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Amended claims in accordance with Rule 86 (2) EPC.

(54) **Refrigerator with back-sided door and turning device**

(57) This invention relates to a refrigerator (1,25,43; 49;71) comprising a cabinet (3,27,50), shelves (9) arranged within a refrigerated space (11) of the cabinet, a back door (5) at a rear side of the cabinet providing access to said shelves from said rear side (4), and a support structure carrying the cabinet. The support structure (7,60) is arranged to provide for horizonal movement, including at least turning motion, of the refrigerator.

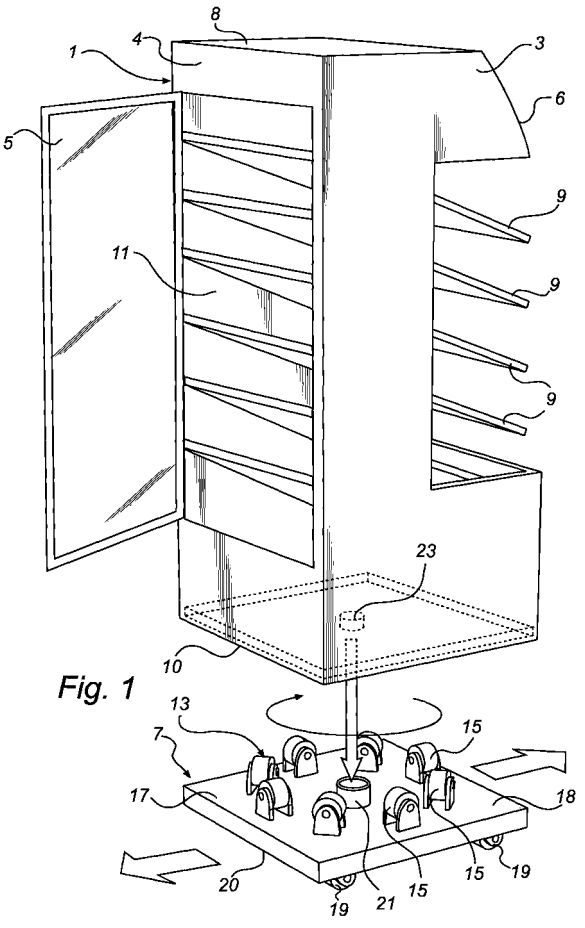

Fig. 1

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Description

Technical field of the invention

[0001] The invention generally relates a refrigerator having a cabinet, and shelves arranged in a cooled space of the cabinet.

Background art

[0002] In stores, refrigerators are typically used for storing, cooling, down to temperatures above as well as below the freezing-point, and displaying items of merchandise to the customers. Examples of merchandise in such a refrigerator are cans and bottles of drink, snuff boxes, cartons with dairies or juices etc. Since this type of merchandise generally has expiry dates, it is desirable to have the oldest items in the front of the shelves, thereby making the oldest items sell first and lowering the risk that items are sold after their expiry dates. When the refrigerator is to be filled with new items, it is therefore desirable to fill the new items from the back of the shelves.

[0003] In prior art, access to the rear side of the shelves has e.g. been facilitated by making the interior part of the refrigerator extractable. That is, the shelves have been arranged on a carriage supplied with wheels, the shelf carriage being extractable from the outer cabinet. When the shelf carriage is extracted from the outer cabinet the shelves can be refilled from the rear side, after which the shelf carriage can be reinserted into the outer cabinet.

[0004] A problem with this is that the fully loaded shelf carriages can be very heavy. The shop assistants find it hard to manoeuvre the heavy shelf carriage back into the outer cabinet.

[0005] Hence, there is a need for a refrigerator in which it is easier to load the shelves from the back thereof.

Summary of the invention

[0006] It is therefore an object of the present invention to provide a refrigerator which alleviates the above-mentioned problems.

[0007] According to the invention, this object is achieved by the refrigerator according to claim 1.

[0008] Thus the present invention relates to a refrigerator comprising a cabinet, shelves arranged within a refrigerated space of the cabinet, a back door at a rear side of the cabinet providing access to said shelves from said rear side, and a support structure carrying the cabinet. The support structure is arranged to provide for horizontal movement, including at least turning motion, of the refrigerator.

[0009] By the combination of having a back door and being turnable, or rotatable, it is possible to easily refill the shelves from the rear.

[0010] In accordance with an embodiment of the refrigerator, the support structure comprises a turning guide arranged to guide the turning motion of the cabinet between a non-turned position and a refill position. In the refill position it is possible to open the back door, and thereby the shelves are accessible from behind.

[0011] The "refill position" is a position wherein the shelf carriage is refilled from the rear side. The guided turning motion means that it is possible to turn back the refrigerator to the position that it had before turning it, i.e. the non-turned position. This "non-turned position" can be a "display position", i.e. the ordinary position wherein the goods in the refrigerator are displayed and sold, or an "intermediate position" that is reached by moving the refrigerator a bit from the display position. In any case, the prior art problems of offset shelf carriages, which are difficult to return to the display position, is alleviated or even eliminated.

