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(54) Door arrangement in dishwasher, and method for operating dishwasher having such arrangement

(57) The present invention relates to a dishwasher having a double-door arrangement comprising a first door openable by vertical translation from a lower closed position to an upper open position and a second door openable by pivoting outwards around a pivot point arranged at a lower end thereof. The first door and the second door are interconnected by a linkage arranged to transfer an opening force applied to the second door to an opening force applied to the first door and the linkage comprises a first segment extending from the second door and a second segment extending between a distal end of the first segment and the first door. In particular, the linkage comprises a releasable section, such that the second door may be disengaged from the first door thus allowing for the second door to pivot beyond a horizontal position in an opening direction.

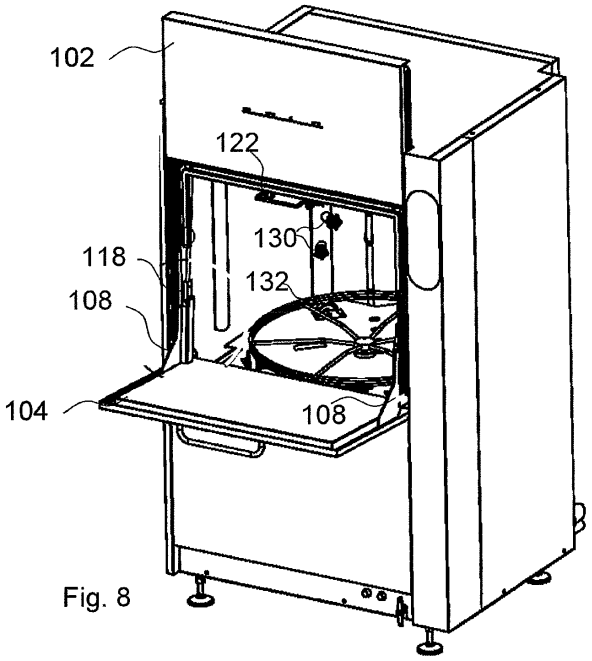

Fig. 8

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Description

Field of the Invention

[0001] The present invention relates to an arrangement in a dishwasher, and in particular to an arrangement for the door of a dishwasher.

Background

[0002] When doing dishes in a commercial establishment, such as in a restaurant or a cantina, use is made of high-capacity dishwashers (the terms ware washers, utensil washer etc. may also be used). There are several different types of dishwashers or dishwasher assemblies for this purpose, and variables include capacity, space efficiency, type of residues to be removed, etc.

[0003] One particular type of dishwasher has a double-door system, comprising an upper door operating in a guillotine fashion, and a lower door being pivotally mounted at its lower end. The lower door and the upper door may be connected by means of a linkage such that when the lower door is pivoted to an opened position the upper door is pushed upwards to an open position, too.

[0004] One advantage with this type of door arrangement is that a large opening area may be provided in a space efficient way. Also, the upper door will act as a deadweight for the lower door as the latter "falls" outwardly to an open position. By having a suitable weight distribution between the two doors it will be easy for a user to open and close the dishwasher. If the corresponding solution were to be achieved using a pivotally mounted door only, the opened door would extend over a large area, making it difficult to reach into the dishwasher besides from simply being in the way, and it would possibly be necessary to add counterweights or springs to facilitate opening and closing. The lower door acts as a loading area, where a utensil tray may be placed during loading and unloading. Utensil trays may also be slid onto the opened door from an upstream arrangement, such as a rinse system, thus providing an ergonomic mode of operation. This is one reason to why a pivotal door may be preferred on some dishwashers.

[0005] An example of the above type of dishwasher is disclosed in the patent US-4 018 239, which may serve as prior art for the present invention.

[0006] The present invention aims at providing an improved door arrangement for a dishwasher, maintaining the above beneficial features while adding more in the purpose of enabling an even more ergonomic mode of operation.

