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(54) **Storage rack**

(57) A storage rack comprising a multitude of horizontal carriers (2) which are arranged above and next to each other so as to form a plurality of storage spaces within the storage rack, wherein the storage rack comprises a plurality of separate modules (1a, 1b, 1c, 1d) which are connected to each other, each module (1)

comprising a horizontal carrier (2) and vertical support bars (7, 8, 9, 10) which are attached to the carrier (2) through attachment means (7, 8, 9, 10), each module further comprising interconnecting means (11, 12) for connecting the module (1a) to at least one further module (1b).

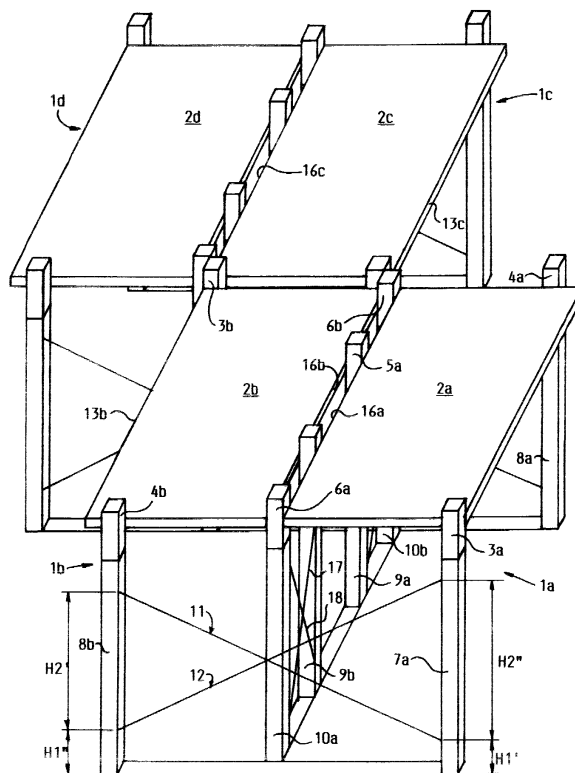


Fig. 2

Description

[0001] The present invention relates to a storage rack comprising a multitude of horizontal carriers which are arranged above and next to each other so as to form a plurality of storage spaces within the storage rack.

[0002] A storage rack is for example known from US-A-5316157. The storage rack disclosed herein comprises a multitude of horizontal carriers which are mounted above and next to each other in a three-dimensional frame so as to form a plurality of storage spaces. The storage rack is suitable for storing pallets or goods or the like. The frame comprises a plurality of vertical columns onto which horizontal beams are fixed at different heights. Each carrier comprises a pair of rails which are fixed horizontally onto the beams between two successive vertical columns. The rails may carry a rolling cart for receiving a pallet. The vertical columns each comprise a pair of vertical posts which are connected to each other and are held in position by means of a plurality of cross interconnecting bars, each of these bars having one end connected to a first vertical post on a first height and the other end connected to a second vertical post on a second height different from the first. The cross interconnecting bars are provided to enhance the stability of the rack.

[0003] The storage rack described in US-A-5316157 shows the disadvantage that it has a limited degree of liberty concerning the possible structures which can be constructed with it. Since the vertical posts extend over the entire height of the rack, the horizontal beams over the entire length and the rails over the entire depth, this storage rack necessarily has the shape of a parallelepiped with substantially straight corners.

[0004] It is the aim of this invention to provide a storage rack which has a larger degree of liberty concerning the possible structures which can be constructed with it.

[0005] This aim is achieved according to the invention by providing a storage rack which comprises a plurality of separate modules which are connected to each other, each module comprising a horizontal carrier and vertical support bars which are attached to the carrier through attachment means, each module further comprising interconnecting means for connecting the module to at least one further module.

[0006] The invention uses a new approach to the construction of a storage rack. State of the art storage racks mostly start from vertical columns which are aligned in a row, onto which the carriers are mounted. The inventor on the contrary starts from a horizontal carrier and adds further carriers in a horizontal arrangement before adding additional carriers in height direction. Thus the inventor no longer uses the vertical approach of the conventional storage racks, but a horizontal approach. He first decides how the carriers should be distributed in a horizontal plane to obtain optimal use of the storage room and then adds additional carriers in vertical direction. In other words, the inventor first designs the stor-

age rack in a horizontal plane before he stacks different layers of the rack on top of each other. As a consequence, the shape of the storage rack can be varied by varying the arrangement and the shape of the carriers.

[0007] With the storage rack of the invention there is the possibility of using carriers with widely varying shapes, for example a rectangular shape, an L-shape or any other shape known to the person skilled in the art. Furthermore it is possible to vary the carriers in size and height, so that for example a first part of the rack can be suitable for storing pallets, whereas a second part of the rack can be suitable to store goods of a smaller size. In this way the storage rack of the invention can be constructed as a function of the shape of the storage room, the dimensions of the pallets or goods which have to be stored and the direction in which the pallets or goods are placed in a storage space in the rack. This has the advantage that the total storage space of a storage room can be enhanced in comparison with conventional storage racks.