[0012] In accordance with an embodiment of the refrigerator, the turning guide is adapted to guide the cabinet to turn around a central axis of the cabinet.

[0013] In accordance with an embodiment of the refrigerator, the support structure comprises wheels at the bottom of the cabinet. The wheels are arranged to rest on a base surface. As will be evident from below, the base surface can be different types of surfaces. For example, it can be a floor or the ground, or it can be a top surface of guide plate included in the support structure.

[0014] In accordance with an embodiment of the refrigerator, said wheels are comprised in the turning guide wherein they provide for the guided turning of the cabinet. In order to obtain this at least some of the wheels are rotatable around a vertical axis. For example, according to an embodiment four wheels are arranged arranged in the corners of an imaginary square, and two diagonally opposite ones of the wheels are rotatable while the other two wheels are non-rotatable and parallell. In another embodiment the wheels are rigidly, i.e. non-rotatably, mounted in angled positions, such that their rotational planes are aligned with tangents on a common circle. Thus, when turning the refrigerator the wheels role on the periphery of a circle. Additional alternatives are disclosed below.

[0015] In accordance with an embodiment of the refrigerator, which is based on the above-mentioned embodiments where wheels are arranged at the bottom of the cabinet, the turning guide comprises a guide foot. The guide foot is vertically movable and horizontally rotatable. It is arranged to be lowered into engagement wwith the base surface. Thus the guide foot is operable to move between a retracted position where it is not in contact with the base surface and an extended position of engagement. This foot serves the purpose of locking the position of the refrigerator while performing the turning thereof.

[0016] In accordance with an embodiment of the method the turning guide comprises a support plate and a bearing arrangement, which is arranged between the support plate and a bottom plate of the cabinet. The turning motion is thus provided in the bearing. This opens up for both wheeled, as just described, and non-wheeled

embodiments.

[0017] In accordance with an embodiment of the refrigerator, the support plate is thus provided with wheels at the bottom of the plate.

[0018] In accordance with an embodiment of the refrigerator, the guided turning motion of the refrigerator is combined with a guided linear motion, which takes place between the display position and the non-turned position. A translation guide provides the linear guidance. In this embodiment all movements of the refrigerator that are performed in conjunction with filling the shelves with goods from the rear thereof are controlled, giving no room for the refrigerator to end up offset causing problems of getting it back in place after filling it with goods.

[0019] Different implementations of the translation guide are set forth in the description of embodiments below.

Brief description of the drawings

[0020] In the following, the embodiments of the invention will be described in detail with reference to the enclosed drawings, in which:

Fig. 1 in an exploded view shows an embodiment of a refrigerator according the present invention;
Fig. 2 in a perspective view from below shows another embodiment of a refrigerator according to the present invention;
Fig. 3 in a perspective view from below shows another embodiment of a refrigerator according to the present invention;
Fig. 4 in an exploded view shows another embodiment of a refrigerator according the present invention; and
Fig. 5 in a perspective view from below shows a lower portion of another embodiment of a refrigerator according to the present invention.

Detailed description of embodiments of the invention

[0021] With reference to Figure 1, a refrigerator according to the invention is schematically shown. The refrigerator 1 comprises a cabinet 3 and a support structure 7 carrying the cabinet 3. The cabinet 3 has a rear side 4, a front side 6, a top 8 and a bottom 10. The cabinet 3 has a refrigerated space 11. A plurality of sloping shelves 9 are arranged spaced and on top of each other within the refrigerated space 11. The shelves 9 are shown most schematically as simple plates. In practise, of course each shelf 9 typically is provided with a stop at a front edge thereof, and different kinds of row partitions separating plural rows of products from each other. However, for reasons of clarity such details are omitted.

[0022] The rear side 4 of the cabinet 3 is provided with a back door 5, which is hinged at a vertical edge thereof. When the back door 5 is opened it is possible to reach into the space 11 in order to put goods on the shelves 9. The door 5 is wide and high enough for allowing easy access to all shelves 9 from the rear side, or rear end, of the shelves 9.

[0023] The refrigerator of this embodiment is of a type called open front. Thus, the greater part of the front side 6 of the cabinet 3 is open so that the customers do not have to open any front door to take a product.

[0024] The support structure 7 comprises a support plate 17 having a top surface 18 and a bottom surface 20, a turning guide 13 arranged on the top surface 18 of the support plate 17, and a translation guide, consisting of wheels 19, arranged on the bottom surface 20 of the support plate 17. The translation guide, i.e. the wheels 19, rests on a base surface, such as a floor. The wheels 19 are rigidly, i.e. non-rotatably, mounted and thus they provide for a linear movement of the refrigerator 1 on the floor. The turning guide 13 comprises a bearing, which in this embodiment consists of a plurality of wheels 15 arranged in a ring, and which carries the very cabinet 3. The turning guide 13 additionally comprises a central seat 21, wherein a central pin 23, protruding downwards from the bottom 10 of the cabinet, is rotatably received. The seat 21 and pin 23 arrangement keeps the cabinet 3 centred onto the support plate 17.

