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(54) Title: STORAGE SYSTEM FOR AN INCUBATOR

(54) Bezeichnung : LAGERSYSTEM FÜR EINEN INKUBATOR

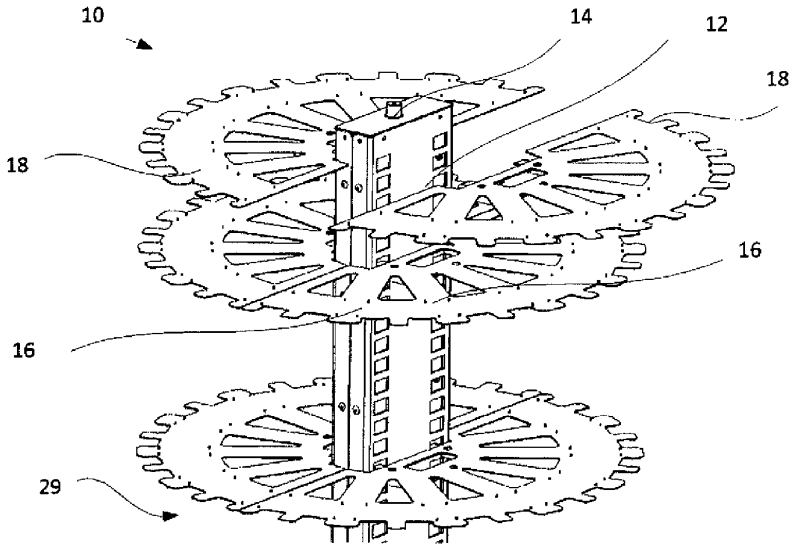

Fig. 1

(57) Abstract: The invention relates to a storage system for an incubator (38), comprising a carrier unit for samples and/or sample containers. The invention is distinguished in that the carrier unit comprises carrier parts (22, 33), between which an upright (14, 34) is mounted in a rotatable manner, and shelves (18, 29, 36) are provided, it being possible for these shelves to be fastened in a releasable manner on the upright (14, 34).

(57) Zusammenfassung:

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— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

Die Erfindung betrifft ein Lagersystem für einen Inkubator (38) umfassend eine Trägereinheit für Proben und/oder Probenbehälter. Die Erfindung zeichnet sich dadurch aus, dass die Trägereinheit Trägerteile (22, 33) umfasst, zwischen welchen ein Holm (14, 34) drehbar eingespannt ist, und Tablare (18, 29, 36) vorgesehen sind, die lösbar an dem Holm (14, 34) befestigbar sind.

Incubator Storage System

The invention relates to an incubator storage system of the type specified in the preamble of claim 1.

Storage systems for incubators are known, most of which are permanently integrated in an incubator. This makes it especially difficult to clean contaminated incubators. This problem is further compounded in the case of moving storage systems as these involve mechanical elements, their design is relatively complex and they are very difficult to handle for a user. In addition, their high weight makes these apparatuses, paternoster systems for example, hard to dismantle and remove from an incubator.

Furthermore, DE 10 2004 053 170 A1 discloses a storage system for heat-sensitive medical and biological samples. The storage system disclosed in this document comprises a support unit for a shaft designed as a hollow shaft on which carrier elements can be detachably mounted. The carrier parts are formed in the manner of shelves. Again, this arrangement is completely integrated in the incubator.

Dismantling the shelves is very time-consuming as the entire shaft has to be dismantled for this purpose.

It is the object of the invention to provide a movable storage system which is readily accessible, allows a high packing density and can be easily cleaned. It is another object of the invention to ensure that an incubator can be easily retrofitted with a storage system.

This object is accomplished by the characterizing features of claim 1 in combination with the features contained in its preamble as well as by the characterizing features of claim 4.

In the following text, the terms incubator and climatic chamber are used synonymously.

In a known manner, a support system and a shaft are provided in an incubator for the storage of samples. Shelves can be detachably mounted on the shaft and the shaft is rotatably mounted within the support system.

