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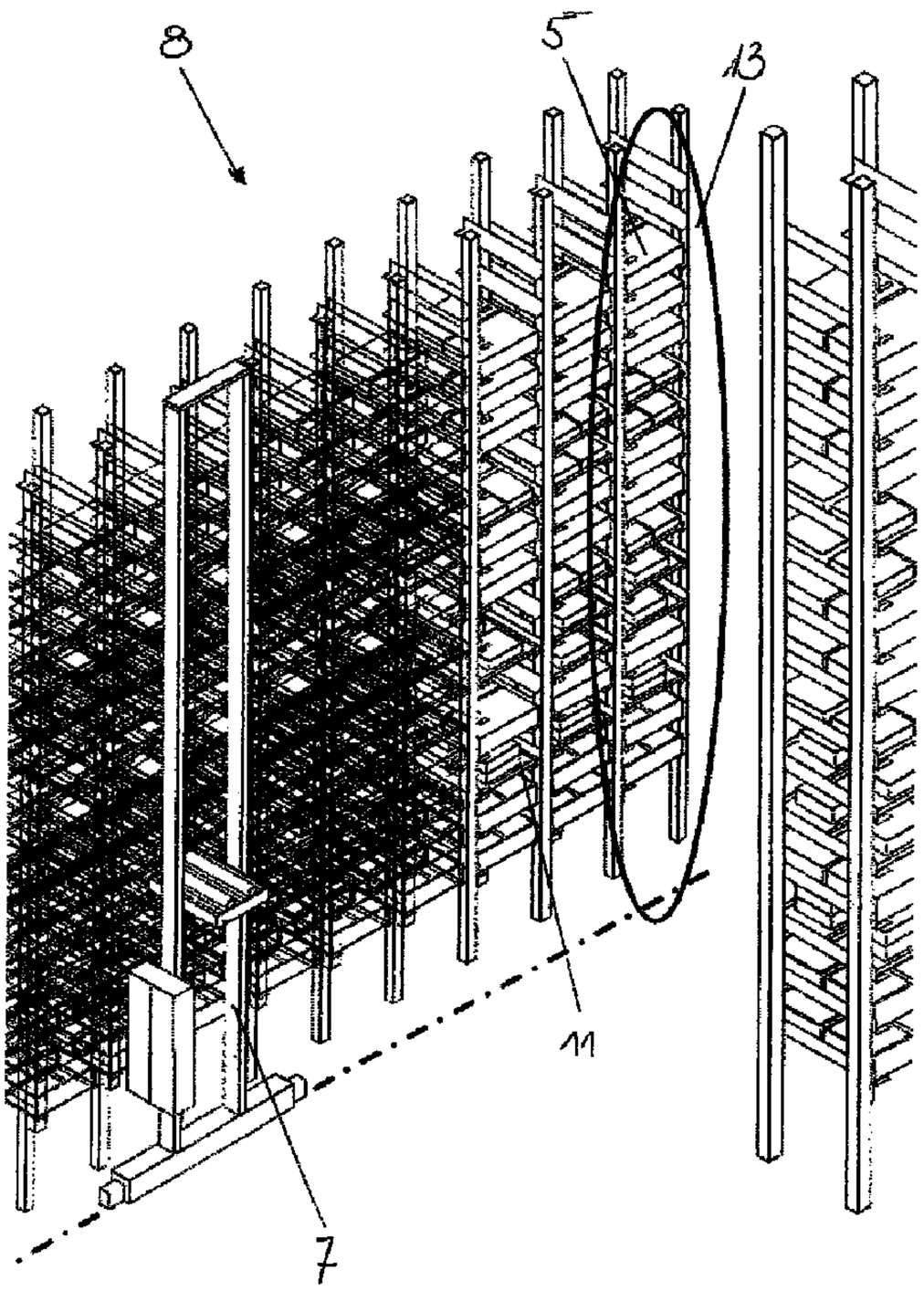
(54) Titre : SYSTEME AUTOMATISE ET PROCEDE POUR PREPARER OU REGROUPER AUTOMATIQUEMENT DES ARTICLES POUR DES COMMANDES

(54) Title: AUTOMATED SYSTEM AND METHOD OF AUTOMATICALLY ORDER-PICKING OR CONSOLIDATING ARTICLES



(57) Abrégé/Abstract:
The invention relates to a method of automatically order-picking or consolidating articles (5) of a wide variety of different formats and varieties, using the following steps: separating (6, 6') the stored articles, storing the articles in a rack bay (8), retrieving the

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(57) Abrégé(suite)/Abstract(continued):
articles and palletizing (10, 10') them. The method is predominantly characterized in that the articles (5) which are to be order-picked for an order are put together in a rack bay (8) already in the sequence which is necessary for palletizing (10, 10'). The invention also relates to an installation for implementing the method.

Abstract

The invention relates to a process for automatic picking or consolidating of articles of very different formats and assortments, including a stage for separating 6, 6' the articles stored, storing the articles in a rack bay 8, retrieving the articles, and palletising 10, 10' them. It is mainly characterised by the articles 5 to be picked for an order already being assembled in a rack bay 8 in the sequence required for palletising 10, 10'. In addition, the invention relates to a plant for implementing the process.

(Fig. 4)

Automated System And Method Of Automatically Order-Picking Or Consolidating Articles

The invention relates to a process for automatic picking or consolidating of articles of very different formats and assortments, including a stage for separating the articles stored, storing the articles in a rack bay, retrieving the articles, and palletising them. Furthermore, the invention relates to a plant for implementing the process.

In classic, manual picking systems, all article pallets/packages are placed ready for picking in floor storage areas or racks along defined picking corridors. In order to assemble the order (picking), the operator drives or walks along the picking route and loads (picks) the picking items specified by the order (issue quantity) on the accompanying loading device (pallet, container on wheels, container, box,...). When the picking order is complete, the loaded order pallet is placed ready in the outgoing goods zone of the loading bay or for further processing. The principle of inverse picking is based on the loading devices on which the individual picking orders are loaded being placed at fixed points and the employee moving the article pallets (source pallets) past the order-related loading devices and picking from the article pallet (source pallet) onto the fixed-location and order-related loading device (article pallet moves, order-related target package unit "waits"). Processes of this type are known, e.g. from EP 1 462 393. If, however, an article that has to be stored low down on the target package due to peripheral circumstances (weight, stability of the target package unit) is not delivered for picking until later, the remaining items of the picking order also cannot yet be picked properly and must therefore be put into intermediate storage.