[0025] Now assume that the refrigerator 1 is placed in a display position against a wall in a store, and that there are other display units, such as refrigerators or shelving racks, on both sides of the refrigerator 1. This is an ordinary situation. In order to refill the shelves 9 with products a shop assistant pulls the refrigerator out, i.e. forward, until it reaches an intermediate position, where the rear side 4 is just in front of a line along the front sides of the neighbouring display units. Then the cabinet 3 is turned around half a turn to a refill position. Now the shop assistant faces the back door 5, opens it and puts in new products from the rear of the shelves 9. When the shelves 9 are full, the shop assistant closes the back door 5, turns the cabinet 3 back to the intermediate position and pushes the refrigerator 1 back to the original position, i.e. display position. Thus, due to the turning guide 13 and the translation guide 19, it is possible to easily move the refrigerator 1 back and forth along a straight line, and turn the cabinet 3 around. The linear and turning motions secure that the refrigerator 1 is not displaced when pulled out and turned but is readily returned to its display position in a controlled way.

[0026] Referring now to Fig. 2 another embodiment of the refrigerator 25 has different translation and turning guides. In addition, the cabinet 27 of the refrigerator 25 is provided with a front door 29, which has to be opened by a customer in order to take a product from a shelf 31. In this embodiment there is not a distinct translation guide, although four wheels 35 arranged at the bottom of the refrigerator 25 are involved in a linear motion. However, the wheels 35 are rotatably arranged, as indicated by arrows around one of the wheels 35, to rotate about a vertical axis. Thus, the directional effect thereof is less than in the embodiment in Fig. 1. Nevertheless, it is fully

possible to move this refrigerator 25 linearly back and forth just like the other embodiment, with a good likelihood not to displace the refrigerator 25. For the turning motion turning guide 33 is arranged at the bottom of the refrigerator 25. The turning guide 33 comprises a rotatable guide foot 37, which is arranged approximately at the middle of an operation lever 39 extending along the bottom of the refrigerator 25 from the rear to the front thereof. The operation lever 39 is provided with a pedal 41 at the front end of the lever 39. The pedal 41 protrudes a bit in front of the front side of the refrigerator 25. The pedal 41 is operable to lower and raise the guide foot 37 vertically into and out of engagement with the floor. When a shop assistant is going to refill the refrigerator 25, he/she pulls out the refrigerator 25 so that is comes free of neighbouring display units. Then the shop assistant depresses the pedal 41 to a lower locking position, thereby lowering the guide foot into contact with the floor. Then the assistant turns the cabinet 27 by turning the whole refrigerator 25 around. The turning takes place about the central axis of the guide foot 37, which is fixed in relation to the floor. After having refilled the refrigerator 25 through the back door, which is not shown in this figure, but is similar to the back door 5 shown in Fig. 1, the shop assistant turns the refrigerator 25 back to the non-turned position, raises the guide foot 37 by depressing it again and letting it up, and pushed the refrigerator 25 back in its display position.

[0027] It should be noted, that this embodiment as well as the first one described, is rotatable on spot too. That is, provided that there is enough space around the refrigerator, the refrigerator does not have to be moved before being turned.

[0028] In fig. 3 an embodiment of the refrigerator 43 that is solely arranged for turning motion is shown. The refrigerator 43 is provided with a turning guide consisting of four wheels 45 arranged at the bottom surface 46 of the refrigerator. The wheels 45 are rigidly attached to the bottom 46, and they are arranged in angled positions such that their rotational planes are aligned with tangents on a common circle. Since, in this embodiment, the wheels 45 are located to the corners of the bottom 46 they are arranged at approximately 45 degrees to the sides of the bottom 46. When turning the refrigerator 43, the wheels consequently rolls along the periphery of a circle, thus keeping the refrigerator positioned except of the rotational movement. After having refilled the refrigerator it is easy to turn it back to a non-turned position, i.e. display position.

[0029] Referring now to Fig. 4, an open front refrigerator 49 comprises a cabinet 50 and a support structure 60 carrying the cabinet 50. The support structure comprises a support plate 61 having a top surface 66 and a bottom surface 64. Further, the support structure 60 comprises a turning guide similar to the one shown in Fig. 1, but having the wheels 53 of the bearing 51 mounted at the bottom surface 55 of the cabinet 50 and rolling on the top surface 66 of the support plate 61, rather than being mounted on top of the support plate 61 as in Fig. 1. Except for that difference, the turning guide also in this embodiment comprises a seat 59 at the top of the support plate 61 and a pin 57 at the bottom 55 of the cabinet 50, wherein the pin 57 is received by the seat 59. The translation guide comprises four wheels 63 at the bottom 64 of the support plate 61 and a wheel guide 65, consisting of a base plate 67 and three wall portions 69 extending upwards from the base plate 67 at two sides and a rear end thereof. Thus, in this embodiment the wheel guide 65 embodies the base surface, at least when the refrigerator 49 is in the display position. The refrigerator 49 can be turned in place or first pulled out to an intermediate position and then turned back to front. When the refrigerator 49 is pulled out, and pushed back, the wheels 63 of the translation guide are guided by the wall sections 69 of the wheel guide 65.