According to the invention, at least the shaft and/or the shelf include connecting means which are designed such that, in order to attach the shelf to the shaft, a mounting movement of the shelf is required, in which the vector of the mounting movement has at least one component that is orthogonal to the shaft.

Various different solutions are conceivable for implementing the connecting means. Magnets may for example be provided on the shelf which can be attached by means of a mounting movement which is exclusively orthogonal to the shaft. Furthermore, U sections, in particular circumferential U sections, may be provided on the shaft, and the shelves can be inserted in the slots provided in the U sections.

In an advantageous embodiment, the connecting means are formed as mutually corresponding insertion means which are provided both on the shaft and on the shelf, and can be made to engage each other. This has the advantage that the storage system can be handled easily and may be equipped as needed.

The insertion means are in particular formed in the shape of hooks and integrally molded on the shelves. These hooks can be made to snap into openings provided in the shaft.

In yet another advantageous embodiment, the rotatable shaft may be detachably connected to a support structure. This affords the particular advantage that not only the shelves but also the shaft can be removed for cleaning. This thus allows the entire storage system to be removed from the incubator in an easy way.

Preferably, at least the outer periphery of the shelves may be of a partially circular design. This ensures a particular good use of space, especially if the incubator is of a square cross-section, at the same time allowing the shaft to be rotated.

In accordance with one embodiment of the invention, the shelves are designed so that they can be split and that hanging the shelf parts on the shaft will yield a complete shelf. This facilitates above all the mounting of the shelf on the shaft and additionally reduces the weight to be carried by the user.

Preferably, a shelf may be divided into two shelf halves. The two shelf halves can be hung on the shaft so as to form one complete shelf. Splitting each shelf in two allows a good compromise to be reached as regards the weight of a single shelf and ease of handling.

To be more specific, the shaft is rectangular and has openings in at least two of its sidewalls. Shelves can variably be hung by insertion in these openings.

This has the advantage that the shelves that can be removably mounted on the shaft can be removed for cleaning. As the individual shelves are light weight, removing them for cleaning does not require a lot of effort on the part of the user. As the shaft can be rotated, all positions on the shelf are easily accessible from a single position. This also proves to be very advantageous when samples or sample containers are to be placed in the incubator.

In yet another advantageous embodiment of the invention, a motor may be provided which is in particular located outside the incubator and can be used to drive the shaft. This may reduce contamination when the incubator is being filled manually as the storage system will not have to be rotated by hand. In addition, this allows the storage system to be combined with an automatic feed device, amongst other things. Automatic rotation of the shaft allows a specific position to be set on the shelf such that a gripper can place a sample on it and/or a sample can be withdrawn from this very position.

According to another aspect of the invention, the carrier unit may be connected to a support system.

The support system may have its own bases or pedestals and can thus be set up irrespective of the climatic chamber.

As it is not connected to the climatic chamber, the support system can easily be connected to a climatic chamber at a later date. This can be implemented by providing an opening in a rear wall of the climatic chamber, for example, into which the support system is then introduced. As an alternative, a wall of the climatic chamber can also be removed completely and be replaced with a matching wall which is already mounted on the support system. Its weight will not act on the climatic chamber as the weight will be borne by the support system.

This support system can thus be easily retrofitted into an already existing climatic chamber. This is above all supported by the modular design of the storage system as the necessary parts can be individually integrated into or removed from the climatic chamber.

The support system can be set up on its own, i.e. independently of a climatic chamber. This is advantageous in that the weight distribution has already been taken into consideration in the support system. Consequently, after having been retrofitted with the storage system of the invention, an existing climatic chamber will not have to be adapted regarding its static equilibrium. This makes it a lot easier to retrofit it with the storage system of the present invention, as the storage system comprising the support system can be connected to the incubator in a self-supporting manner.