The purpose of the invention is to eliminate this disadvantage and enable faster picking, where each individual step can also be automated.

The invention is thus characterised by the articles to be collected for an order already being collected in a rack bay in the sequence required for palletising. As a result, the sorting process otherwise required before palletising can be omitted.

A favourable further development of the invention is characterised by a fictitious part of the rack being assigned to an order Thus, all of the articles for an order can be collected regardless of the physical design of the rack.

An advantageous embodiment of the invention is characterised by the number of storage spaces reserved for an order in the rack bay being adjusted dynamically to the loading quantity for the respective delivery package unit. Thus, the rack can also be utilised to the optimum when orders are of different sizes.

If the individual articles are stored next to each other in the rack bay, regardless of whether they are directly above or beside one another, stacked singly or several layers deep, they can be assigned precisely at any time and only a short distance is covered to retrieve them.

A favourable embodiment of the invention is characterised by the articles being stored on trays. Thus, several articles can also be stored and transported at once. Standardised transport can also be performed easily using conventional devices.

A particularly favourable development is characterised by retrieval beginning with the bottommost tray or package unit, and continuing with the package unit stored at the next level in each case. As a result, the retrieving device can retrieve all trays and/or package units belonging to one order easily without having to move back to an idle position. This achieves very high retrieval performance.

An advantageous embodiment of the invention is characterised by the retrieved package units being brought directly to the delivery package unit. With appropriate preparation, the delivery package unit can be filled directly without any further sorting or intermediate storage of the articles.

The invention also relates to a plant for automatic picking or consolidating of articles of very different formats and assortments, with the units rack bay, retrieving unit for the articles, and palletising device.

In the plant according to the invention, a rack bay is provided in which the articles to be collected for an order are already assembled in the sequence required for palletising. Thus, the sorting process otherwise necessary before palletising can be omitted.

A favourable further development of the invention is characterised by the rack bay having a number of rack columns that are divided into fictitious storage zones. Thus, all articles can be collected regardless of the physical design of the rack, and the rack is also used to the optimum when filled accordingly.

It is favourable if the rack can hold trays loaded to different heights. In this way, most packages can be stored and retrieved automatically.

An advantageous embodiment of the invention is characterised by a rack feeder being provided for retrieval, which has a load-bearing means to hold the filled trays or loose article packages, where the rack feeder can have a vertical conveyor. Highest retrieval performance can be achieved with this rack feeder.

An advantageous development of the invention is characterised by the rack bay having a number of transport units for the goods to be picked, where the transport units can hold the trays with the articles for an order. Thus, the packages for the orders can be collected easily and conveyed all together.

It has proved particularly favourable if the transport units are designed as self-supporting racks, which can also be stored on pallets. Thus, they can be conveyed easily using conventional transport means.

The invention can also be used to advantage in consolidating orders. In this case, articles that have already been picked using other processes are stored in the rack bay according to the orders and also placed in the rack bay in the order package unit in the sequence specified. Thus, orders that are assembled in different picking processes can be added to the order package unit together in the desired sequence. As a result, so-called fast-moving articles can be assigned to an order together with so-called slow-moving articles or articles to be picked manually and then brought to the appropriate order package unit. Any de-palletising that would otherwise be required can, of course, be omitted for the articles already picked.

The invention is now described in examples based on the drawings, where Figure 1 shows a diagram of traditional, manual inverse picking, Fig. 2 a schematic flow sheet of picking according to the invention, Figs. 3a to 3e variants for loading the trays, Fig. 4 a rack according to the invention, Fig. 5 a

rack with rack feeder according to the invention, and Fig. 6 an alternative design of the invention.

Figure 1 shows the traditional inverse picking process, where all order pallets or order package units 2 are placed ready on floor areas or racks, as the case may be, along defined picking corridors 4 in a warehouse 1. In order to assemble the order (picking), the employee drives or walks along the picking route 4 and assigns the articles 5 to the individual orders or to the order pallets or package units 2 assigned to the orders. When the picking order is complete, the loaded order pallet or package unit 2 is placed ready in the outgoing goods zone of the loading bay or for further processing. The principle of inverse picking is based on the loading equipment (order pallets 2) on which the individual delivery orders are loaded being placed at fixed points, and the employee then travels with the source pallets, each containing one article type, through the picking corridors 4 past the order-related loading equipment 2 and picks from the source pallet to the fixed-location, order-related loading equipment 2 (source pallet moves – order-related target package "waits").

The basic structure of a plant according to the invention is shown in Fig. 2. The articles supplied are separated in an automatic 6 or manual 6' de-palletising unit, and the individual article packages are put into storage on a rack 8 by one or several rack feeders (RGB) 7. Articles are retrieved using a special picking device 9, then the individual article packages are brought to an automatic 10 or a manual 10' palletising unit, where the order package unit is then completed. With storage and retrieval according to the invention, subsequent sorting can be omitted before palletising.

The picking process according to the invention is based on the article items/packages needed to assemble the order (picking) either being manipulated and transported themselves automatically and stored in a conventional container rack or being placed on loading devices (containers, trays) that can be manipulated and transported automatically.

The article packages can be separated or repacked on defined loading trays prior to picking, with the trays being stored temporarily in an automatic small parts warehouse (neutral storage). If the delivery orders are known, this can

also be handled specific to each order directly before the picking process in a re-packing or de-palletising area 6, 6' (automatically or manually). If the article packages are separated beforehand without reference to orders or repacked on defined loading trays, only one package (smallest picking unit per article) can be placed on each loading tray. If the articles are separated immediately before picking or the orders are known at the time of separation, then more than one package can be placed on each loading tray (not more than the number of delivery item packages for the order). Since the delivery items are loaded on the trays according to the order, picking performance of the overall system is maximized.

Figures 3a to 3e show possible examples for loading of the individual trays 11 with one package per tray 11 (Fig. 3a), several packages per tray 11 (Fig. 3b), loose packages (Fig. 3c), containers 12 with several packages loaded on trays 11 (Fig. 3d), as well as stacks of packages on trays 11 (Fig. 3e), depending on the type of articles and requirement of the order.