Summary

[0007] For achieving the above purpose the present invention relates to a dishwasher having a double-door arrangement comprising a first door openable by vertical translation from a lower closed position to an upper open position (a guillotine door) and a second door openable by pivoting outwards around a pivot point arranged at a lower end thereof, wherein the first door and the second door are interconnected by a linkage arranged to transfer an opening force applied to the second door to an opening force applied to the first door. The dishwasher is **characterized in that** the linkage comprises a releasable section, such that the second door may be disengaged from the first door thus allowing for the second door to pivot beyond a horizontal position in an opening direction.

[0008] The double-door arrangement has several advantages, yet a problem may appear in regard of accessibility during manual cleaning or service of the interior of the dishwasher. With the second door being opened and extending horizontally outwards the physical working position may be awkward for a service person. The present invention allows for a more ergonomic physical working position and an improved accessibility.

[0009] In its simplest form the linkage is provided by a first segment extending from a lower edge of the second door where it is rigidly attached, at an approximate right angle thereto, and a second segment extending from the free end (or distal end) of the first segment. The second segment is pivotally attached to said free end with its first end, and pivotally attached to the first door with its second end. Both segments may be rigid. As the second door is opened the free end of the first segment, two which the second segment is attached, will follow an arcuate path, and thereby the first door will be forced upwards.

[0010] According to one or more embodiments of the present invention the linkage comprises a release joint, and in one or more embodiments the release joint is arranged to remain engaged when it absorbs the weight of the first door. In to one or more embodiments the release joint comprises a pin/groove connection, where a pin axis may fit in a groove of a second segment of the linkage. This arrangement allows for the joint to pivot in one plane, and by shaping the groove the desired properties are readily achievable. In other embodiments the release joint comprises a ball joint. The release joint may be arranged between the first segment and the second segment, which is a position which is reachable by a user, and a position in which the above examples of release joints may be readily realized.

[0011] In one or more embodiments the second segment of the linkage comprises stop lugs, arranged and dimensioned to prevent the second door from pivoting beyond the horizontal position. This arrangement is convenient since it suffices with one release action (per linkage, usually two linkages) in order to obtain the desired result. The stop lugs extend outwards, towards the lateral edges of the opening of the dishwasher and are adapted to engage a surrounding structure when the second door is in the correct horizontal position.

[0012] According to one or more embodiment the dishwasher comprises a lock device for securing the first door in an open position. Such a lock device is preferred, yet not essential. Preferred since it facilitates for the user,

and not essential since there will be room for a user to access the interior of the dishwasher even if the first door is in its closed position. More advantages of the lock device will be discussed in the detailed description. A suggested lock device includes a hook arrangement pivotally attached to an upper surface of the interior of the dishwasher. This arrangement makes it easy to fold the lock device out of the way when not needed and easy to verify whether a locked position is obtained or not.

[0013] According to a second aspect of the present invention the release joint is arranged where the linkage couples to the second door. In one or more embodiments the release joint comprises a releasable hinge. The releasable hinge is lockable such that it may be locked during normal use, and released when as the second door should be pivoted beyond the horizontal position. The aspect has a benefit in that the linkage between the first and the second door is intact at all times. One possibility for a lockable hinge may be that a hinge is used as one of at least two connection points between the first segment and the second door. The second connection point may be a releasable coupling, such as one provided with a releasable lock-pin, a draw-bolt catch, or any other releasable coupling obvious to the skilled person aware of the details considering stress and load of the actual application.

[0014] In one or more embodiments the second segment may be attached to walls of an inner chamber of the dishwasher by means of a magnetic force in the released position.

[0015] A method for operating a dishwasher of the type having a double-door arrangement comprising a first door openable by vertical translation from a lower closed position to an upper open position (a guillotine door) and a second door openable by pivoting outwards around a pivot point arranged at a lower end thereof, wherein the first door and the second door are interconnected by a linkage arranged to transfer an opening force applied to the second door to an opening force applied to the first door, the linkage comprising a releasable section, such that the second door may be disengaged from the first door thus allowing for the second door to pivot beyond a horizontal position in an opening direction comprises the steps of

opening the dishwasher,
optionally locking the first door in place
releasing the releasable section of the linkage
pivoting the second door beyond a horizontal position.