Furthermore, the carrier unit and the support system can be designed such that they are already connected to a housing of an automatic feed device. This has the advantage that an automatic feed system comprising the storage system of the invention can be integrated in an incubator at a later date.

Preferably the carrier unit can be shaped such that it can be inserted into openings provided in the sidewall of an incubator. Advantageously, the carrier unit comprises an upper support profile and a lower support profile which are not substantially wider than the vertical opening in the wall required for an automatic feed unit capable of being adjusted vertically for feeding the samples. The support system can be designed such that it can only be slid into the incubation chamber from the outside and does not abut on the original incubator. This has the advantage that it allows for easy retrofitting of stationary incubators. Preferably the support system is thus located outside the incubator. The support system including the carrier unit forms a single unit and may be combined with standard incubators at a later date. Also an exchange of the incubator, for example in the case of a defect, is possible without any difficulty since the carrier unit and the support system can easily be dismantled and separated from the incubator.

Further advantages, features and possible applications of the present invention may be gathered from the following description in which reference is made to the embodiments illustrated in the drawings.

Throughout the description, the claims and the drawings, those terms and associated reference numerals are used as are specified in the list of reference numerals below. Of the drawings,

Fig. 1 a perspective view of a storage system;

Fig. 2 a schematic top view of a storage system that is connected to an automatic feed device;

Fig. 3 a schematic lateral view of a storage system that is connected to a support system.

Shown in Fig. 1 is a storage system 10 according to the invention for an incubator 38, which can have its shaft 12 rotatably connected to a carrier unit via connecting means 14. Provided in the sidewalls of the shaft 12 are openings 16 into which semi-circular shelf elements 18 are fitted. In this way, single shelf elements can be combined to form a circular shelf 29 onto which samples or sample containers may be placed all over its peripheral area. Preferably, Petri dishes (not shown here) of identical size are placed there. The shaft 12 may be fitted with an appropriate number of shelves 29 as required.

It is further considered advantageous that the shaft 12 be detachably mounted on the carrier unit. As a result, the entire storage system 10 can be taken apart and its component parts can be removed one after the other from the incubator 38. This makes for easy cleaning both of the storage system component parts and the empty incubator 38.

The fact that the storage system can be rotated makes all positions where sample containers may have been placed perfectly accessible from a certain position. This is particularly important for the automated storage of sample containers.

Fig. 2 is a top view of a storage system 20 according to the invention. In this embodiment, a shaft 12 is rotatably mounted via a carrier rack 22 which holds a plate 24 at its end through which a shank 26 projects which is connected to the shaft 12. Said shank 26 merges into a driving disk 27. The driving disk 27 connects the shank 26 to a motor 28 via a toothed belt. The motor 28 is located outside the incubator. The toothed belt 28a runs within said carrier rack 22.

This enables the shelves 29 connected to the shaft 12 in the manner specified by the present invention to be rotated automatically. In this case the motor 28 is connected to an automatic sample feed device via a data processing system which is not shown for reasons of clarity. This allows the storage system 20 to be adjusted to a feed device 30.

In this embodiment, the carrier plate 24 has been chosen such that merely a small portion of the sidewall of the climatic chamber has to be removed in order to retrofit an incubator 38 with the carrier racks 22 located at the top and bottom.

Fig. 3 is a schematic lateral view of a storage system of the invention in combination with a support system 32 provided separately of the incubator 38 for integration into an incubator 38 at a later date. As can be seen therefrom, the support parts 33 are connected to an external support system 32. Rotatably mounted between the support parts 33 is a shaft 34. As shown in Fig. 1, this shaft 34 has openings into each of which a shelf half 36 can be inserted. This lateral view furthermore shows that the carrier unit is mounted at a height level that will ensure that a gap remains between the bottom of the support system 32 and the carrier unit 30 into which the bottom part of the incubator 38 can be slid. The outline of the incubator 38 is shown schematically here. This device having the separate support system 32 is thus suitable for retrofitting an already existing incubator 38 without its interior having to be significantly modified for this purpose. A wall merely has to be provided with a gap to allow the support parts 33 to be slid into the incubator 38. The incubator 38 can then be retrofitted with the shaft 34 and the shelves 36 at a later date, through the usual door.