The source pallets are brought to the de-palletising area 6, 6' automatically or manually. The de-palletising area can be designed for automatic 6 or manual 6' operations (depending on the physical properties of article packing). The article packages separated at the de-palletising area 6, 6' are loaded on system trays 11 automatically or manually, where more than one package can also be loaded on a tray 11. The empty trays 11 are brought to the de-palletising area 6, 6' automatically. Articles whose physical properties are such that no tray 11 is required for further manipulation are separated at the de-palletising area 6, 6' either automatically or manually and transferred directly to the outbound conveyors, e.g. roller or belt conveyors, (loose article packages).

The trays 11 loaded according to order by the de-palletising equipment, or from the buffer store, or loose article packages are put into storage in a conventional rack 8 for containers by means of automatic stackers 7, where the "ingoing storage strategy", i.e. which loaded tray 11 or which loose article package is stored where and how, is an essential component of the process according to the invention. The rack 8 can be designed either for single-depth or for multiple-depth storage of trays 11 or loose article packages.

The loaded trays 11/loose article packages 5 are put into storage according to a loading pattern calculated beforehand by the system to take account of the loading sequence of the delivery package unit (e.g. container on wheels, pallet, ...). For this purpose, fictitious storage zones 13 with a number of storage spaces 14 resulting from the loading quantity and loading sequence calculated beforehand are reserved for the resulting delivery package units for the order. The size, i.e. the number of storage spaces 14, changes dynamically with the loading quantity for the respective delivery package unit, which optimizes the filling level of the rack 8. The picking process according to the invention ensures further that the delivery items (trays with article packages or loose article packages) belonging to an order-related delivery package unit (container on wheels, pallet, ...) are stored in storage spaces 14 in the immediate vicinity (above, beside, etc.). Thus, the storage capacity of a fictitious storage area 13 is equal to the load of a delivery package unit.

Figure 4 now shows a rack 8, where the individual article packages 5 are put into storage by a rack feeder 7. An essential component of the picking process according to the invention is retrieval of order-related trays 11 pre-sorted in "fictitious" storage zones 13 and loaded with articles 5, or of loose article packages 5. The trays 11 belonging to a delivery package unit or loose articles 5 in a rack column are stored directly above one another, stacked singly or several layers deep.

Figure 5 shows retrieval of the trays 11 loaded with the articles 5 or loose article packages 5. For this purpose, a special rack feeder 9 with a special load-bearing means 15 is used to hold the trays 11 loaded with article packages 5 or the loose article packages 5 on the one hand, as well as a powerful vertical conveyor 16 (Z-conveyor, paternoster, or similar) as integral component on the other hand. The load-bearing means 15 retrieves (removes) the trays 11 loaded with article packages 5 or the loose article packages 5 from the rack 8 and transfers them to the on-board vertical conveyor 16 by means of the conveying equipment, e.g. roller or belt conveyors, installed on the rack feeder 9. The vertical conveyor 16 then passes the trays 11/loose article packages 5 on to a conveying plant which is used to transport them onwards to the palletisers 10, 10'. In the invention it is useful if the load-bearing means 15 for

removing the trays 11/loose article packages 5 moves in beneath the bottommost storage space 14 of the "fictitious" storage zone – assigned exactly to a delivery package unit at the given moment – retrieves the trays 11 and/or loose article packages 5 stored at this level of the rack 8 and then – without moving the load-bearing means 15 back to the "waiting position – middle position" again – lifts them to the next storage space up 14' with one lifting movement and retrieves the next trays 11/loose articles 5. At the same time, the retrieved trays 11/loose article packages 5 are conveyed towards the palletisers 10, 10' by the vertical conveyor 16. This process achieves very high retrieval performance.

The packages to be palletised on delivery package units are retrieved according to the process described above and brought to the palletisers by an automatic conveying plant. Before palletising, those delivery items loaded on a tray must be removed from the tray. This can be achieved automatically or manually. The packages are delivered to the palletising area in the sequence required for palletising, where the sequence is already formed in the warehouse. With these procedures, there is no need for the sorting equipment otherwise required. Furthermore, the delivery package units can be loaded easily according to the necessary peripheral circumstances (including weight, stability).

Figure 6 shows an alternative embodiment of the invention. Here, the articles are brought on a rack feeder 18 from a pallet store 17 with the articles to be picked to a de-palletising area 6' (shown here as manual workplace) and separated or stored on trays 11. These trays 11 are then brought on conveying equipment 19 to a rack feeder 20, which brings these trays 11 to the appropriate locations of the order transport units 21. In this case, the order transport units 21 are mounted in racks under the pallet store 17, so they do not need a large storage space. Here, too, the articles are already allocated according to the orders so that there is no need for sorting later. The order transport units 21 are then brought to the palletisers 10 or 10' using lifting gear, e.g. a conventional fork-lift or an automatic rack feeder (RBG). With suitable devices the bottom level here can also be brought to the palletisers 10, 10' first of all and the order transport unit 21 moved up one level so that the next level can then be emptied and further processed. Normally, the heavy articles are

stored at the bottom on the order package unit, e.g. pallet, or in the order transport unit 21 in order to guarantee stability. With the form of storage and retrieval planned, this can be achieved everywhere.

With the selected arrangement of the pallet store 17 above the order transport units 21, this part can also be enclosed effectively and act as a cold store. The articles only need to be brought through the de-palletising area 6 and appropriate lock gates into a room with a slightly higher temperature for a short period before being stored again in the cold store. The orders can also be palletised on order package units in an enclosed room before then being loaded directly into the refrigerated vehicle.

Plants and systems of this kind are used above all for picking and consolidating articles that are assembled in larger units, e.g. for retailing or supermarkets. In particular, they can also be used for picking of fresh products, such as fruit or vegetables.

The invention is not limited to the examples shown in the drawings. De-palletising and palletising areas can be designed to operate either automatically or manually, as required. The arrangement of the racks can also be selected at will.