Brief Description of the Drawings

[0016]

Figs. 1 and 2 are schematic sequential sectional sideviews illustrating the door arrangement of a prior art dishwasher.

Fig. 3 is a schematic sectional sideview of a dishwasher having a door arrangement in accordance with a first embodiment of the present invention.

Figs. 4-6 illustrate two different release joints.

Fig. 7 illustrates a dishwasher having a release joint according yet another embodiment of the present invention.

Fig. 8 is a perspective view illustrating a less schematic example of a dishwasher according to one embodiment of the present invention.

Detailed Description

[0017] The present invention is readily understood from the following detailed description concerning a few non-limiting embodiments thereof. Fig. 1 is a schematic sideview of the general construction of a dishwasher 100 having a double-door arrangement with a first door, a guillotine door, 102 and a second door, a pivoting door, 104 for access to the interior 106 of a dishwasher. A linkage 108, 110 is used to transfer an opening force applied to the second door 104 to the first door 102. In use a first segment 108 of the linkage is rigidly attached at a lower portion of the second door 104 at its proximal end. At its distal end it connects to a second segment 110 of the linkage with a first hinged joint 112. The second segment is connected with a lower portion of the second door via a second hinged joint 114. As the second door 104 is pivoted to an open position, as shown in Fig. 2, the first door 102 will be forced upwards for obvious reasons.

[0018] Stop lugs 116 are preferably provided and arranged to stop the second door 104 as it reaches a horizontal position as shown in Fig. 2, and the linkage is tuned such that this position corresponds to the first door 102 being in a fully opened position. In the illustrated embodiment the stop lugs 116 are arranged on the second segment 110, for reasons which will be apparent. The stop lugs 116 extend in the plane of the opening and engage edges of the opening or another abutment arrangement at a preferred position to prevent excessive opening of the second door 104.

[0019] The linkage comprises a release joint 118 of which a first embodiment is illustrated in Fig. 3 and related drawings (Figs. 4-6). It is readily understood that if the first hinged joint 112 has the design of Fig. 4, the joint will release if the first door 102 is held in an opened position and the second door 104 is moved in a closing direction. The release joint 118 is designed such that the second segment will follow in the closing direction, into the dishwasher, a short distance before releasing fully. In this way it will be readily possible to lock the second segment in a position where it is out of the way for the subsequent movement in the opening direction. It should be noted that a less elaborate design, such as the one shown in the sideview of Fig. 6 may also be used. In short the release joint comprises a socket 124 with a groove 126 which fits over a cooperating shaft 128, and one of the groove and socket is arranged in the end of the first segment and the other in the end of the second segment,

meaning that the order of the components 124 and 126 may be the other way around. The skilled person realizes that there are other options for the releasable joint, such as a ball joint, having a similar functionality.

[0020] After the release joint 118 has been released the second door may be pivoted beyond the horizontal position and into an essentially vertical position (not shown) in which it is out of the way, enabling service personnel to reach into the dishwasher more readily.

[0021] If the second segment is not secured it may swing outwardly as it releases from the first segment, and thus be an obstacle as the first segment is to be pivoted out of the opening. In one embodiment of the present invention this problem is conveniently solved by use of magnets. In one embodiment a magnet, symbolically illustrated at 120, is located outside of an interior wall of the dishwasher, and if the release joint comprises or is made to comprise a suitable material it will be magnetically attracted to the magnet and thus the segment will be held into place when released from the first segment. The magnet is preferably located in a place slightly inside of the position in which the engagement between the first and second segment is disrupted. It is obvious that instead of the above the release joint (or the released end of the second segment) may comprise a magnet and that e.g. a ferromagnetic material may be arranged outside of the interior. Other alternatives are also possible, such as having a mechanical hook arrangement for the second segment. The exemplified types of arrangements may be applied to any embodiment of the present invention.

[0022] The above arrangement makes enables positioning of the second segment without having to introduce additional constructional details inside the dishwasher, which is a beneficial feature.