If the support system 32 is used in combination with an automatic feed system which has a vertically adjustable feed device, the support unit can simply be slid into the incubator 38 together with the mounted shaft 34 in order to facilitate installation. Subsequently, the shelf halves 36 will have to be hung on the shaft 34.

List of reference signs

10	storage system
12	shaft
14	connecting means
16	opening
18	shelf element
20	storage system
22	support rack
24	plate
26	shank
27	driving disk
28	motor
28a	toothed belt
29	shelves
30	feed device
32	support system
34	shaft
36	shelves
28	incubator

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Claims

1. A storage system for an incubator comprising a carrier unit, said carrier unit in turn comprising: support elements which have a shaft rotatably mounted between them, and shelves which can be detachably mounted on said shaft, with a mounting movement of the shelves having to be performed for attaching the shelves to the shaft; wherein the shaft and/or the shelves include connecting means which are designed such that the vector of the mounting movement has at least one component that is orthogonal to the shaft.

2. The storage system of claim 1, wherein the carrier unit is connected to a support system.

3. The storage system of claim 2, wherein the support system is located outside the incubator.

4. The storage system of any one of claims 1 to 3, wherein the shelves are composed of at least two shelf components.

5. The storage system of any one of claims 1 to 4, wherein the shaft is rectangular and has openings in at least two lateral portions thereof on which the shelves can be hung.

6. The storage system of any one of the preceding claims, wherein the shaft can be detachably mounted on the carrier unit.

7. The storage system of any one of the preceding claims, wherein the external periphery of the shelves is at least partially circular.

8. The storage system of any one of the preceding claims, wherein the carrier unit is connected to a frame of an automatic sample feed device.