Claims

1. Process for automatic picking or consolidating of articles of very different formats and assortments, including a stage for storing the articles in a rack bay, retrieving the articles, and palletising them, characterised by the articles to be collected for an order already being collected in a rack bay in the sequence required for palletising.

2. Process according to Claim 1, characterised by the articles being separated before being stored in a rack bay.

3. Process according to Claim 1 or 2, characterised by a fictitious part of the rack being assigned to an order.

4. Process according to one of Claims 1 to 3, characterised by the number of storage spaces in the rack bay being adjusted dynamically to the loading quantity for the respective delivery package unit.

5. Process according to one of Claims 1 to 4, characterised by the individual articles being stored next to each other in the rack bay.

6. Process according to Claim 5, characterised by the individual articles being stored in the rack bay directly above or beside one another, stacked singly or several layers deep.

7. Process according to one of Claims 1 to 6, characterised by the articles being stored on trays.

8. Process according to one of Claims 1 to 7, characterised by retrieval beginning with the bottommost tray or package unit.

9. Process according to Claim 8, characterised by retrieval continuing with the package unit stored at the next level in each case.

10. Process according to Claim 9, characterised by the retrieved package units being brought directly to the delivery package unit.

11. Plant for automatic picking or consolidating of articles of very different formats and assortments, with the units rack bay, retrieving unit for the articles, and palletising device, characterised by the articles to be collected for an order

being already assembled in a rack bay (8) in the sequence required for palletising (10, 10').

12. Plant according to Claim 11, characterised by a separating plant for the stored articles being included before the rack bay (8).

13. Plant according to Claim 11 or 12, characterised by the rack bay (8) having a number of rack columns that are divided into fictitious storage zones.

14. Plant according to one of Claims 11 to 13, characterised by the rack (8) holding trays (11) loaded to different heights.

15. Plant according to one of Claims 11 to 14, characterised by a rack feeder (9) being provided for retrieval, which has a load-bearing means (15) to hold the filled trays (11) or loose article packages (5).

16. Plant according to Claim 15, characterised by the rack feeder (9) having a vertical conveyor (16).

17. Plant according to Claim 11, characterised by the rack bay (8) having a number of transport units (21) for the goods to be picked.

18. Plant according to Claim 17, characterised by the transport units (21) holding the trays (11) with the articles for an order.

19. Plant according to Claim 17 or 18, characterised by the transport units (21) being designed as self-supporting racks.