[0023] Fig. 7 illustrates a further embodiment of the present invention. In this embodiment the release joint 218 is arranged where the first segment attaches to the second door, at the lower end thereof. A lock arrangement (not shown) is designed to hold the first segment rigidly in place during normal operation, and the lock arrangement may then be unlocked - such that the releasable joint is released - when opening of the second door beyond the horizontal position is desired. In this case too, the first door should be locked into place before the releasable joint is released.

[0024] In order to secure the first door in an open position a lock device 122 may be provided. In the illustrated embodiments the lock device comprises a pivotally arranged hook 122. Some advantages of this specific arrangement is that it has a non-complex mechanical construction, it is simple to verify visually that the first door is secured, and it is impossible for the first door to slip out of the grip of the lock device 122. The skilled person realizes that there are several other options for the lock device, such as a bolt, or latch arrangement. In one or more embodiments the lock device is bistable in its suspension, such that it either assumes an active position as shown in Fig. 7, where it locks the first door in an open position, or a passive position as shown in Fig. 3, where it is positioned to interfere with the function of the dishwasher to the least possible extent. One way of obtaining bistability is to arrange a tension spring, schematically indicated at 123 in Fig. 10, exerting a force between a point on the lock device 122 and a point located above the pivot point on the socket comprising the pivot point, which obviously results in a desired bistable behavior..The skilled person realizes that there are several ways of obtaining a bistable behavior of the lock device 122.

[0025] The present disclosure does not touch details of dishwashers as such, and this is not considered necessary since the starting point is a very specific door arrangement for a dishwasher. A skilled person within the field of dishwashers (ware washers, utensil washers, tray washers etc) would have no problem in realizing the present invention based on what is disclosed herein. Still, in order for the reader to obtain a more detailed understanding of a dishwasher according to one embodiment of the present invention a more realistic perspective view is illustrated in Fig. 8, followed by the detailed views of Figs. 9 and 10. In the drawings details corresponding to details previously presented in connection to the schematic illustrations have been given the same reference numerals. In Fig. 8 it is also possible to observe in more detail the interior of the dishwasher. Typically it comprises several spray nozzles 130 for rinsing and cleaning dishes (pots and pans) arranged on a driven rotary basket or holder 132, and the particular dishwasher shown may have the option to add granules to the dishwater in order to obtain a more abrasive effect on food residues.

Claims

1. A dishwasher having a double-door arrangement comprising a first door openable by vertical translation from a lower closed position to an upper open position and a second door openable by pivoting outwards around a pivot point arranged at a lower end thereof, wherein the first door and the second door are interconnected by a linkage arranged to transfer an opening force applied to the second door to an opening force applied to the first door, wherein the linkage comprises a first segment extending from the second door and a second segment extending between a distal end of the first segment and the first door, **characterized in that** the linkage comprises a releasable section, such that the second door may be disengaged from the first door thus allowing for the second door to pivot beyond a horizontal position in an opening direction.

2. The dishwasher of claim 1, wherein the release section is provided by a release joint between the first segment and the second segment.

3. The dishwasher of claim 2, wherein the release joint comprises pivot pin and a cooperating open groove, connecting the end of the distal end of the first segment to an end of the second segment.

4. The dishwasher of any preceding claim, further comprising lock device for securing the first door in an open position.

5. The dishwasher of claim 4, wherein the lock device comprises a hook arrangement, pivotally attached with one end to an upper surface of the interior of the dishwasher.

6. The dishwasher of claim 4 or 5, wherein the lock device exhibits a bistable suspension, such that it may be securely positioned in an active position and a passive position, respectively.

7. Dishwasher according to claim 1, wherein a coupling between the second door and the first segment of the linkage comprises the releasable section.

8. The dishwasher of claim 7, wherein the releasable section comprises a lockable hinge, wherein unlocking of the hinge allows for the desired movement of the second door.

9. The dishwasher of any preceding claim, wherein stop lugs are arranged on the second segment of the linkage, for preventing the second door from pivoting beyond the horizontal position unless disengaged.