[0030] In fig. 5 another embodiment of the refrigerator 71 is shown. It comprises a translation guide consisting of two rigidly mounted wheels 77, 78, which are mounted at the bottom 73 of the refrigerator, midways along opposite sides of said bottom 73. The turning guide 75 comprises two rotatably mounted wheels 79, 80, also mounted at the bottom 73 of the refrigerator 71, but in the middle of front and rear sides thereof. The turning guide 75 further comprises a operation lever 81 provided with a pedal and a guide foot 83 operated similar to the operation lever and guide foot described above. Due to the front wheel 79, however, the operation lever is not straight but twice hooked in order to extend at the side of the front wheel 79. In this embodiment, the two rigidly mounted wheels 77, 78 provide a linear guidance, at least to a significant extent, while not preventing the turning motion.

[0031] Above embodiments of the refrigerator according to the present invention have been described. These should be seen as merely non-limiting examples. As understood by a skilled person, many modifications and alternative embodiments are possible within the scope of the invention.

[0032] For example, the bearing, above exemplified by means of wheels could be of any appropriate kind, such as a plurality of roller or ball bearings, one large horizontal bearing, etc.

[0033] The cabinet can be of different types in excess of the shown open front and front door types.

[0034] The support structure can be modified in many different ways, and so on.

Claims

1. A refrigerator comprising a cabinet, shelves arranged within a refrigerated space of the cabinet, a back door at a rear side of the cabinet providing access to said shelves from said rear side, and a support structure carrying the cabinet, wherein said support structure is arranged to provide for horizontal movement, including at least turning motion, of the

refrigerator.

2. A refrigerator according to claim 1, wherein said support structure comprises a turning guide arranged to guide the turning motion of the cabinet between a non-turned position and a refill position, where said back door is openable, wherein said shelves are accessible.

3. A refrigerator according to claim 2, wherein the turning guide is adapted to guide the cabinet to turn around a central axis of the cabinet.

4. A refrigerator according to claim 2 or 3, wherein said support structure comprises wheels at the bottom of the cabinet, wherein said wheels are arranged to rest on a base surface.

5. A refrigerator according to claim 3, wherein said turning guide comprises said wheels, which provide for the turning motion by at least some thereof being rotatable about a vertical axis.

6. A refrigerator according to claim 3, wherein said turning guide comprises said wheels, which are rigidly mounted in angled positions such that their rotational planes are aligned with tangents on a common circle.

7. A refrigerator according to any one of claims 4-6, said turning guide comprising a vertically movable, horizontally rotatable guide foot, which is arranged to be lowered into engagement with the base surface.

8. A refrigerator according to claim 2 or 3, wherein said turning guide comprises a support plate and a bearing arrangement, which is arranged between said support plate and a bottom plate of the cabinet.

9. A refrigerator according to claim 8, wherein wheels are arranged at a bottom surface of said support plate, wherein said wheels are arranged to rest on a base surface.

10. A refrigerator according to any one of clams 2-9, wherein said horizontal movement comprises a linear motion, and said support structure comprises a translation guide for guiding the linear motion of the refrigerator between a display position and said non-turned position.

11. A refrigerator according to claim 4 or 9, wherein said horizontal movement comprises a linear motion, and said support structure comprises a translation guide for guiding the linear motion of the refrigerator between a display position and said non-turned position, wherein said translation guide comprises a wheel guide comprising said base surface.

12. A refrigerator according to claim 4, 8 or 11, wherein said wheels are locked from rotation in a horizontal plane.

13. A refrigerator according to claim 1, wherein said horizontal movement comprises a linear motion, and said support structure comprises a translation guide for guiding the linear motion of the refrigerator between a display position and said non-turned position.

Amended claims in accordance with Rule 86(2) EPC.

1. A refrigerator comprising a cabinet, shelves arranged within a refrigerated space of the cabinet, a back door at a rear side of the cabinet providing access to said shelves from said rear side, and a support structure carrying the cabinet, wherein said support structure is arranged to provide for horizontal movement, including at least turning motion, of the refrigerator, wherein said support structure comprises a turning guide arranged to guide the turning motion of the cabinet between a non-turned position and a refill position, where said back door is openable and said shelves are accessible, and wherein the turning guide is adapted to guide the cabinet to turn around a central axis of the cabinet.

2. A refrigerator according to claim 1, wherein said support structure comprises wheels at the bottom of the cabinet, wherein said wheels are arranged to rest on a base surface.

3. A refrigerator according to claim 2, wherein said turning guide comprises said wheels, which provide for the turning motion by at least some thereof being rotatable about a vertical axis.

4. A refrigerator according to claim 2, wherein said turning guide comprises said wheels, which are rigidly mounted in angled positions such that their rotational planes are aligned with tangents on a common circle.

5. A refrigerator according to any one of claims 2-4, said turning guide comprising a vertically movable, horizontally rotatable guide foot, which is arranged to be lowered into engagement with the base surface.

6. A refrigerator according to claim 1, wherein said turning guide comprises a support plate and a bearing arrangement, which is arranged between said support plate and a bottom plate of the cabinet.

7. A refrigerator according to claim 6, wherein wheels are arranged at a bottom surface of said support

plate, wherein said wheels are arranged to rest on a base surface.