20. Plant according to Claim 19, characterised by the transport units (21) being stored on pallets.

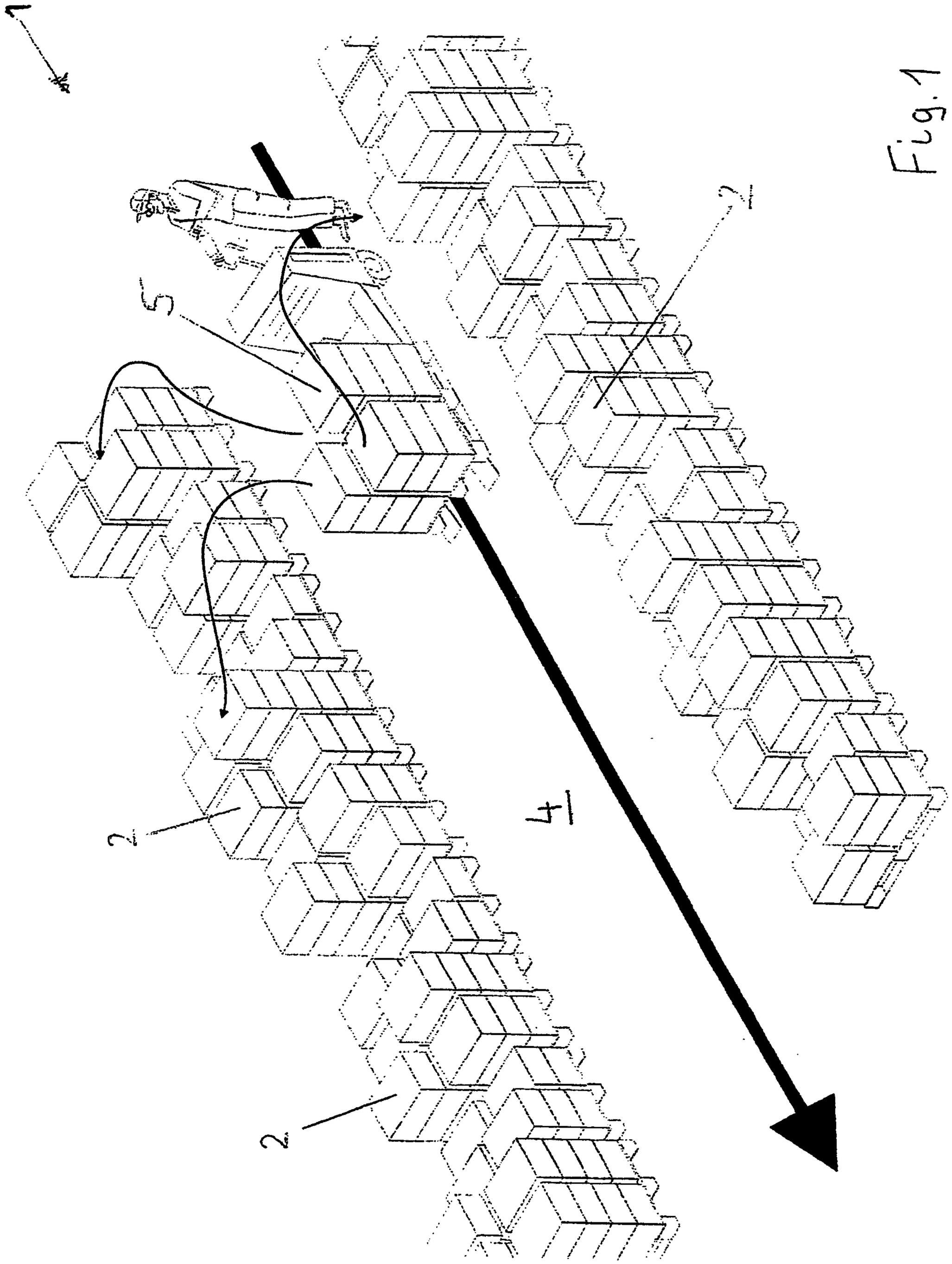

Fig.1

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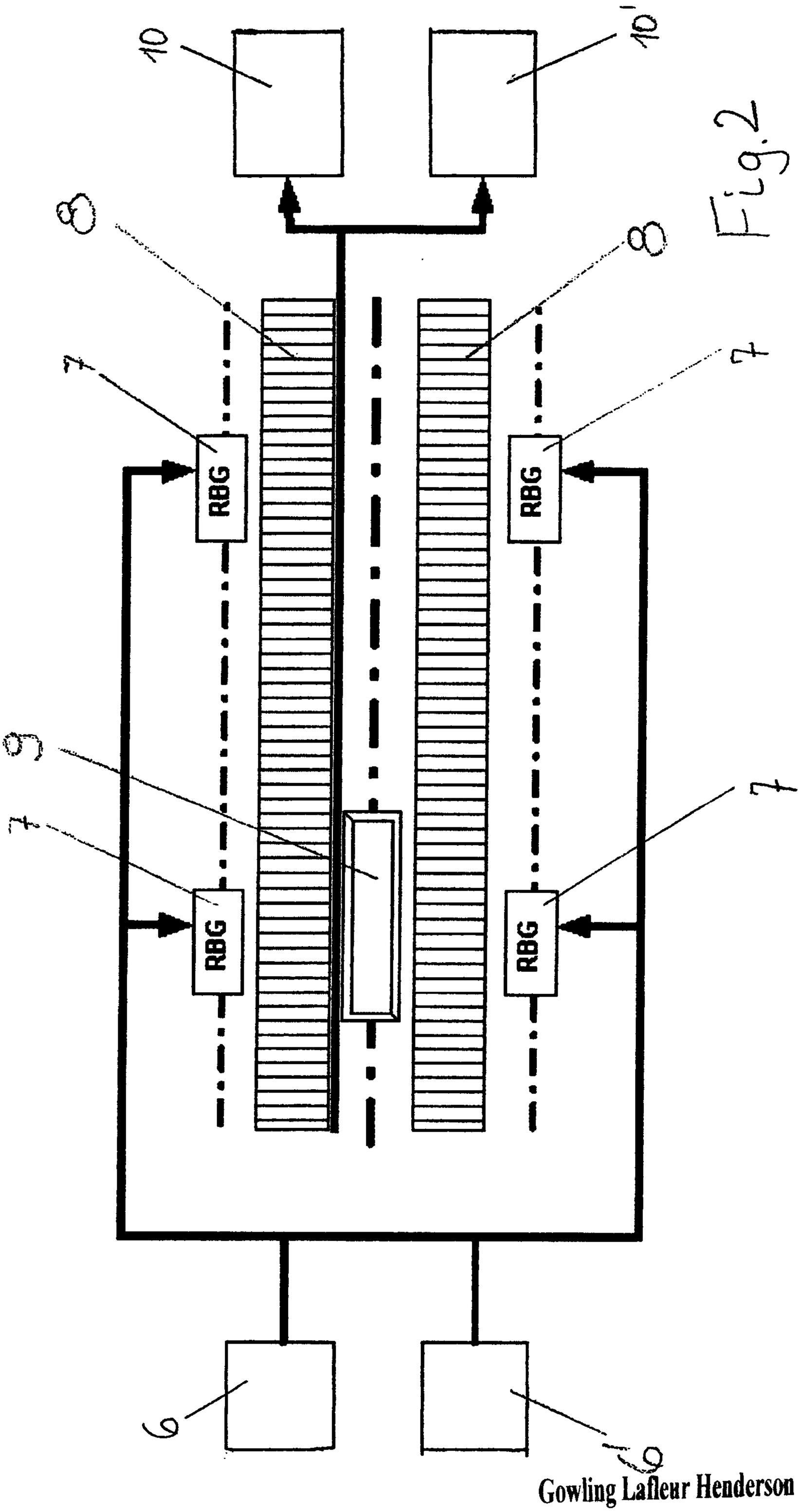