[0008] In a preferred embodiment of the storage rack of the invention, the attachment means for attaching the vertical support bars to the horizontal carriers preferably comprise attachment bars which are positioned on the outer rim of the carrier. This has the advantage that the total surface of the carrier remains free to store pallets or goods or the like.

[0009] The attachment bars preferably extend beyond an upper and a lower surface of the carrier. In this way the attachment bars can keep the support bars in vertical position and prevent the support bars from collapsing from underneath the carrier. This has the advantage that the stability of the module can be enhanced.

[0010] The attachment bars preferably have top and bottom openings which are provided to receive the vertical support bars. This has the advantage that support bars can be attached both above and below a carrier, so that two modules can be stacked on top of each other by sliding the vertical support bars of the upper module into the top openings of the attachment bars on the carrier of the lower module. In this way the storage rack can be built up to a substantial height by stacking several modules on top of each other.

[0011] The carriers in the storage rack of the invention preferably have a substantially rectangular shape. Each carrier is preferably provided with four attachment bars which are arranged such that:

- a first attachment bar is positioned on a first lateral side adjacent the corner defined by a front side and the first lateral side,
- a second attachment bar is positioned on a second lateral side on a first distance D1 from the corner defined by the front side and the second lateral side,
- a third attachment bar is positioned on the back side on a second distance D2 from the corner defined by the back side and the second lateral side, and
- a fourth attachment bar is positioned on the back

side adjacent the corner defined by the back side and the first lateral side.

This arrangement has the advantage that, when two modules are brought together side-by-side, back-to-back or back-to-side, the attachment bars and the support bars of the adjacent sides of the two carriers can be aligned in such a way that the space between the two carriers can be limited to the width of a single attachment bar. In this way, a substantial amount of space can be saved when a plurality of modules are brought together. Since no attachment bars are placed on the front side of the carrier, no part protrudes from the front side of a storage space defined by a module. This has the advantage that, when two or more modules are placed next to each other side-by-side, none of the support bars are located in front of the front side of the modules, so that the risk of hitting the support bars with a fork-lift truck can be reduced. Not placing any attachment bars on the front side of the carrier also has the advantage that the accessibility of the storage space defined by the module can be enhanced.

[0012] The interconnecting means in the storage rack of the invention preferably comprise cross interconnecting bars which each have a first end connected to a support bar of a first module on a first height H1 and a second end connected to a support bar of a second, adjacent module on a second height H2. The second height H2 is preferably different from the first height H1. The cross interconnecting bars are located in a plane which is substantially parallel to a side of the first module and a side of the second module. Providing these cross interconnecting bars has the advantage that the stability of the rack and its ability to withstand shocks, which may be caused by a fork-lift truck hitting the rack, can be enhanced.

[0013] In an alternative embodiment of the storage rack of the invention, the interconnecting means comprise at least one protrusion and at least one corresponding recess which engage each other. The at least one protrusion is provided on a first side of a first carrier and the at least one recess is provided on a second side of a second carrier, the first side of the first carrier being adjacent to the second side of the second carrier, the recess being provided to receive the protrusion. This has the advantage that the connection of two separate modules can be performed without using cross interconnection bars.

[0014] In a preferred embodiment of the storage rack of the invention, the modules are arranged such that

- a first module is placed back-to-back with a second module,
- a third module is placed next to the second module, the front side of the carrier of the third module being in line with the back side of the carrier of the second

module and the back side of the carrier of the third module being in line with the front side of the carrier of the second module.

- a fourth module is placed back-to-back with the third module.

[0015] This arrangement of the modules can be particularly advantageous in an assembly of two or more storage racks of this embodiment in a storage room. In the most efficient assembly of two or more storage racks of this embodiment, a first storage rack is placed in such a way that the front sides of the storage spaces in the rack form an angle $\alpha < 90^\circ$ with the longitudinal direction of the aisle between this first storage rack and a second storage rack. More particularly, the modules are placed in such a way that the line formed by their most protruding corners is substantially parallel to the longitudinal direction of the aisle. The second storage rack is preferably the mirror image of the first rack with respect to a plane which divides the aisle between opposite storage racks in longitudinal direction in two. This assembly of storage racks has the advantage that a fork-lift truck riding in the longitudinal direction of the aisle can access the storage spaces in the racks by turning over an angle $\beta = 90^\circ - \alpha$. So the fork-lift truck only has to make a turn of less than 90° to be able to move a pallet into or out of a storage space in any one of the two racks. As a result, the aisle between the two storage racks can be narrowed in comparison with an aisle between two storage racks of the type described in US-A-5316157, in which the fork-lift truck has to make a 90° turn to access a storage space. So with the assembly of storage racks described above a more efficient use of the total storage space in a storage room can be achieved.

