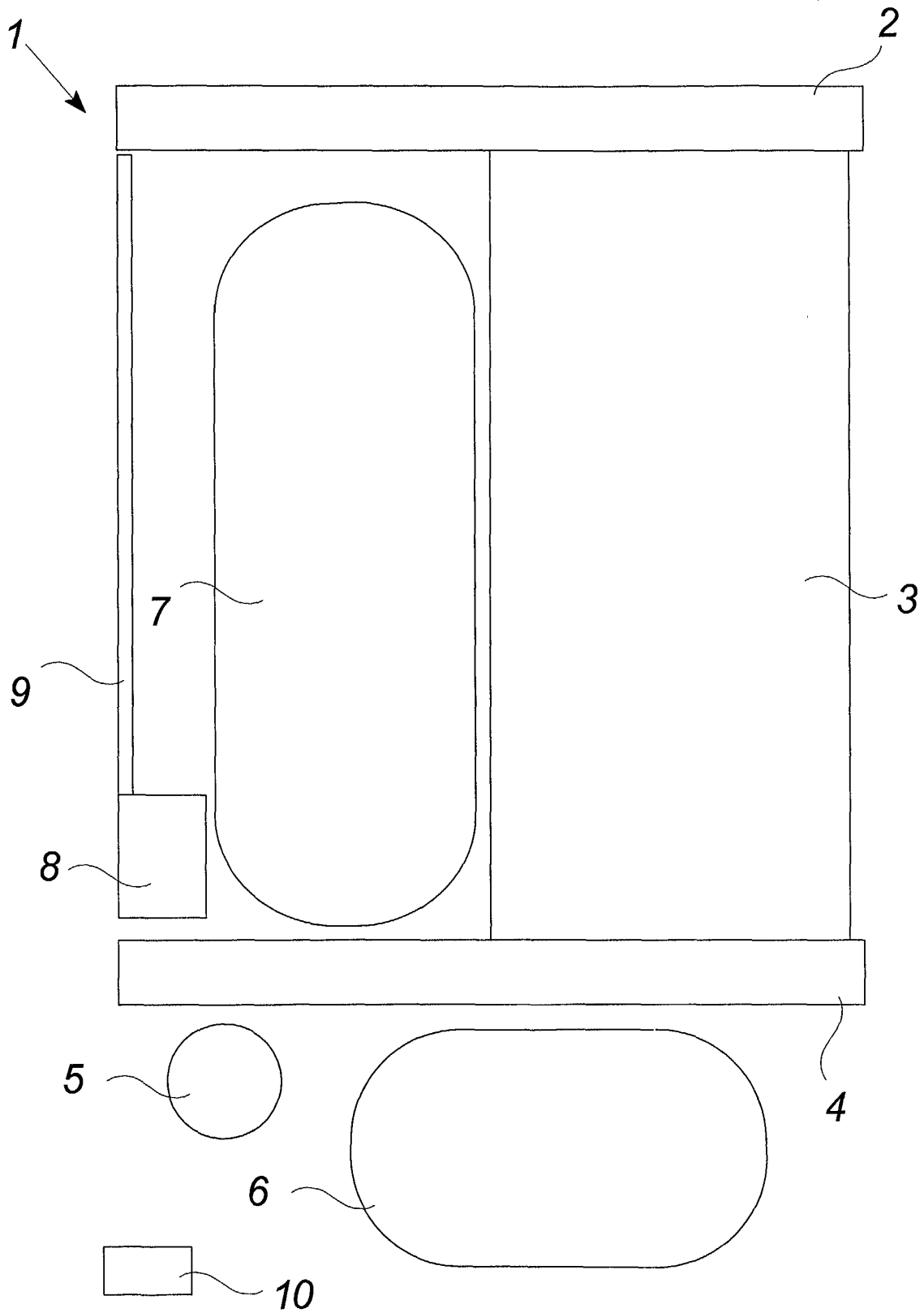


Fig. 1

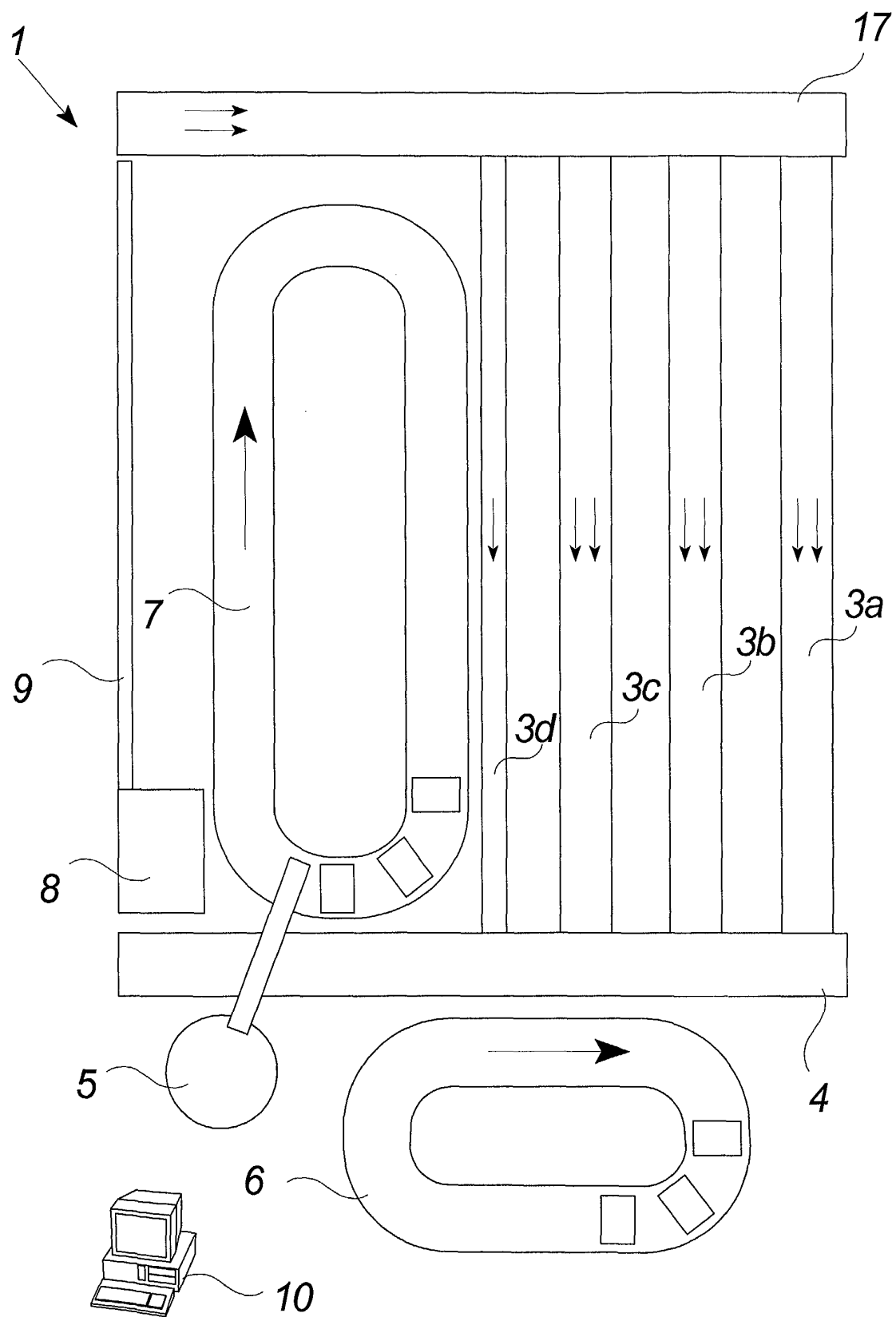