Fig.2

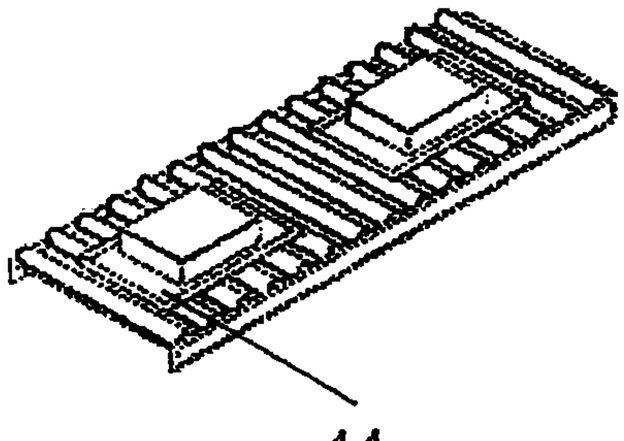

Fig. 3a

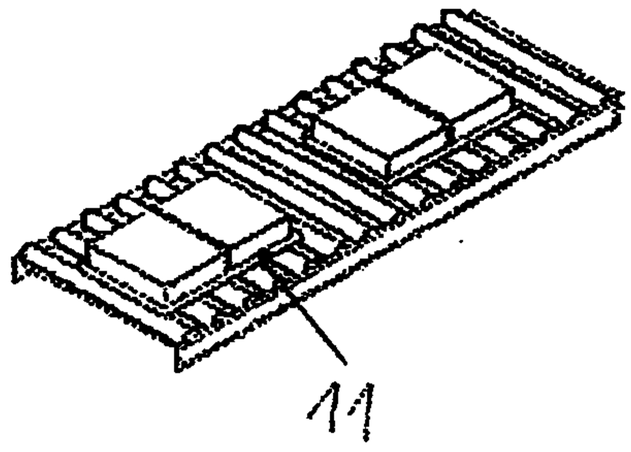

Fig. 3b

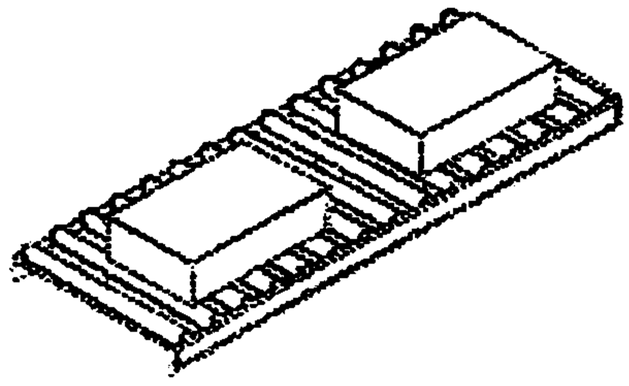

Fig. 3c

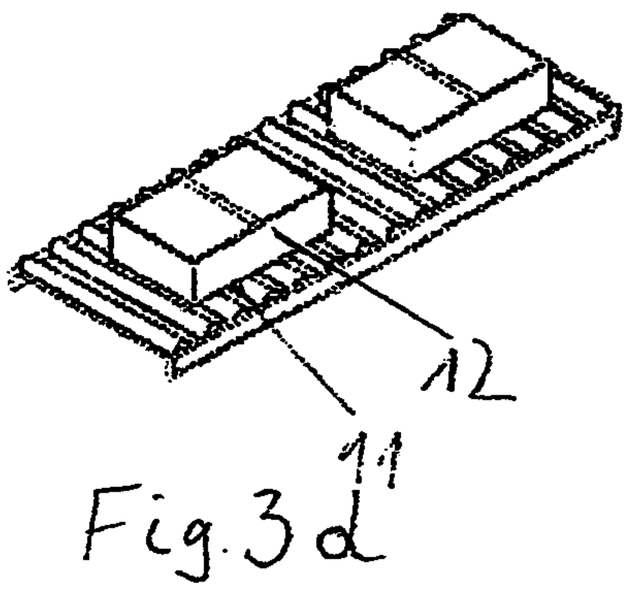