[0016] In a preferred embodiment of the storage rack of the invention, vertical support bars are placed under the lowermost carrier, so that the floor below the lowermost carrier is left open for storing goods or pallets. This has the advantage that no space is taken up by a carrier which is placed directly on the floor.

[0017] The elements in the modules of the storage rack of the invention can be constructed in various materials, for example in steel, in another metal or alloy, or in a plastic material.

[0018] The storage rack of the invention will be further elucidated by means of the following description and the appended figures.

[0019] Figure 1 shows a perspective view of a preferred embodiment of a module of the storage rack according to the invention.

[0020] Figures 2 and 3 respectively show perspective and top views of a preferred embodiment of the storage rack of the invention.

[0021] Figure 4 shows an efficient assembly of two storage racks of the preferred embodiment shown in figures 2 and 3.

[0022] Figure 5 shows a top view of an alternative embodiment of the storage rack of the invention.

[0023] Figure 6 shows an efficient assembly of two storage racks of the alternative embodiment shown in figure 5.

[0024] Figure 7 shows an alternative embodiment of the storage rack of the invention which is more suitable for storing pallets or goods or the like for a long period of time.

[0025] Figures 8, 9 and 10 show embodiments of interconnecting means for connecting a first carrier to a second carrier.

[0026] The storage rack shown in figure 2 comprises a plurality of separate modules 1a, 1b, 1c, 1d, an example of which is shown in figure 1. The module 1 shown in figure 1 comprises a horizontal carrier 2 and vertical support bars 7, 8, 9, 10. The support bars 7, 8, 9, 10 are preferably removably mounted in attachment means 3, 4, 5, 6 for attaching the support bars 7, 8, 9, 10 to the carrier 2, but may also be fixedly connected to the attachment means 3-6 or constitute a unity therewith. Each module 1 is preferably further provided with interconnecting means 11, 12, 17, 18 (figure 2) for connecting the module to at least one adjacent module. The carrier 2 shown in figure 1 has a rectangular shape with a front side 13, two lateral sides 14, 15 and a back side 16. A module 1 of the storage rack of the invention can however also comprise an L-shaped carrier or a carrier of any shape known to the person skilled in the art.

[0027] The carrier 2 can have widely varying forms so as to allow storage racks to be built for a wide variety of goods. The carrier 2 can for example have the form of a plate, a grid of bars or profiles, a tray or container or any other form known to the person skilled in the art. The carrier 2 can also be provided to receive machines or other devices which can be fixedly attached on the carrier, or the carrier 2 can comprise rolls for transporting pallets or goods over the carrier.

[0028] The attachment means 3, 4, 5, 6 of the module shown in figure 1 preferably have the form of vertical attachment bars positioned on the outer rim of the carrier 2. In this way the whole surface of the carrier 2 remains free for storing pallets or goods or the like.

[0029] The attachment bars 3, 4, 5, 6 preferably extend beyond the top and bottom surfaces of the carrier 2. In this way the attachment bars 3, 4, 5, 6 can enhance the stability of the module, as they keep the support bars 7, 8, 9, 10 in vertical position and prevent them from collapsing from underneath the carrier.

[0030] Each of the attachment bars 3, 4, 5, 6 preferably has top and bottom openings for receiving the vertical support bars 7, 8, 9, 10. In order to receive the support bars, the attachment bars 3, 4, 5, 6 preferably have a cross section which is preferably slightly larger than the cross section of the support bars 7, 8, 9, 10, so that the support bars can be slid into the attachment bars. Alternatively, the cross section of the upper end and/or the lower end of an attachment bar 3, 4, 5, 6 is smaller than the cross section of the support bar 7, 8, 9, 10, so that the support bar can be slid over the upper end and/

or the lower end of the attachment bar. In any way support bars can be attached to the carrier 2 both above and below the carrier 2, so that two modules 1 can be stacked on top of each other by sliding the support bars of the upper module of the two into or over the attachment bars of the lower module of the two. By stacking several modules 1 on top of each other in this manner, the storage rack of the invention can be built up to a substantial height.

[0031] Furthermore it is possible to vary the carriers 2 in shape, size and height, so that for example a first part of the rack can be suitable for storing pallets, whereas a second part of the rack can be suitable to store goods of a smaller size. Using the modules 1 of the storage rack of the invention, a larger degree of liberty concerning the possible structures which can be constructed can be achieved in comparison with state of the art storage racks. As the storage rack of the invention is constructed by combining separate modules 1, the storage rack does not necessarily have the shape of a parallelepiped, but can have any shape which is deemed to be convenient by the person skilled in the art. Thus, the storage rack according to the invention can be adapted to the pallets or goods which have to be stored, the shape of the storage room and the direction in which the pallets or goods have to be placed in the rack.