9. The storage system of any one of the preceding claims, wherein the shaft is connected to the motor via driving means.

10. The storage system of claim 10, wherein the motor is provided outside of said incubator.

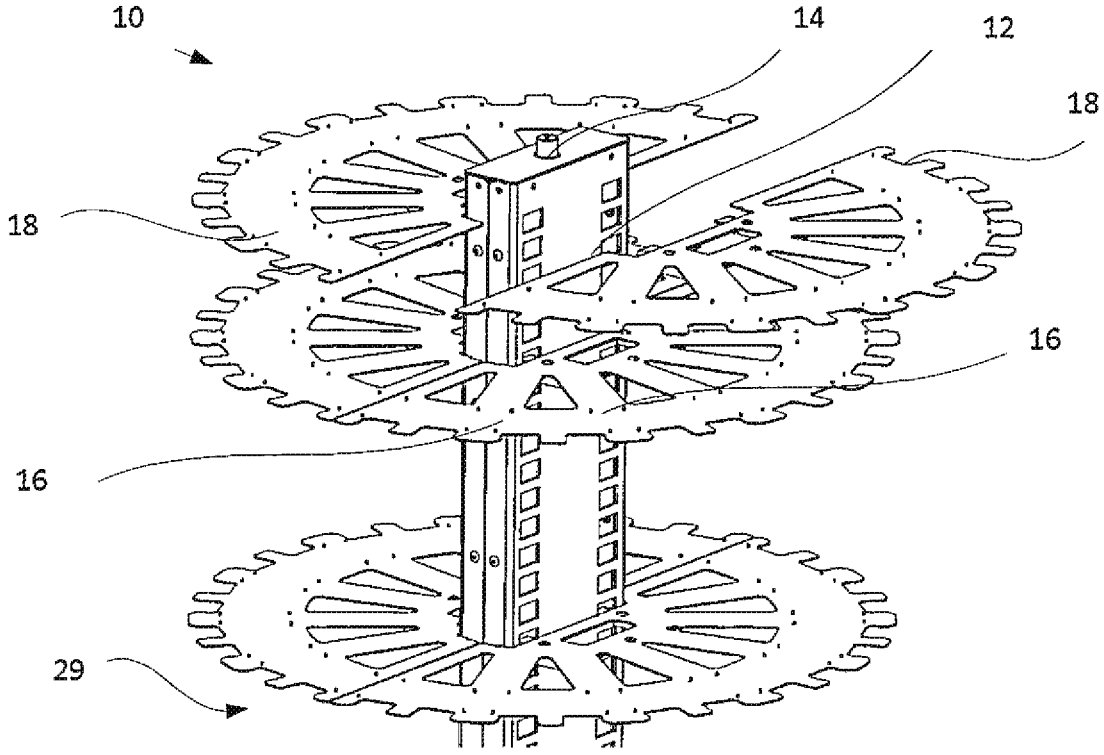

Fig. 1

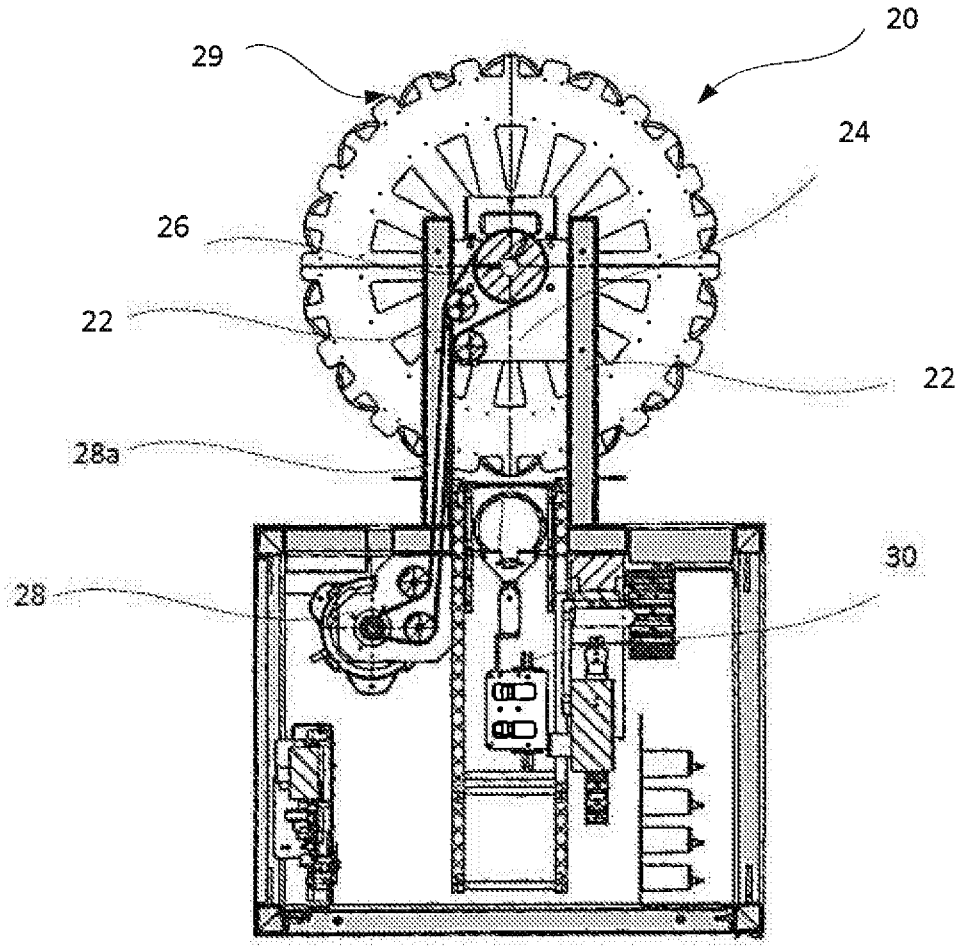

Fig. 2

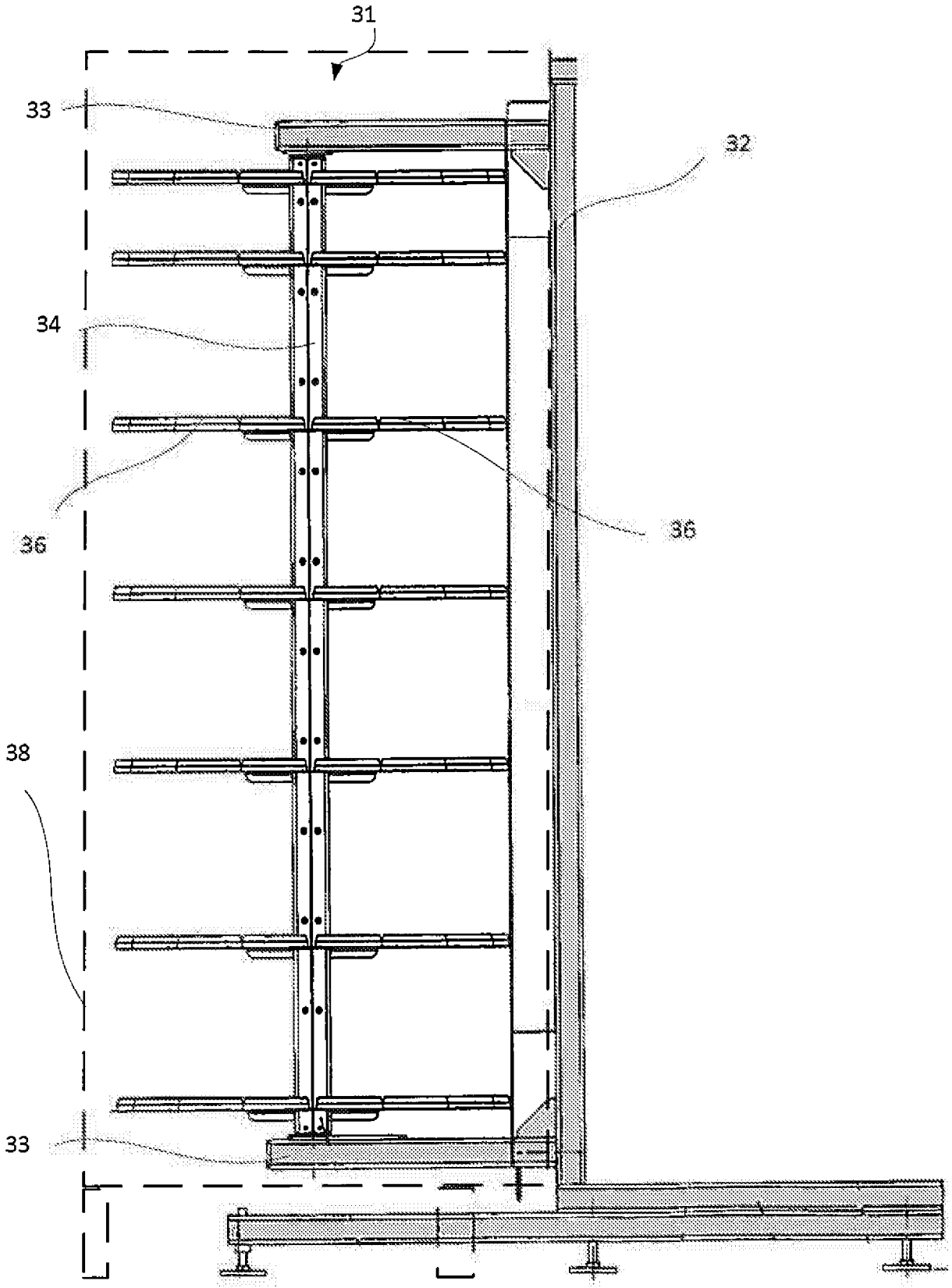

Fig. 3