8. A refrigerator according to any one of clams 1-7, wherein said horizontal movement comprises a linear motion, and said support structure comprises a translation guide for guiding the linear motion of the refrigerator between a display position and said non-turned position.

9. A refrigerator according to claim 2 or 7, wherein said horizontal movement comprises a linear motion, and said support structure comprises a translation guide for guiding the linear motion of the refrigerator between a display position and said non-turned position, wherein said translation guide comprises a wheel guide comprising said base surface.

10. A refrigerator according to claim 2, 6 or 9, wherein said wheels are locked from rotation in a horizontal plane.

11. A refrigerator according to claim 1, wherein said horizontal movement comprises a linear motion, and said support structure comprises a translation guide for guiding the linear motion of the refrigerator between a display position and said non-turned position.

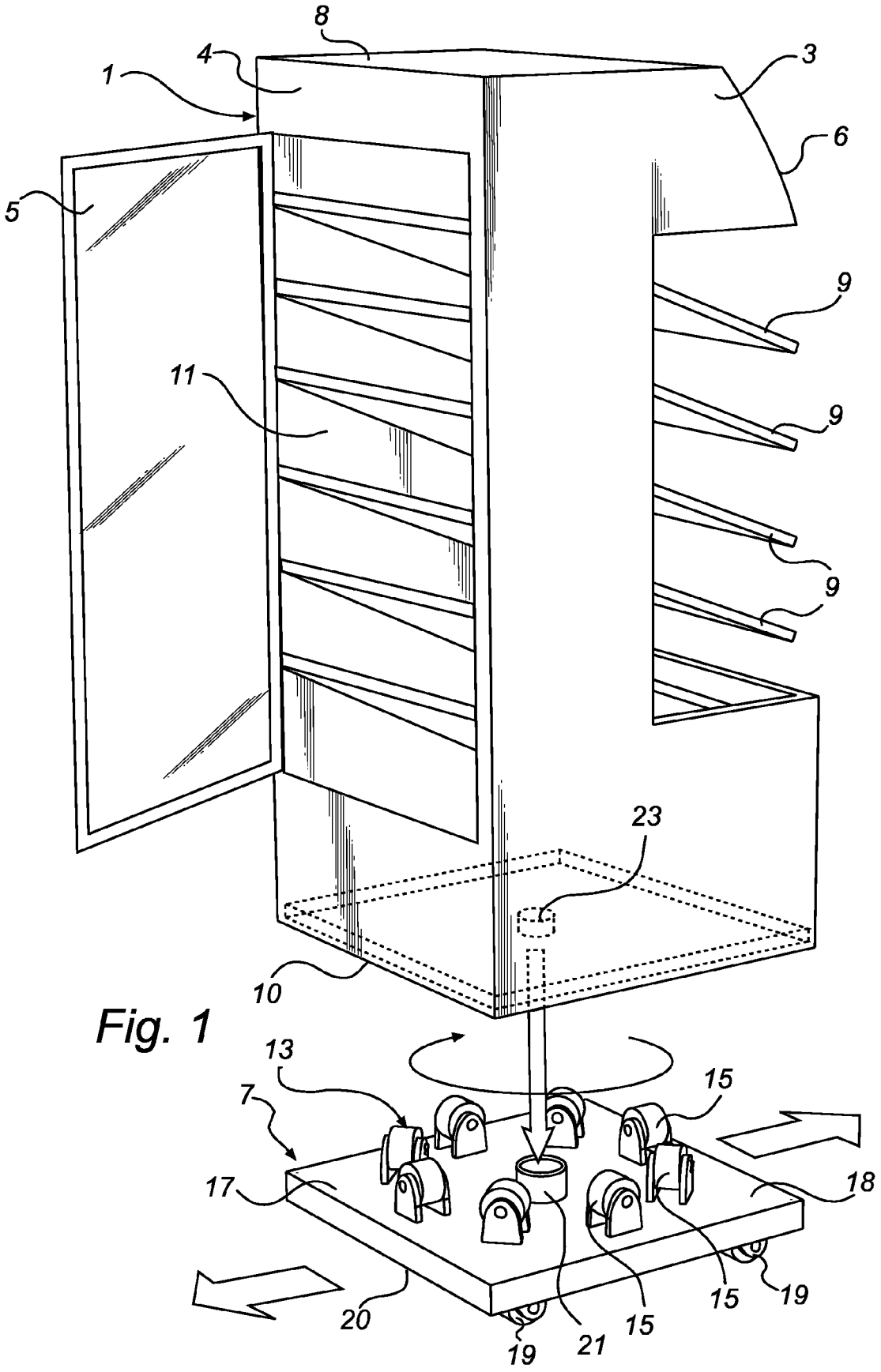

Fig. 1

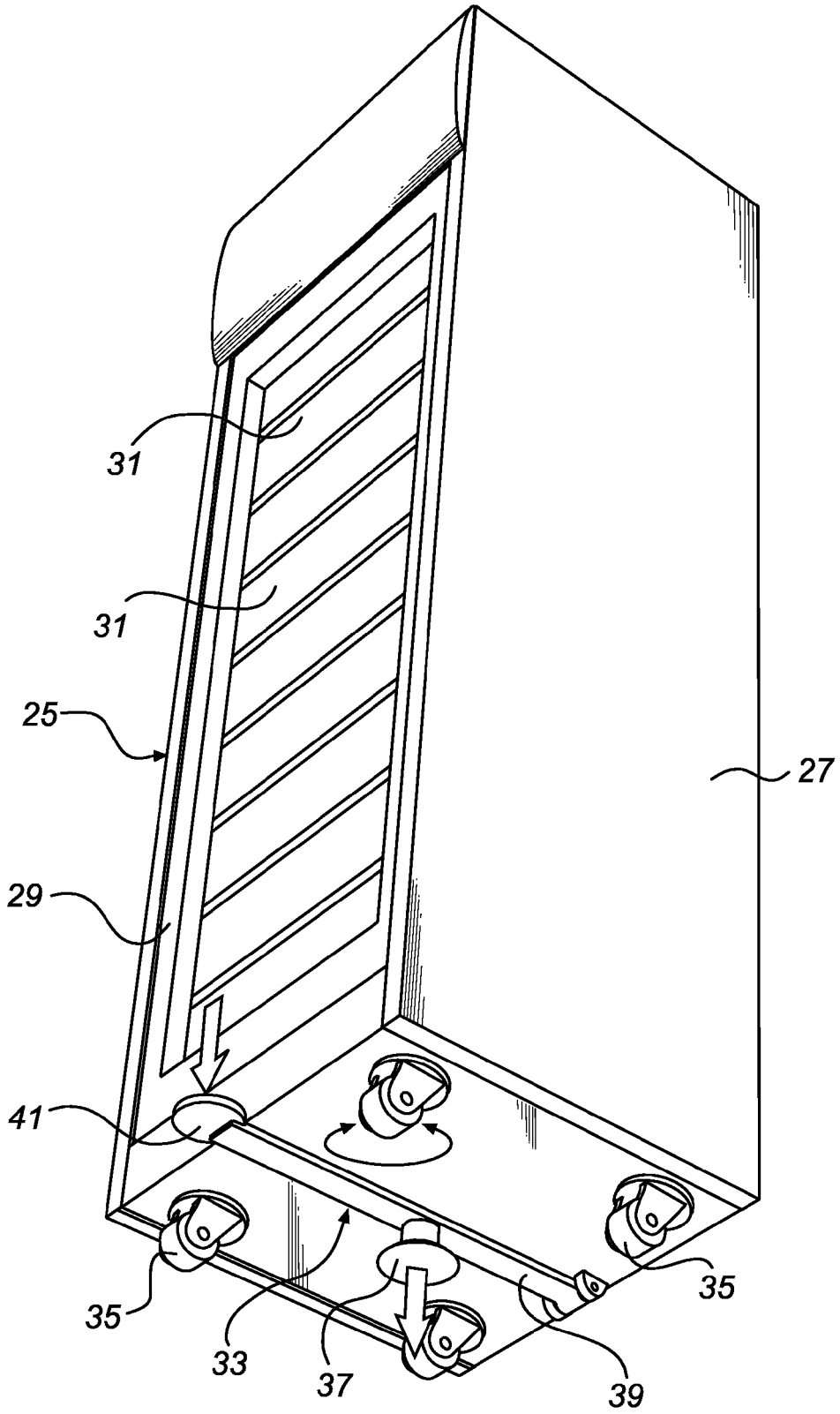

Fig. 2