[0032] In the preferred embodiment of the module 1 shown in figure 1, the carrier 2 is provided with four attachment bars 3, 4, 5, 6. The attachment bars 3, 4, 5, 6 are preferably arranged such that:

- a first attachment bar 3 is positioned on a first lateral side 14 on a third distance D3 from, but preferably adjacent the corner defined by the front side 13 and the first lateral side 14,
- a second attachment bar 4 is positioned on a second lateral side 15 on a first distance D1, e.g. 10 to 50 cm, from the corner defined by the front side 13 and the second lateral side 15,
- a third attachment bar 5 is positioned on the back side 16 on a second distance D2, e.g. 10 to 50 cm, from the corner defined by the back side 16 and the second lateral side 15, and
- a fourth attachment bar 6 is positioned on the back side 16 on a fourth distance D4 from, but preferably adjacent the corner defined by the back side 16 and the first lateral side 14.

[0033] D1-D4 are preferably chosen such that $D3 < D1$ and $D4 < D2$. D1 may be equal to or different from D2; D3 may be equal to or different from D4. The wording "adjacent the corner" means that the first and fourth attachment bars 3, 6 are located on said corners of the carrier 2, but do not extend beyond the end of the side on which they are located. Because of the above explained arrangement of the attachment bars 3, 4, 5, 6 on the outer rim of the carrier 2, adjacent modules can be aligned in such a way that the space between adja-

cent carriers can be limited to the width of a single attachment bar. This can for example be seen in figures 2 and 3, which show a preferred embodiment of the storage rack of the invention. In this embodiment, the two modules 1a and 1b are placed back-to-back. Because of the specific arrangement of the attachment bars as described above, adjacent modules can be arranged in such a way that the attachment bars 5a and 6a on the back side 16a of the carrier 2a of the module 1a are in line with the attachment bars 5b and 6b on the back side 16b of the carrier 2b of the module 1b. The distance between the two carriers 2a and 2b is approximately the width of a single attachment bar.

[0034] The interconnecting means for connecting one module to at least one further module can have various shapes which are known to the person skilled in the art. In the embodiment of the storage rack shown in figure 2 the interconnecting means for connecting each module to an adjacent module comprise cross interconnecting bars 11, 12, 17, 18. The interconnecting bars 11, 12, 17, 18 have a first end connected to a first support bar 7, 9 on a first height H1, and a second end connected to support bar 8, 10 on a second height H2. H1 may be equal to or different from H2. In a preferred embodiment, the interconnecting bar 11 has a first end connected to support bar 7a on a first height H1' and a second end connected to support bar 8b on a second height H2'. The second height H2' is preferably different from the first height H1'. The interconnecting bar 12 has a first end connected to support bar 8b on a first height H1" and a second end connected to support bar 7a on a second height H2". The second height H2" is preferably different from the first height H1". H1' can be equal to or different from H1"; H2' can be equal to or different from H2". The support bars 9b, 10a are in a similar way provided with the cross interconnecting bars 17, 18. The interconnecting bars 11, 12 connected to the support bars 7a and 8b define a plane perpendicular to the front side of the storage space defined by the first module; the interconnecting bars 17, 18 connected to the support bars 10a and 9b form a plane which is substantially parallel to the storage space defined by the first module. The cross interconnecting bars 11, 12 and 17, 18 can enhance the stability of the storage rack and its ability to withstand shocks, which may be caused by a fork-lift truck hitting the rack.

[0035] Alternatively, the interconnecting means for connecting the modules to each other can comprise at least one protrusion 25, 27 and at least one corresponding recess 26, 28 which engage each other (figures 8 and 9), the recess 26, 28 being provided to receive the protrusion 25, 27. The at least one protrusion 25, 27 is provided on a first side of a first carrier 2a and the at least one recess 26, 28 is provided on a second side of a second carrier 2b, the first side of the first carrier 2a being adjacent to the second side of the second carrier 2b. In providing such protrusions and grooves, the use of interconnecting bars can be prevented.

[0036] The at least one protrusion is for example a pair of teeth 25 and the at least one recess a pair of corresponding grooves 26, the grooves 26 being provided to receive the teeth 25 (figure 8). The protrusion and the recess can also be respectively a pin 26 and a corresponding hole 27, the hole 27 being provided in a ring 28 which is attached to a first carrier 2a and the pin 26 being attached to a second carrier 2b in such a way that the pin 26 can be vertically inserted into the hole 27 in the ring 28 (figure 9).