10. A method for operating a dishwasher of the type having a double-door arrangement comprising a first door openable by vertical translation from a lower closed position to an upper open position and a second door openable by pivoting outwards around a pivot point arranged at a lower end thereof, wherein the first door and the second door are interconnected by a linkage arranged to transfer an opening force applied to the second door to an opening force applied to the first door, the linkage comprising a releasable section, such that the second door may be disengaged from the first door thus allowing for the second door to pivot beyond a horizontal position in an opening direction comprises the steps of
opening the dishwasher,
optionally locking the first door in place
releasing the releasable section of the linkage
pivoting the second door beyond a horizontal position.

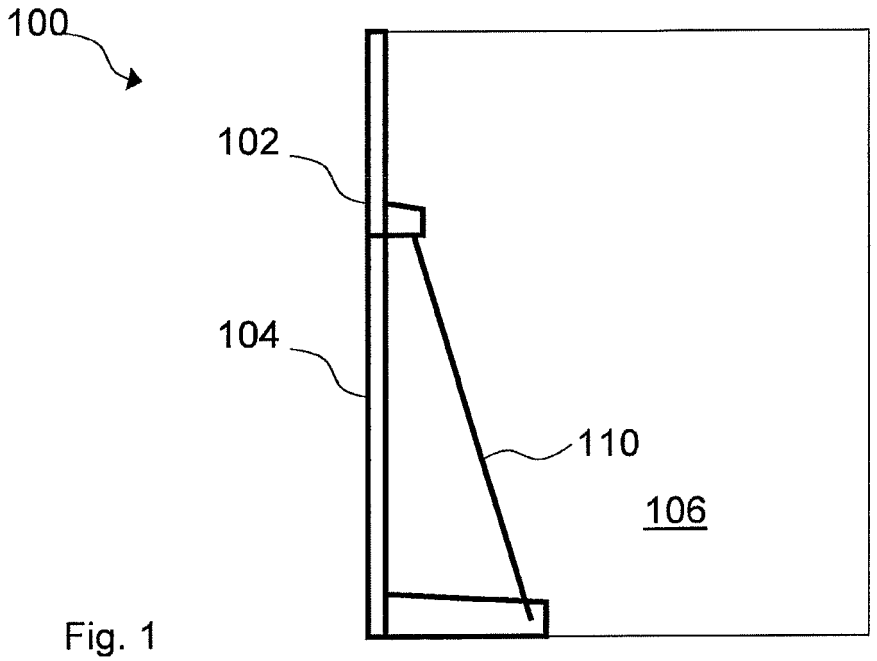

Fig. 1

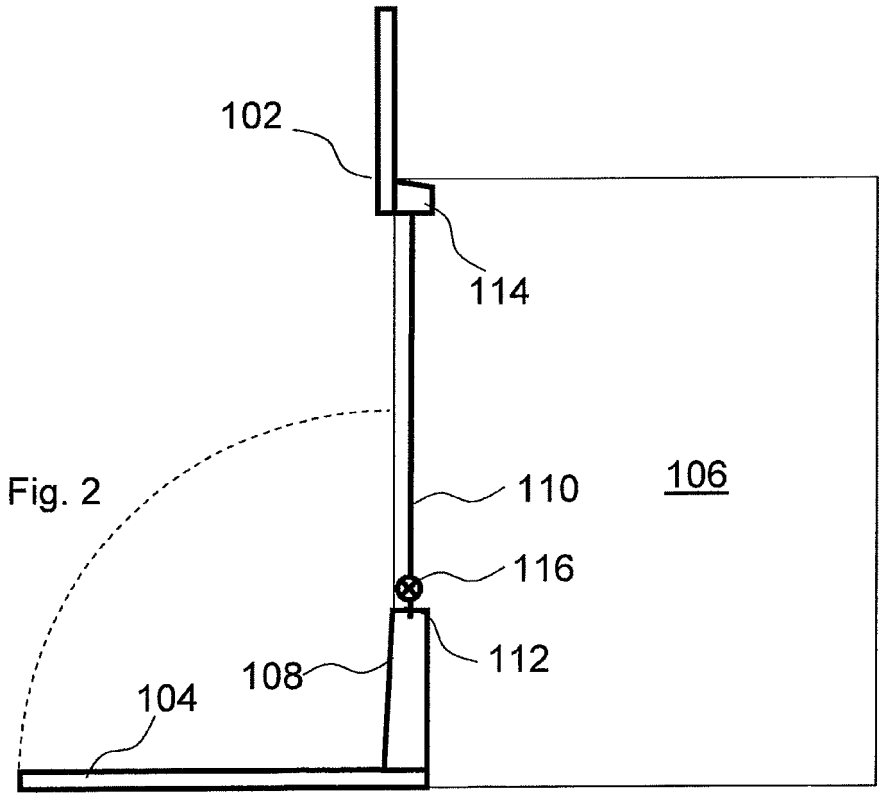

Fig. 2

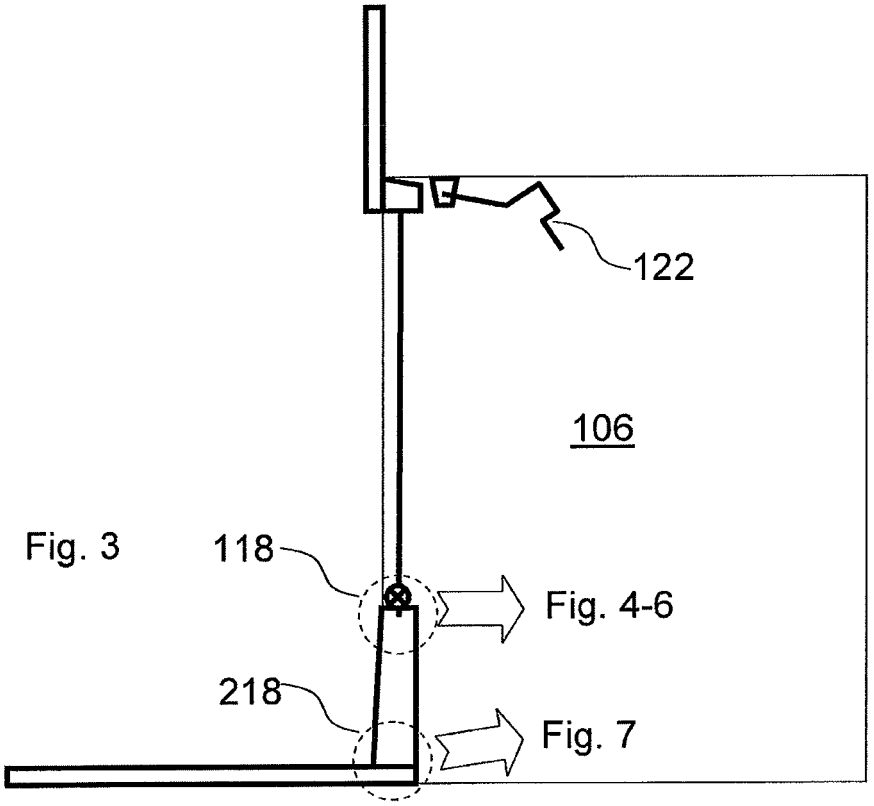

Fig. 3

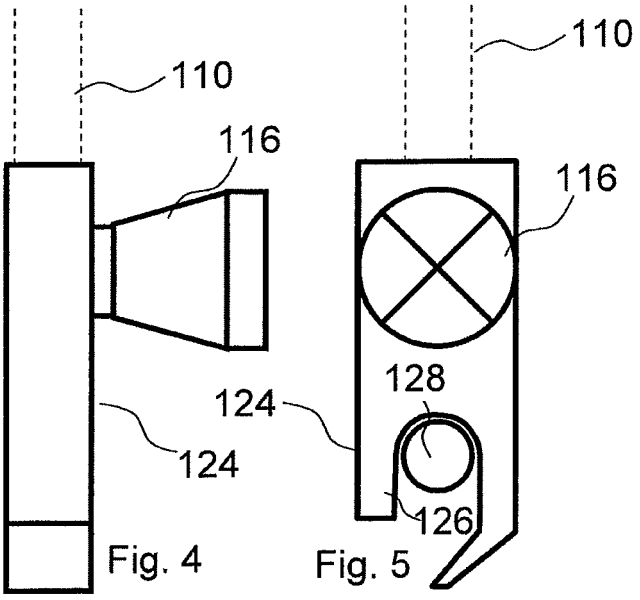

Fig. 4