Fig. 3d

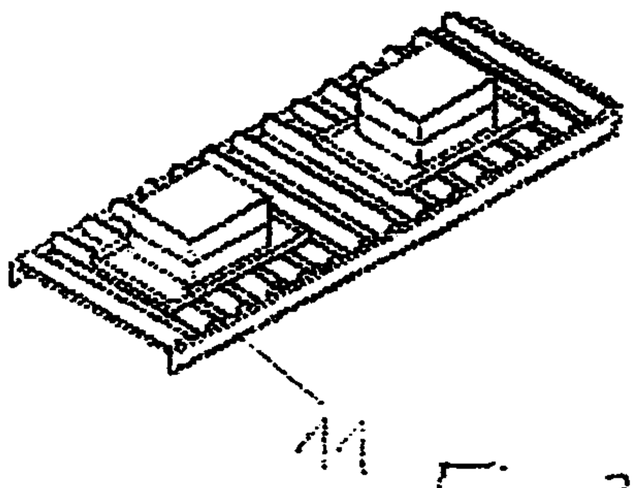

Fig. 3e

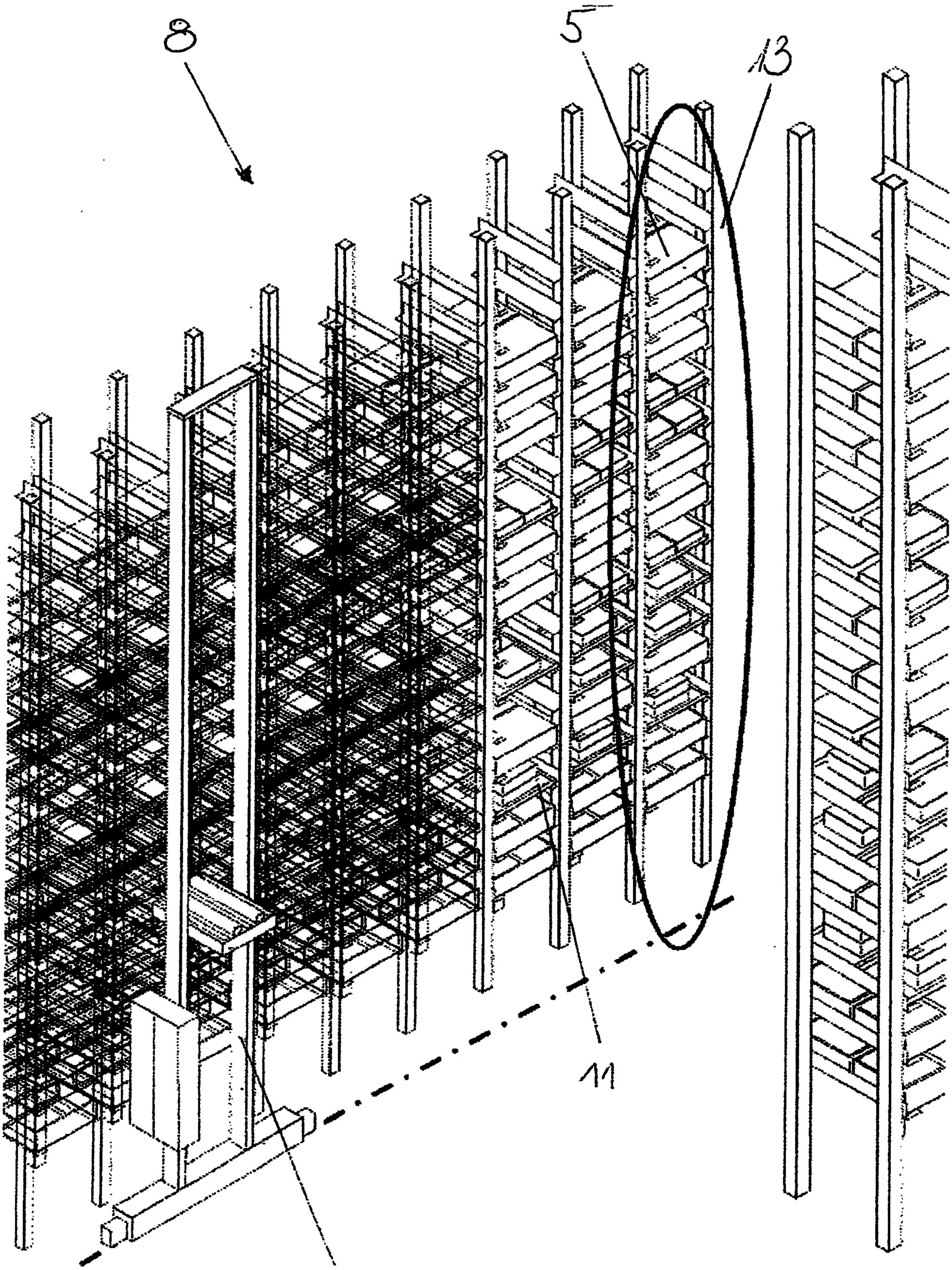

Fig 4

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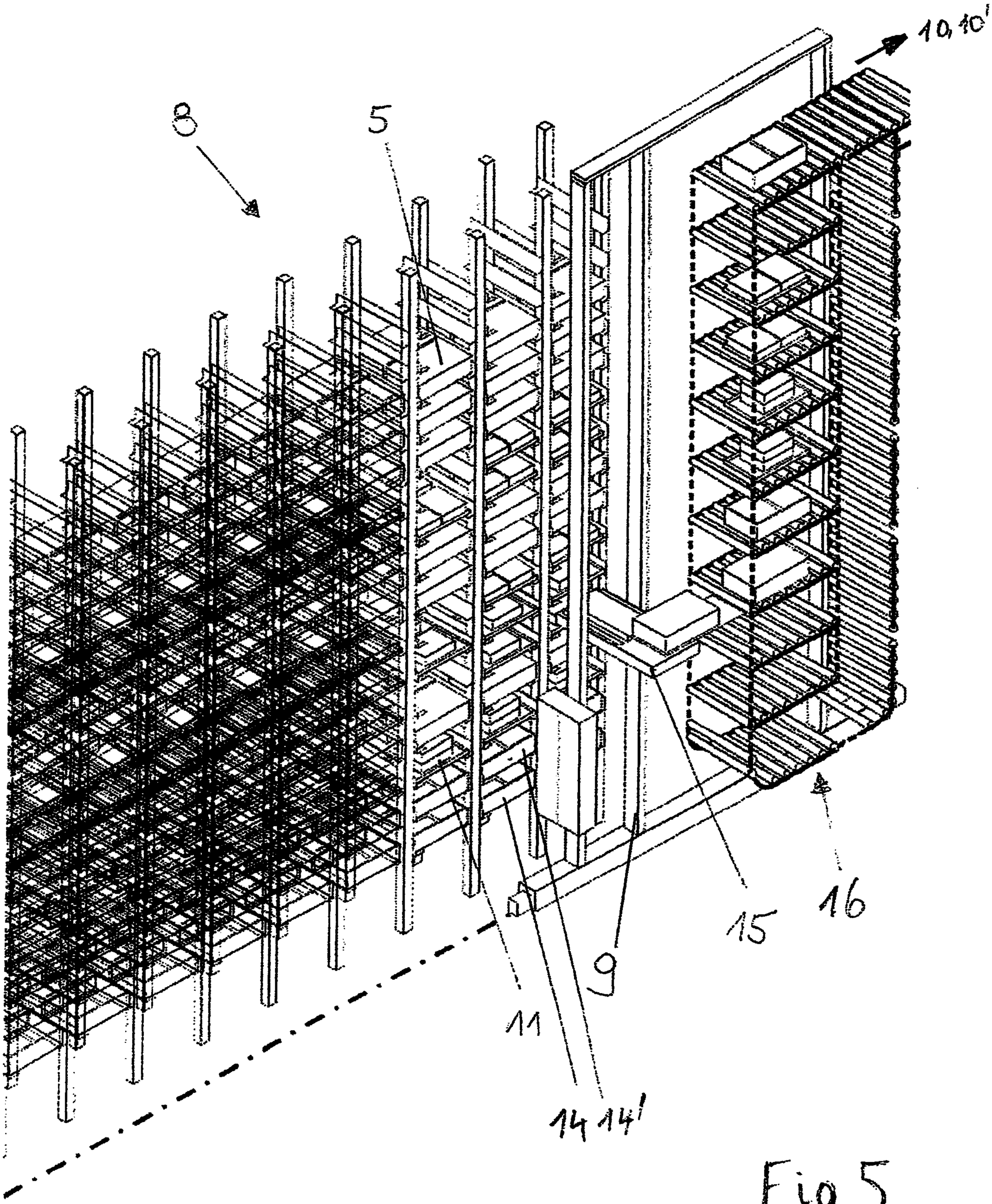