[0037] The interconnecting means can also for example comprise at least one pair of lips 30, 31 which engage each other (figure 10). A first lip 30 is provided on a first side of a first carrier 2a and extends in upward direction. A second lip 31 is provided on a second side of a second carrier 2b and extends in downward direction. The first lip 30 is connected to the first carrier 2a by means of its lower edge 32 and an upright edge 34, and has a free edge 36 which is slanted towards the bottom of the lip 30. The second lip 31 is connected to the second carrier 2b by means of its upper edge 33 and an upright edge 35, and has a free edge 37 which is slanted towards the top of the lip 31. The free edge 36 of the first lip 30 opposes the upright edge 35 of the second lip 31 and the upright edge 34 of the first lip 30 opposes the free edge 37 of the second lip 31. The second carrier 2b is connected to the first 2a by sliding the second lip 31 behind the first lip 30 from above. If the second carrier 2b is located too far to one side so that, upon connecting the carriers, the upright edge 34 of the first lip 30 hits the slanted edge 37 of the second lip 31, the slanted edge 37 will guide the second carrier 2b into the correct position. So, providing the lips 30, 31 with the slanted edges 36, 37 has the advantage that a certain amount of play exists for sliding the lips behind each other in connecting the second carrier 2b to the first carrier 2a. In this way the connecting of the carriers to each other can be facilitated.

[0038] The following are examples of possible embodiments of the storage rack of the invention.

[0039] A preferred embodiment of the storage rack according to the invention is a so-called "parking rack". A first embodiment of this "parking rack" is shown in figures 2 and 3. In this embodiment, the modules 1a, 1b, 1c, 1d are arranged such that

- a first module 1a is placed back-to-back with a second module 1b,
- a third module 1c is placed next to the second module 1b, the front side 13c of the carrier 2c of the third module 1c being substantially in line with the back side 16b of the carrier 2b of the second module 1b and the back side 16c of the carrier 2c of the third module 1c being substantially in line with the front side 13b of the carrier 2b of the second module 1b,
- a fourth module 1d is placed back-to-back with the third module 1c.

[0040] Figure 4 shows an efficient assembly of two storage racks of the first embodiment of the "parking rack". A first storage rack 19 is placed in such a way that the front sides of the storage spaces in the rack form an angle $\alpha < 90^\circ$ with the longitudinal direction of the aisle 21 between this first storage rack 19 and a second storage rack 20. More particularly, the modules are placed in such a way that the line formed by their most protruding corners is substantially parallel to the longitudinal direction of the aisle 21. The said second storage rack 20 is preferably the mirror image of the first rack 19 with respect to a plane which divides the aisle 21 in longitudinal direction in two. This assembly of storage racks has the advantage that a fork-lift truck riding in the longitudinal direction of the aisle 21 can access the storage spaces in the racks 19, 20 by turning over an angle $\beta = 90^\circ - \alpha$. So the fork-lift truck only has to make a turn of less than 90° to be able to move a pallet into or out of a storage space in any one of the two racks 19, 20. As a result, the width of the aisle 21 between the two storage racks 19, 20 can be limited and a more efficient use of the total storage space in a storage room can be achieved.

[0041] A second embodiment of the "parking rack" is shown in figure 5. In this embodiment the modules 1a, 1b, 1c, 1d are arranged such that

- a first module 1a is placed back-to-side with a second module 1b, the back side 16b of the carrier 2b of the second module 1b being substantially in line with a lateral side 15a of the carrier 2a of the first module 1a,
- a third module 1c is placed side-to-back with the second module 1b, the back side 16c of the carrier 2c of the third module 1c being substantially in line with the lateral side 14b of the carrier 2b of the second module 1b which does not face the back side 16a of the carrier 2a of the first module 1a, and
- a fourth module 1d is placed side-to-back with the third module 1c, the back side 16d of the carrier 2d of the fourth module 1d being substantially in line with the lateral side 15c of the carrier 2c of the third module 1c which does not face the back side 16b of the carrier 2b of the second module 1b.

[0042] Figure 6 shows an efficient assembly of two storage racks of the second embodiment of the "parking rack". A first storage rack 19 is placed in such a way that the front sides of the storage spaces in the rack form an angle $\alpha = 45^\circ$ with the longitudinal direction of the aisle 21 between this first storage rack 19 and a second storage rack 20. More particularly, the modules are placed in such a way that the line formed by their most protruding corners is substantially parallel to the longitudinal direction of the aisle 21. The said second storage rack 20 is preferably the mirror image of the first rack 19 with respect to a plane which divides the aisle 21 in longitudinal direction in two. With this second embodiment of

the "parking rack", a fork-lift truck riding in the aisle 21 only has to make a turn of $\beta = 90^\circ - \alpha = 45^\circ$ to access a storage space in one of the racks 19, 20. As a result, the width of the aisle 21 can be limited.

[0043] In the embodiments of the storage rack of the invention which have been described above, the modules are preferably placed next to and on top of each other before pallets or goods or the like are stored in them. As a consequence, the above described embodiments are more suitable for storing pallets or goods or the like for short periods. In storing pallets or goods or the like for longer periods, in which the pallets or goods do not have to be removed from a storage room, it is advisable to store the pallets or goods as close together as possible in order to save as much space as possible. This means that at least some of the goods or pallets will not be accessible for a certain period, but leaving spaces or aisles between the pallets or goods is not necessary since the pallets or goods will be left in the storage room for a long time. So the above described embodiments of the storage rack of the invention are less suitable for storing pallets or goods or the like for longer periods.