Fig. 5

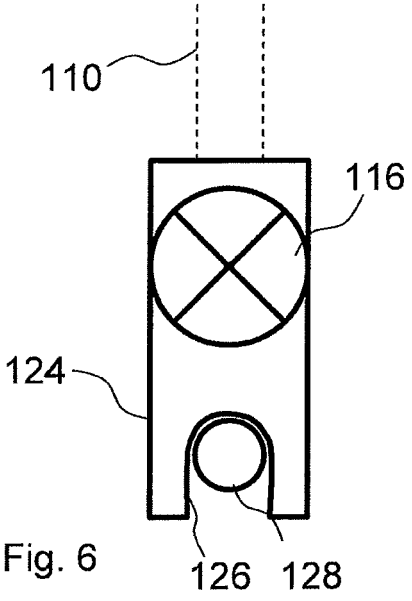

Fig. 6

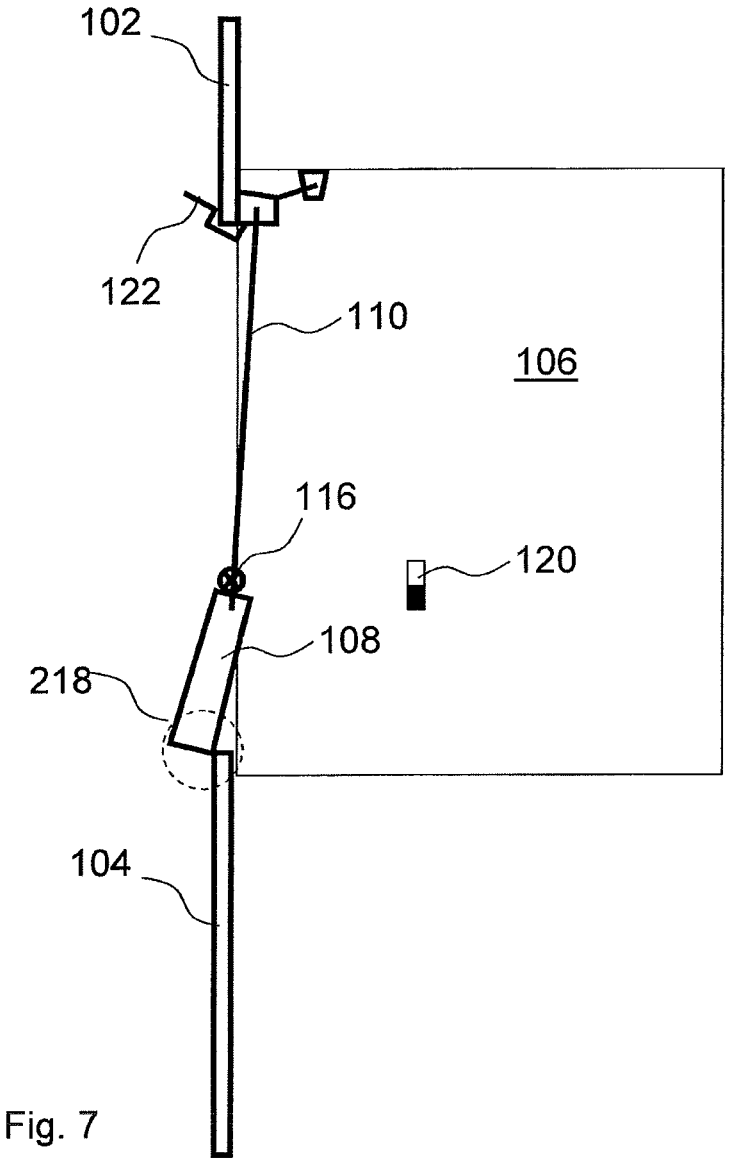

Fig. 7

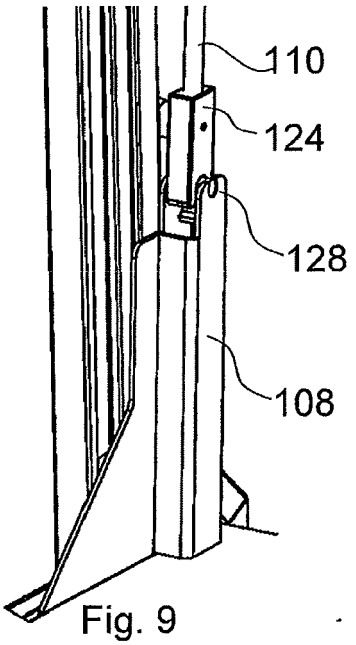

Fig. 9

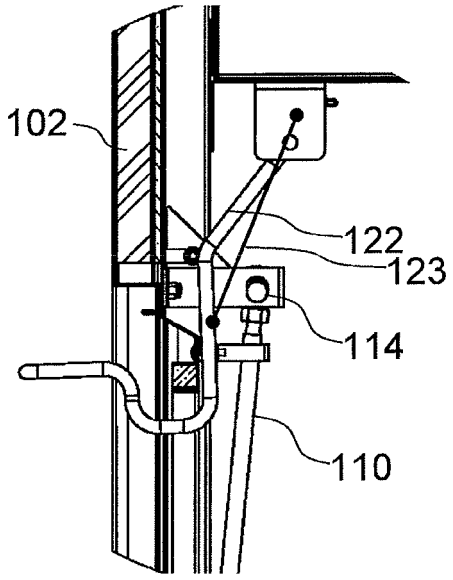

Fig. 10

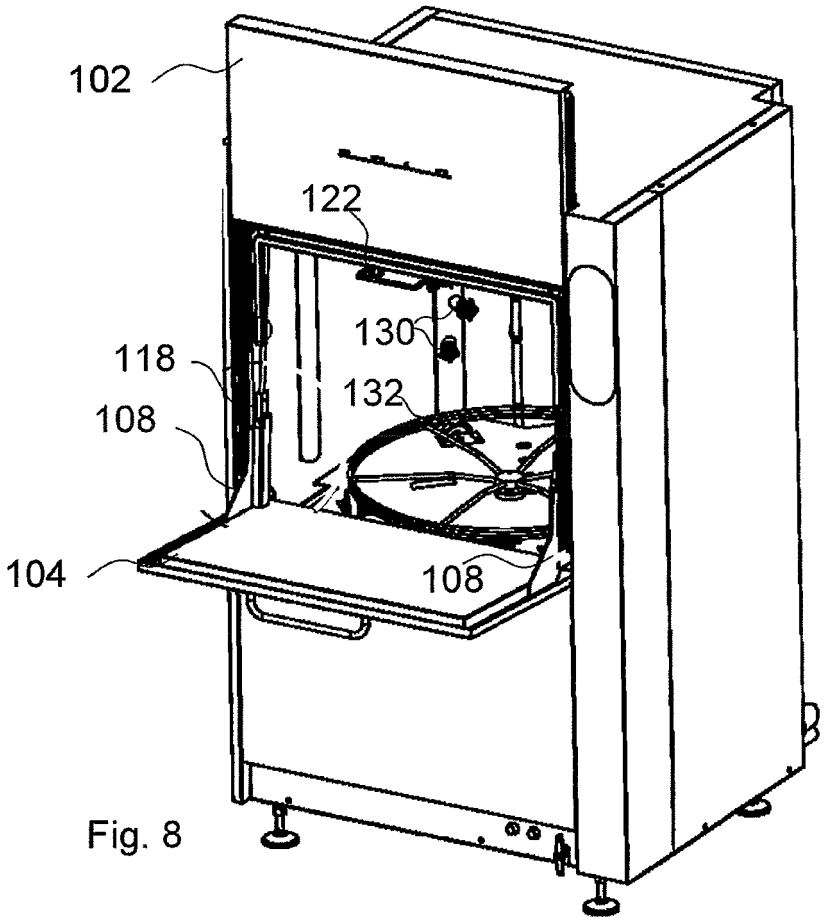

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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