Fig. 2

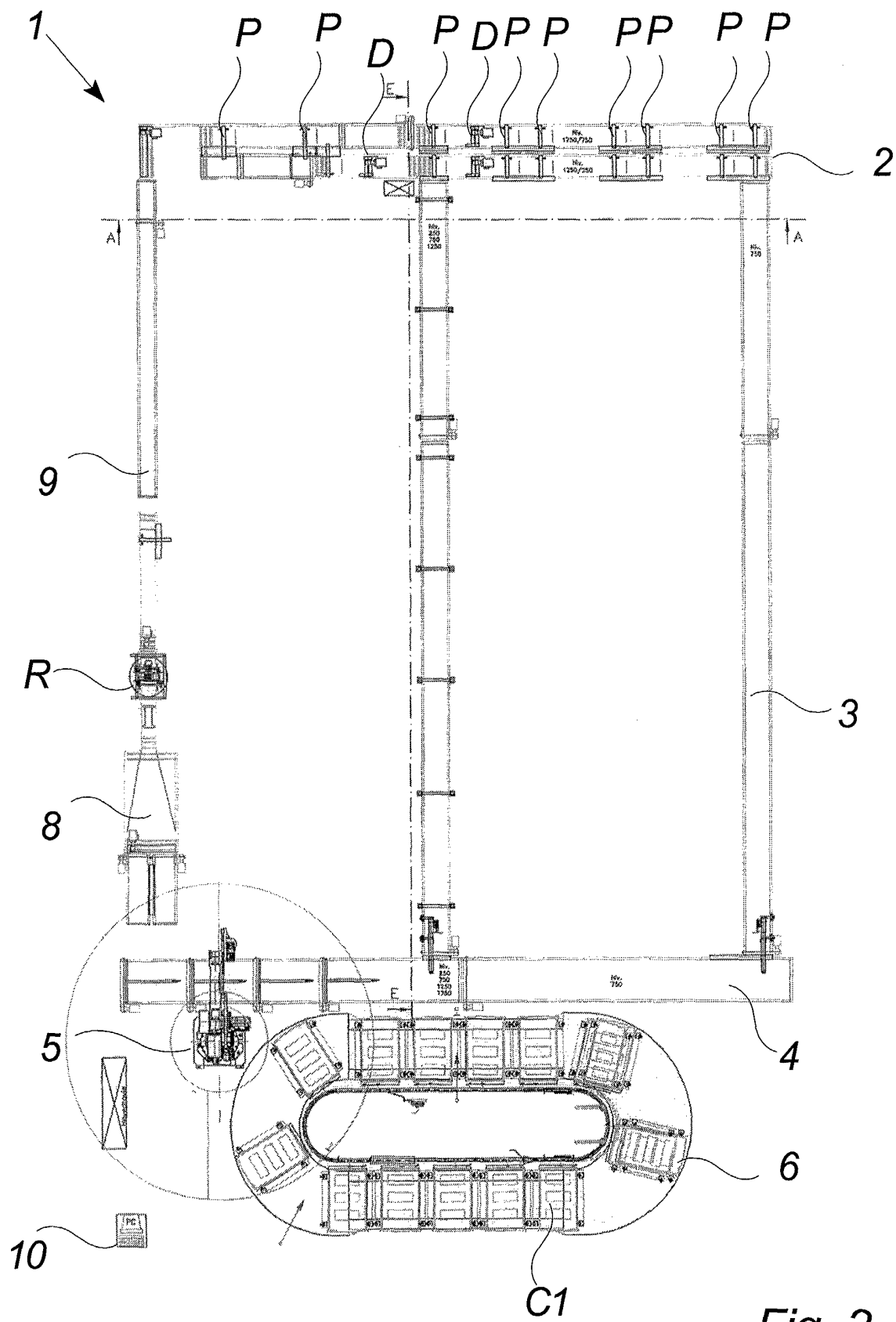


Fig. 3

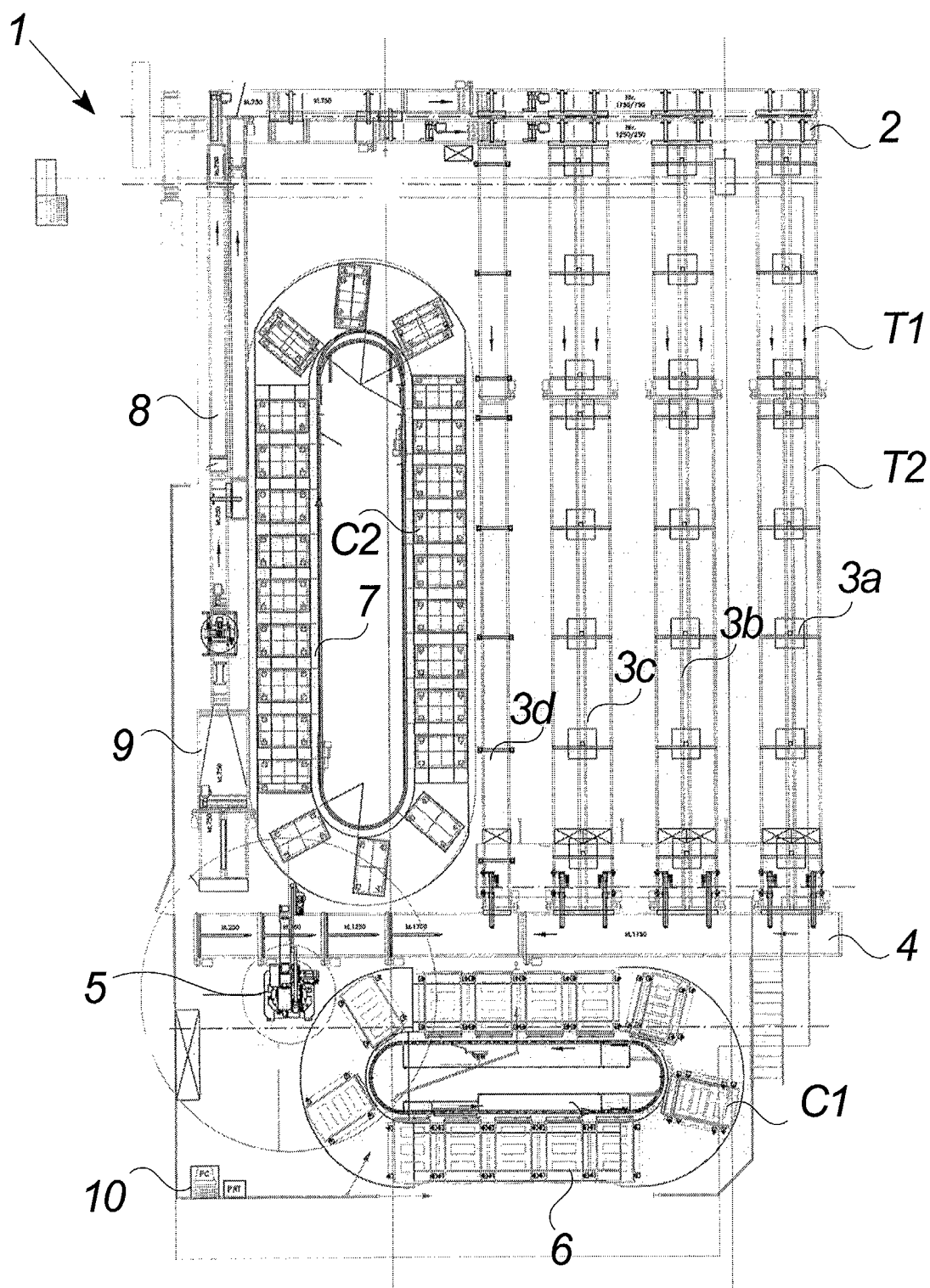