[0044] A storage rack which is more suitable for storing pallets or goods for longer periods is the so-called "domino rack", an example of which is shown in figure 7. In the "domino rack", a pallet is placed in a storage space before a module is placed over it, and the module is removed before the pallet is removed. Figure 7 shows how two modules 22, 23 of the embodiment of the "domino rack" are placed together. Each module 22, 23 comprises a carrier 2 and vertical support bars 7, 8, 9, 10 which are either attached directly to the carrier 2 or by means of attachment means (not shown). Below the support bars 7, 8, 9, 10 a base 24 is provided, connecting the front support bars 7, 8 to the rear support bars 9, 10 and the rear support bars 9, 10 to each other. In this way the front side of the module 22, 23 is left open, facilitating the placing of the module 22, 23 over a pallet or goods (not shown) which are located on the ground. Each module 22, 23 preferably has dimensions which are such that two pallets can be located in the storage space defined by the module. The front side 13 and the back side 16 of the carrier 2 are preferably provided with interconnecting means for connecting a first module 22 to a second module 23. The interconnecting means can have various shapes which are known to the person skilled in the art. They are provided to enhance the stability of the storage rack.

[0045] Storing pallets or goods or the like in a "domino rack" as shown in figure 7 comprises the following steps. First two pallets are placed adjacent each other on the ground, for example near a wall of the storage room. Then a first module 22 is placed over the two pallets with the front side of the module 22 facing the wall. Next, two pallets are for example placed at the back side of the first module 22, after which a second module 23 is placed over these two pallets with the front side of the

second module 23 facing the back side of the first module 22. The placing of the second module 23 is carried out in such a way that the interconnecting means on the front side of the second module 23 engage the interconnecting means on the back side of the first module 22. Further pallets and modules can then be placed next to, behind or on top of the first and second modules 22, 23. It is also possible to first place a module on the ground before placing pallets in it.

Reference list

[0046]

1	module
2	carrier
3,4,5,6	attachment bars
7,8,9,10	support bars
11,12	interconnecting bars
13	front side
14	first lateral side
15	second lateral side
16	back side
17,18	interconnecting bars
19	first storage rack
20	second storage rack
21	aisle
22	first module
23	second module
24	base
25	tooth
26	groove
27	pin
28	hole
29	ring
30	first lip
31	second lip
32	lower edge
33	upper edge
34,35	upright edge
36,37	free, slanted edge
D1	first distance
D2	second distance
H1	first height
H2	second height
α, β	angle

Claims

1. A storage rack comprising a multitude of horizontal carriers (2) which are arranged above and next to each other so as to form a plurality of storage spaces within the storage rack, **characterised in that** the storage rack comprises a plurality of separate modules (1a, 1b, 1c, 1d) which are connected to each other, each module (1) comprising a horizontal carrier (2) and vertical support bars (7, 8, 9, 10)

which are attached to the carrier (2) through attachment means (7, 8, 9, 10), each module further comprising interconnecting means (11, 12) for connecting the module (1a) to at least one further module (1b).

2. Storage rack according to claim 1, **characterised in that** the attachment means for attaching the vertical support bars (7, 8, 9, 10) to the horizontal carrier (2) comprise attachment bars (3, 4, 5, 6) which are positioned on the outer rim of the carrier (2).

3. Storage rack according to claim 2, **characterised in that** the attachment bars (3, 4, 5, 6) extend beyond a top and a bottom surface of the carrier (2).

4. Storage rack according to claim 2 or 3, characterised in each of the attachment bars (3, 4, 5, 6) has top and bottom openings which are provided to receive the vertical support bars (7,8,9,10).

5. Storage rack according to any one of the claims 2 to 4, **characterised in that** the carrier (2) of the module (1) has a rectangular shape comprising

a) a first lateral side (14) on which a first attachment bar (3) is positioned adjacent a corner defined by a front side (13) and the first lateral side (14),

b) a second lateral side (15) on which a second attachment bar (4) is positioned on a first distance (D1) from a corner defined by the front side (13) and the second lateral side (15), and

c) a back side (16) on which a third attachment bar (5) is positioned on a second distance (D2) from a corner defined by the back side (16) and the second lateral side (15) and on which a fourth attachment bar (6) is positioned adjacent a corner defined by the back side (16) and the first lateral side (14).