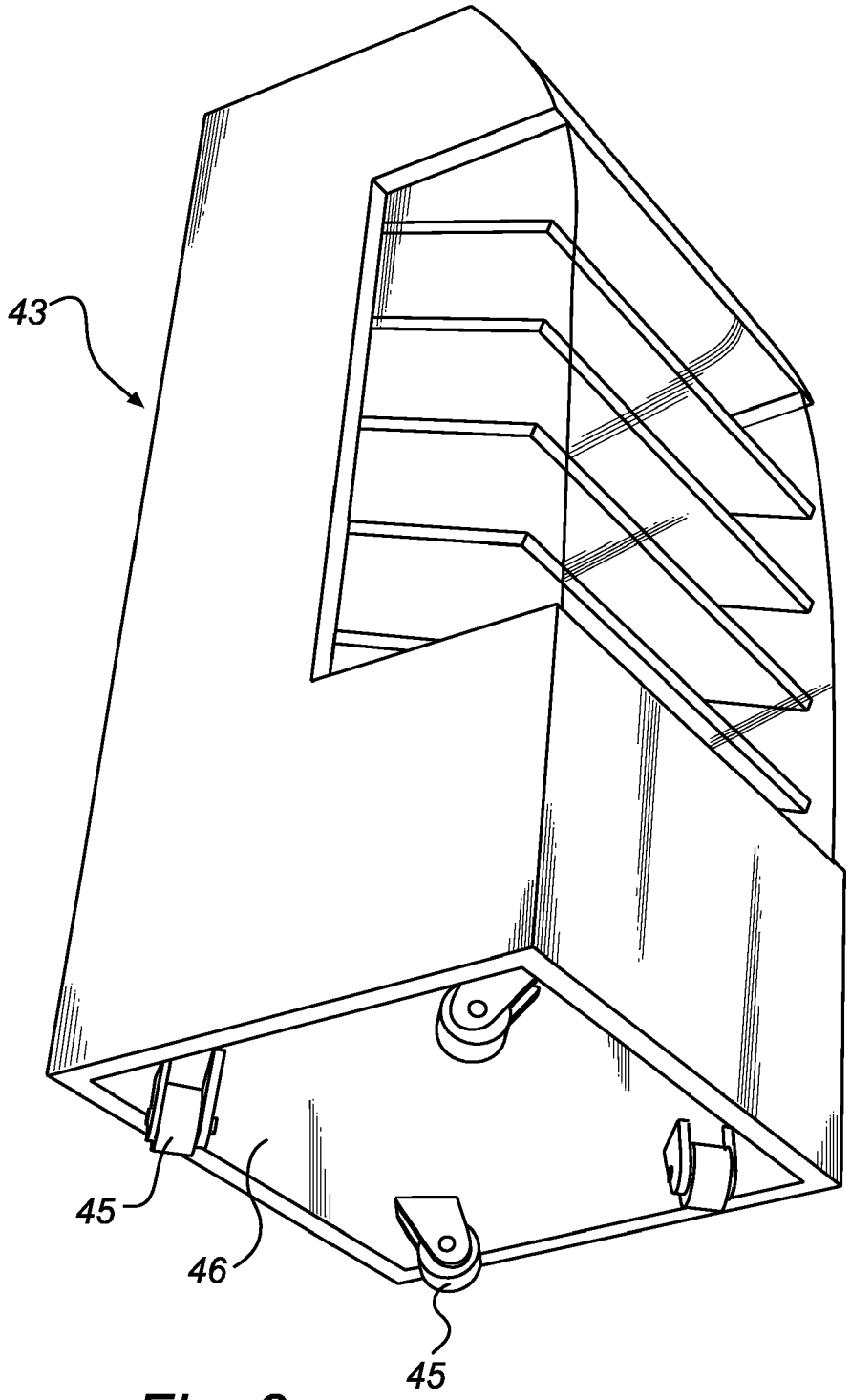

Fig. 3

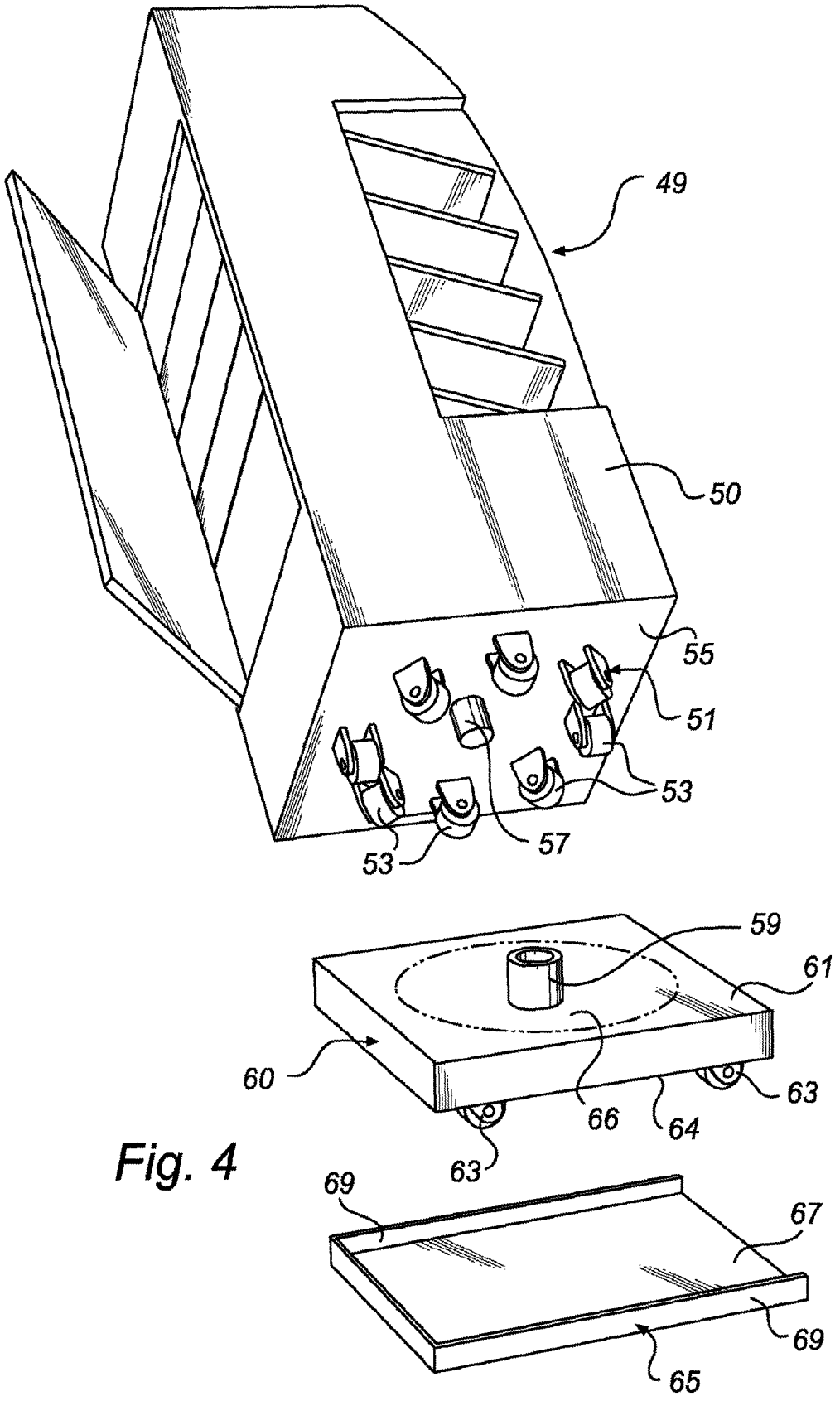

Fig. 4

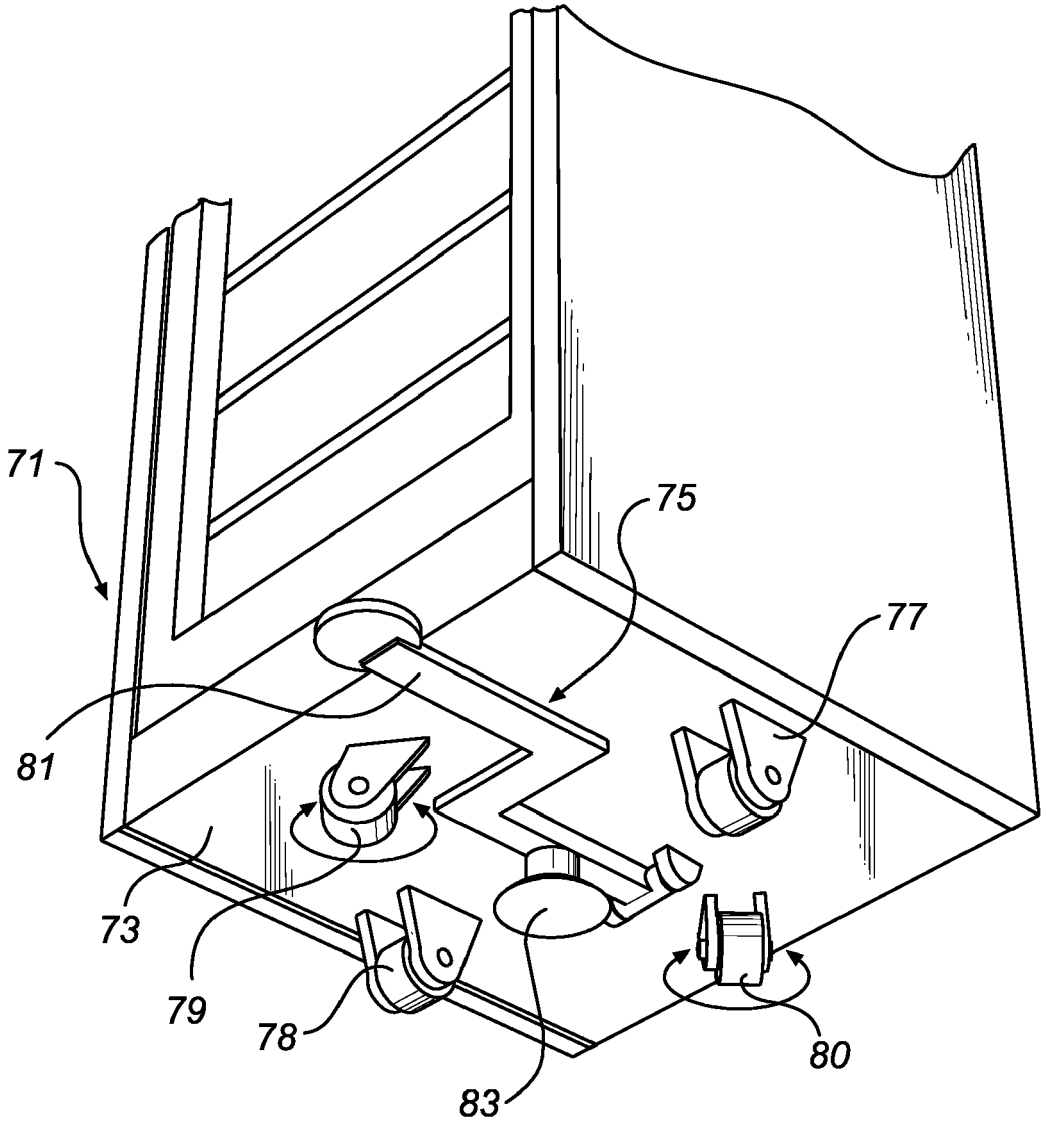

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 7124

DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 October 2005	Nehrdich, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 10 7124

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