Fig. 4

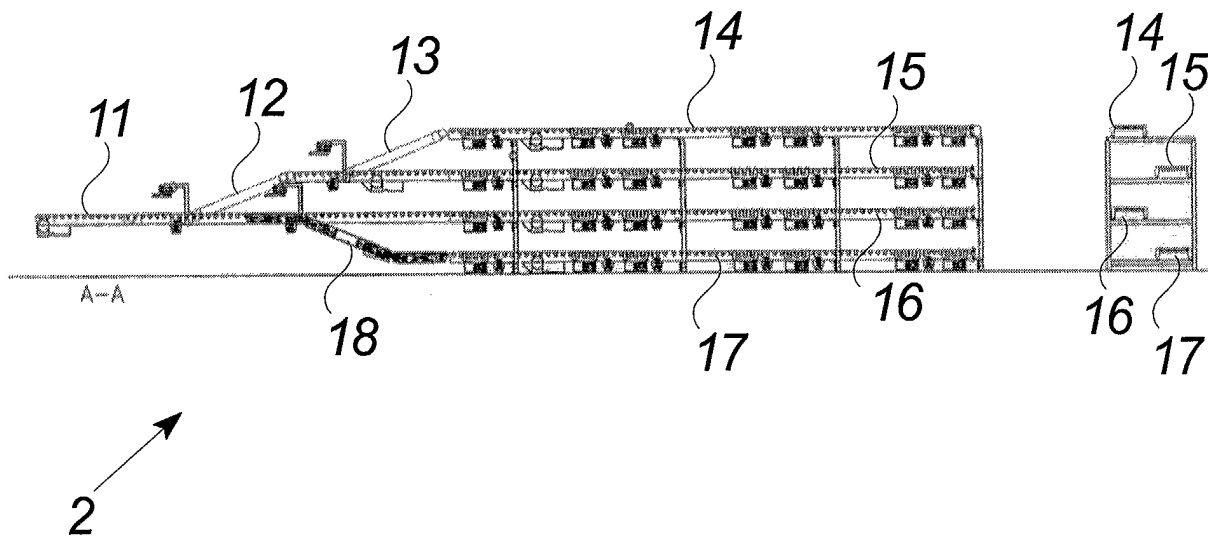


Fig. 5

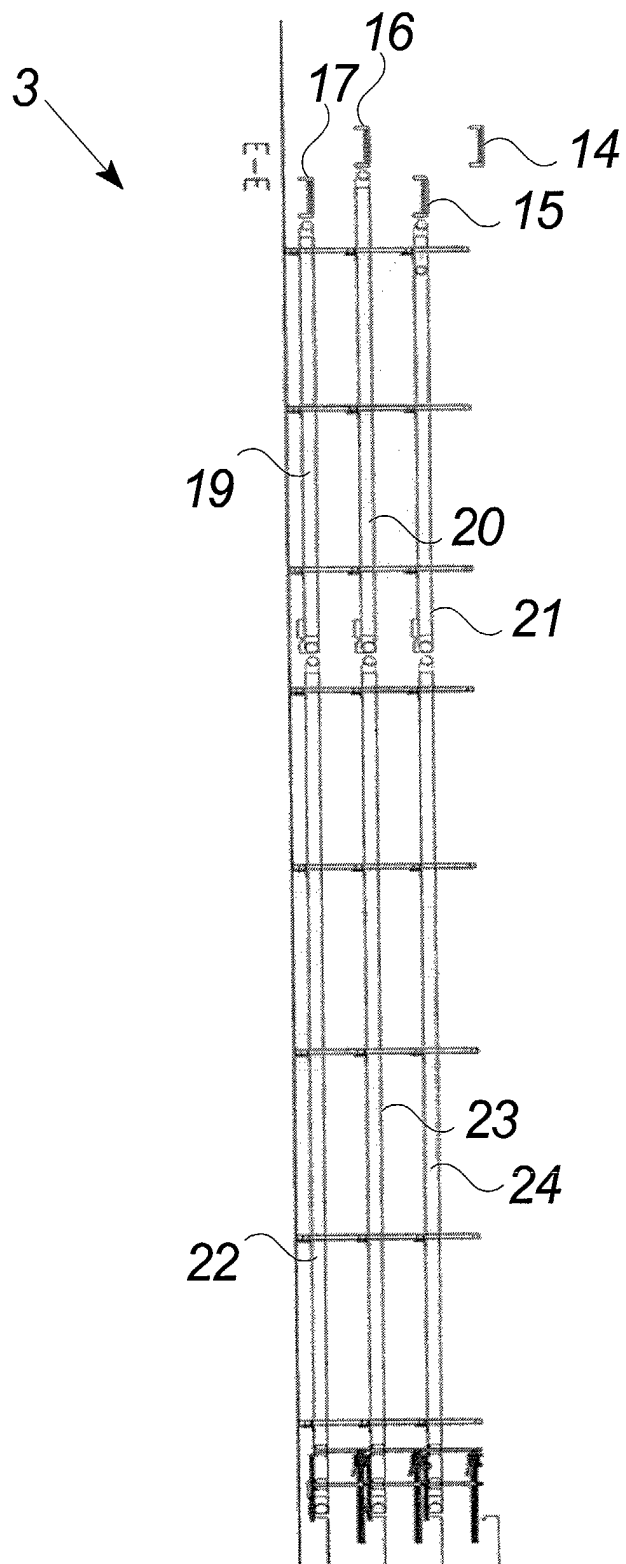