6. Storage rack according to any one of claims 1 to 5, **characterised in that** the interconnecting means comprise cross interconnecting bars (11, 12, 17, 18) which each have a first end connected to a support bar (7a, 8b, 9b, 10a) of a first module (1a, 1b) on a first height (H1) and a second end connected to a support bar (7a, 8b, 9b, 10a) of a second, adjacent module (1a, 1b) on a second height (H2), the cross interconnecting bars(11, 12, 17, 18) being located in a plane which is substantially parallel to a side of the first module (1a) and a side of the second module (1b).

7. Storage rack according to any one of claims 1 to 5, **characterised in that** the interconnecting means comprise at least one protrusion (25, 27) and at least one corresponding recess (26, 28) which en-

gage each other, the at least one protrusion (25, 27) being provided on a first side of a first carrier (2a) and the at least one recess (26, 28) being provided on a second side of a second carrier (2b), the first side of the first carrier (2a) being adjacent to the second side of the second carrier (2b), the recess being provided to receive the protrusion.

8. Storage rack according to any one of claims 1 to 5, **characterised in that** the interconnecting means comprise at least one pair of lips (30, 31) which engage each other, a first lip (30) being provided on a first side of a first carrier (2a) and extending in upward direction, a second lip (31) being provided on a second side of a second carrier (2b) and extending in downward direction, the first lip (30) having a lower edge (32) and an upright edge (34) both connected to the first carrier (2a) and a free edge (36) which is slanted towards the bottom of the lip (30), the second lip (31) having an upper edge (33) and an upright edge (35) both connected to the second carrier (2b) and a free edge (37) which is slanted towards the top of the lip (31), the free edge (36) of the first lip (30) opposing the upright edge (35) of the second lip (31) and the upright edge (34) of the first lip (30) opposing the free edge (37) of the second lip (31).
9. Storage rack according to any one of the claims 1 to 8, **characterised in that** the modules (1a, 1b, 1c, 1d) are arranged such that
- a first module (1a) is placed back-to-back with a second module (1b),
 - a third module (1c) is placed next to the second module (1b), the front side (13c) of the carrier (2c) of the third module (1c) being in line with the back side (16b) of the carrier (2b) of the second module (1b) and the back side (16c) of the carrier (2c) of the third module (1c) being in line with the front side (13b) of the carrier (2b) of the second module (1b),
 - a fourth module (1d) is placed back-to-back with the third module (1c).
10. Assembly of two or more storage racks according to claim 9, **characterised in that** a first storage rack (19) is placed in such a way that the front sides of the storage spaces in the rack form an angle (α) of less than 90° with the longitudinal direction of an aisle (21) between the first storage rack (19) and a second storage rack (20), the most protruding corners of the modules in the first rack (19) forming a line which is substantially parallel to the longitudinal direction of the aisle (21), and that the second storage rack (20) is the mirror image of the first storage rack (19) with respect to a plane which divides the aisle (21) in longitudinal direction in two.

11. Storage rack according to any one of claims 1 to 10, **characterised in that** each lowermost module (1) comprises a carrier (2) with vertical support bars (7, 8, 9, 10) attached underneath it, the vertical support bars resting on the floor.