Fig.5

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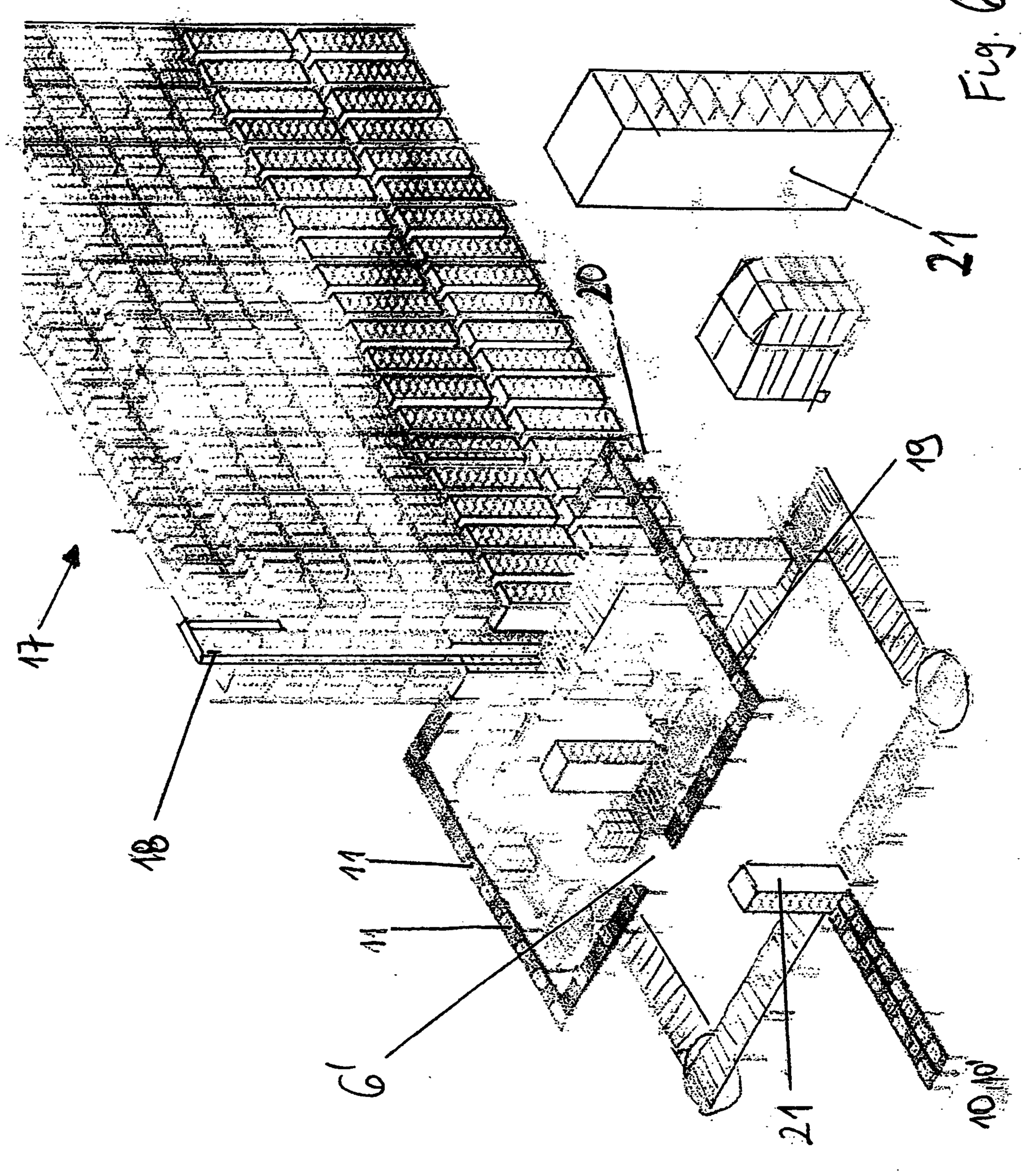
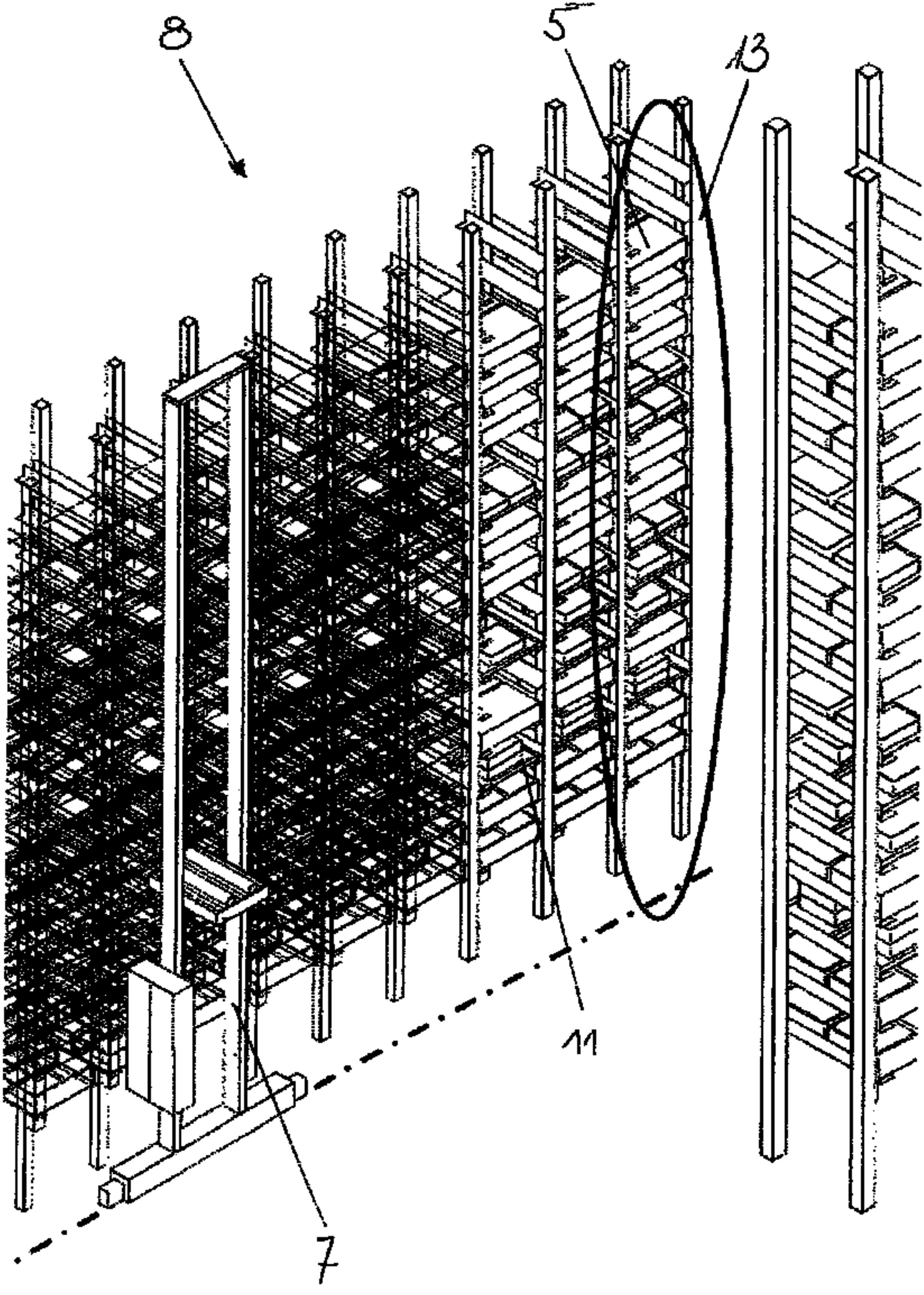


Fig. 6
21
20
19
17
18
11
11
6
21
10
10'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