Fig. 6

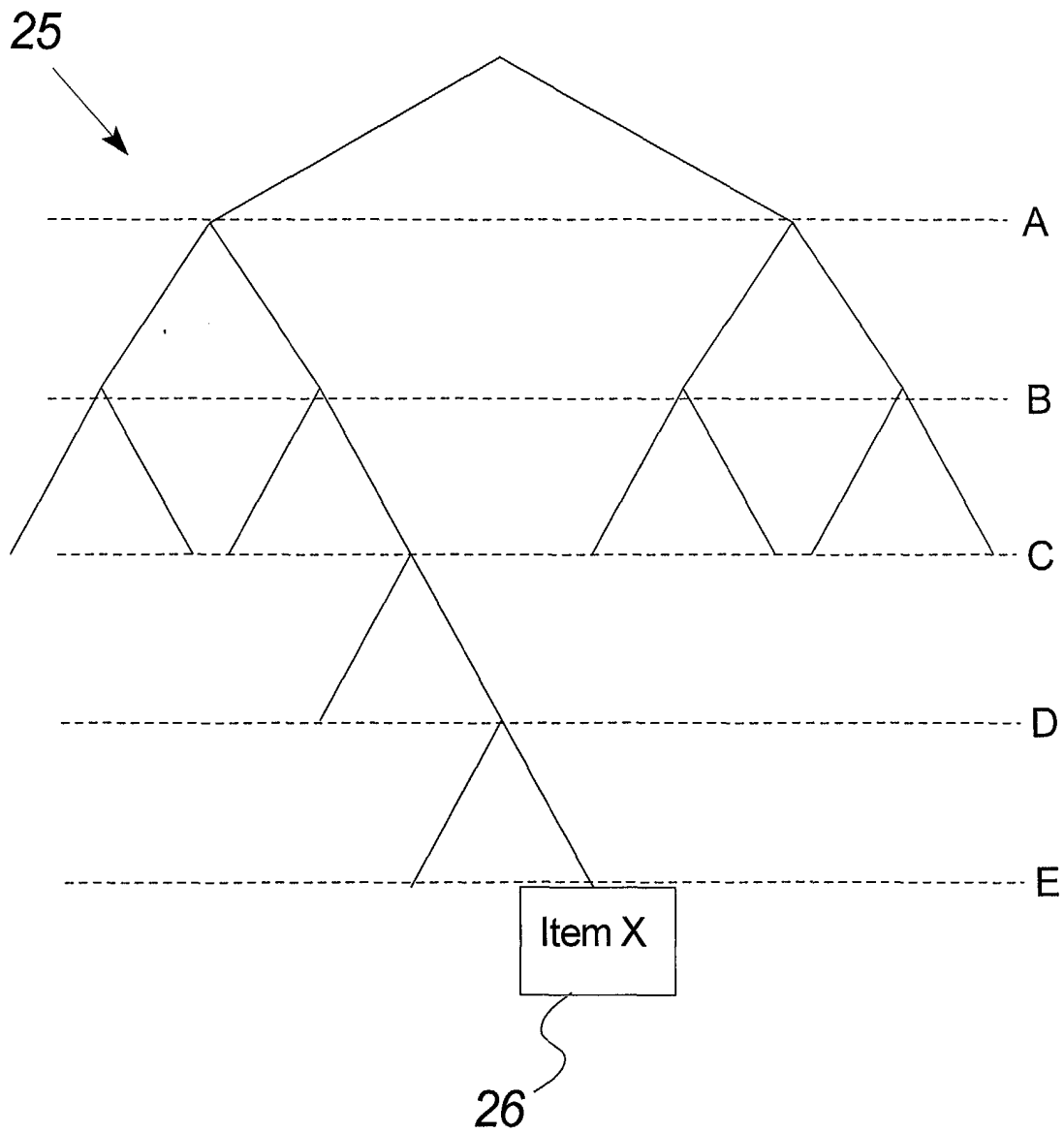
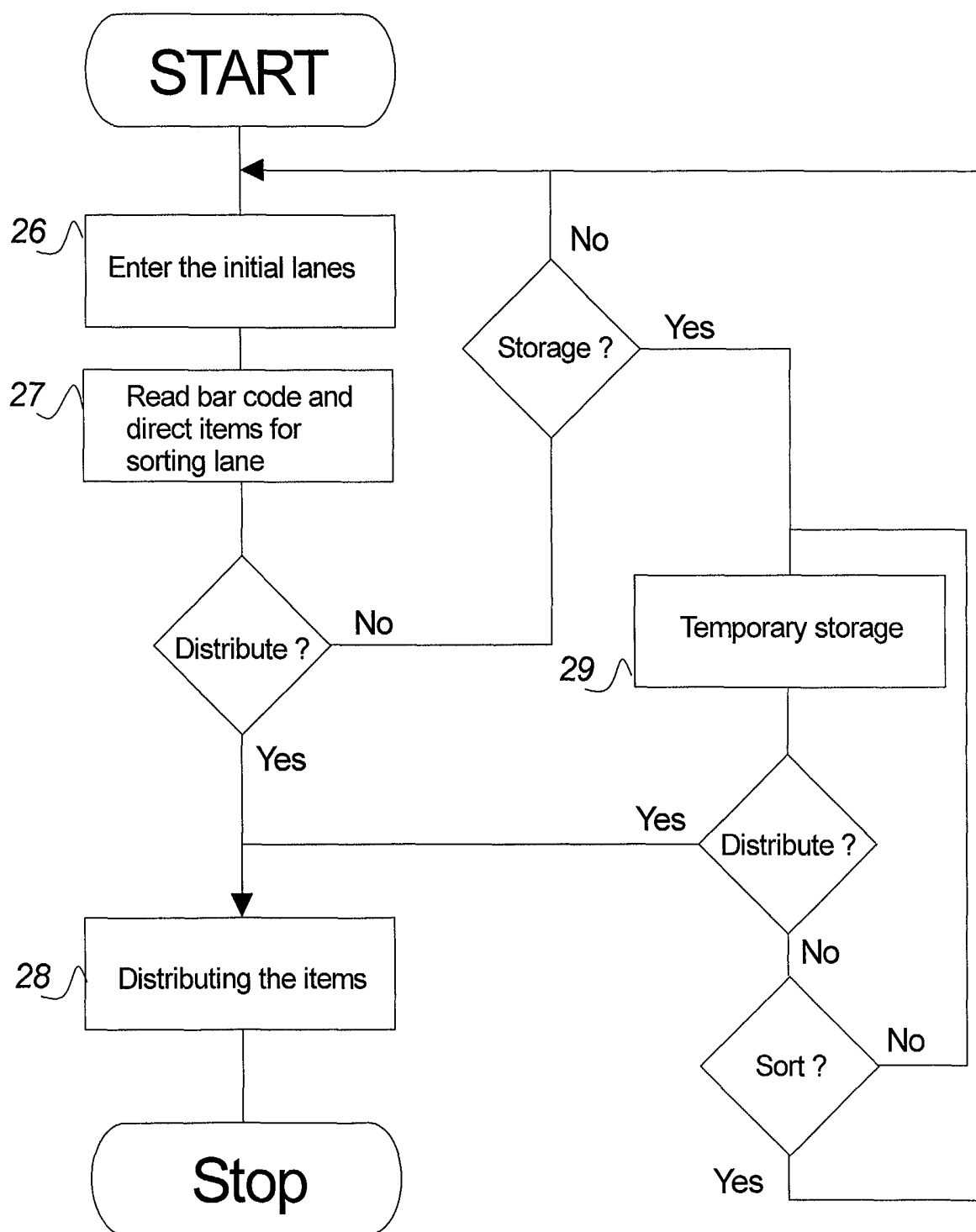


Fig. 7

*Fig. 8*



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EUROPEAN SEARCH REPORT

Application Number
EP 03 07 5413

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 28 July 2003	Examiner Wich, R
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