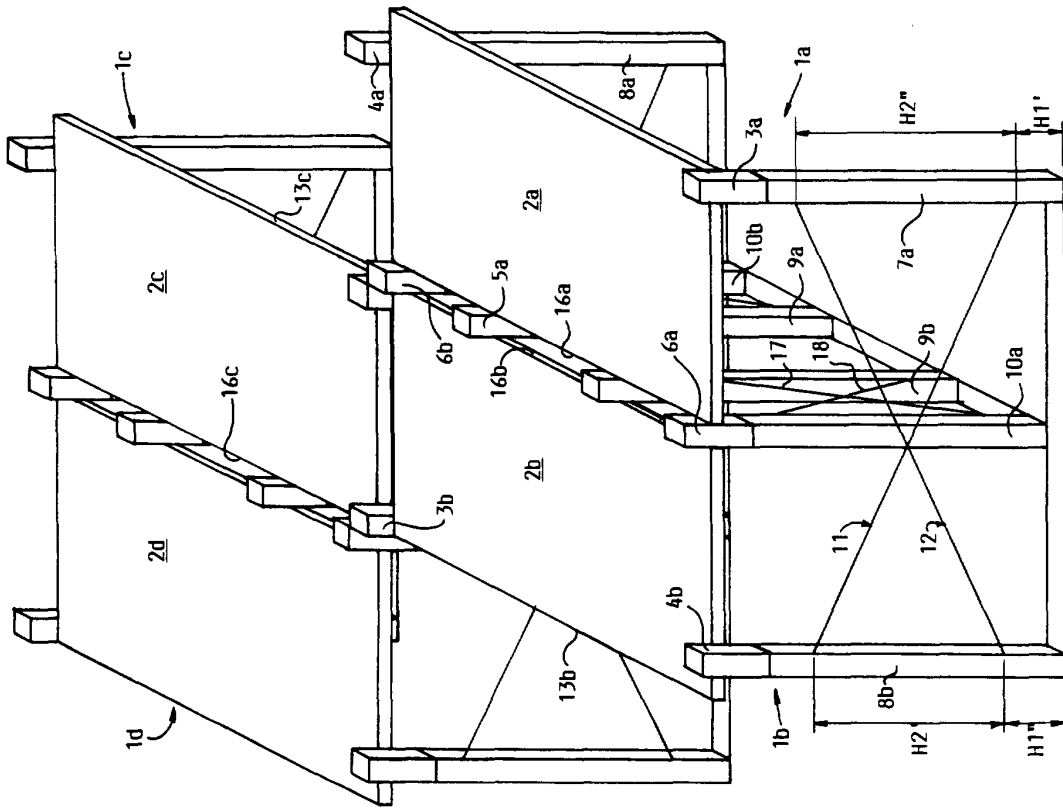


Fig. 2

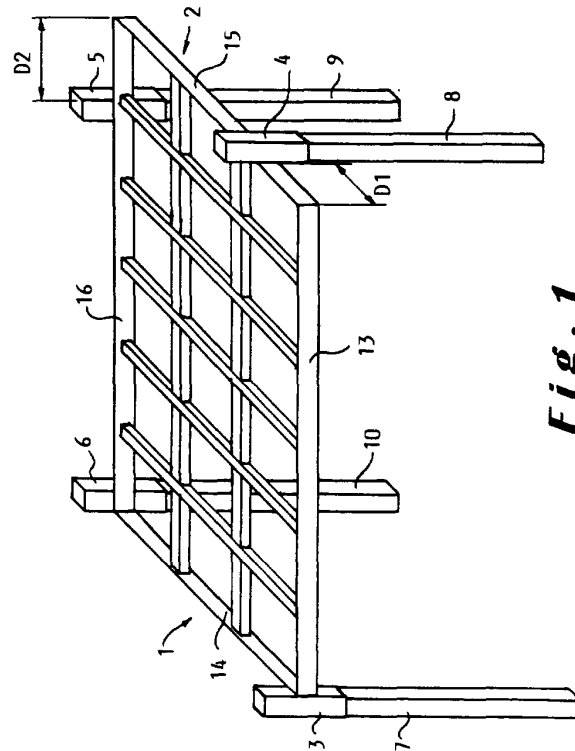


Fig. 1

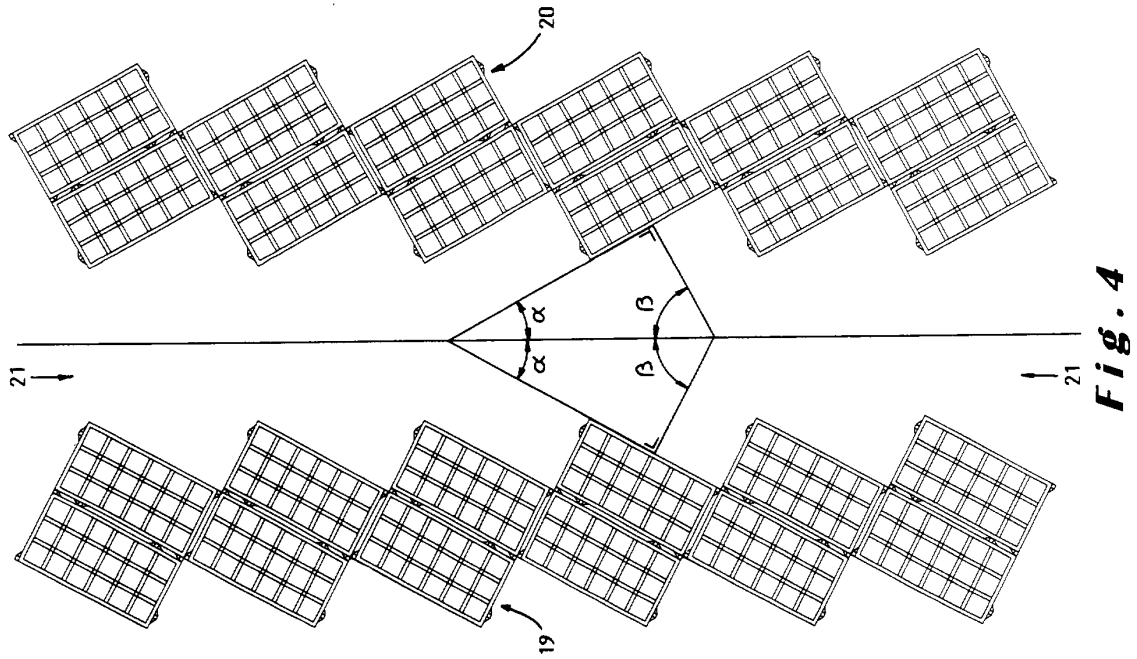


Fig. 4

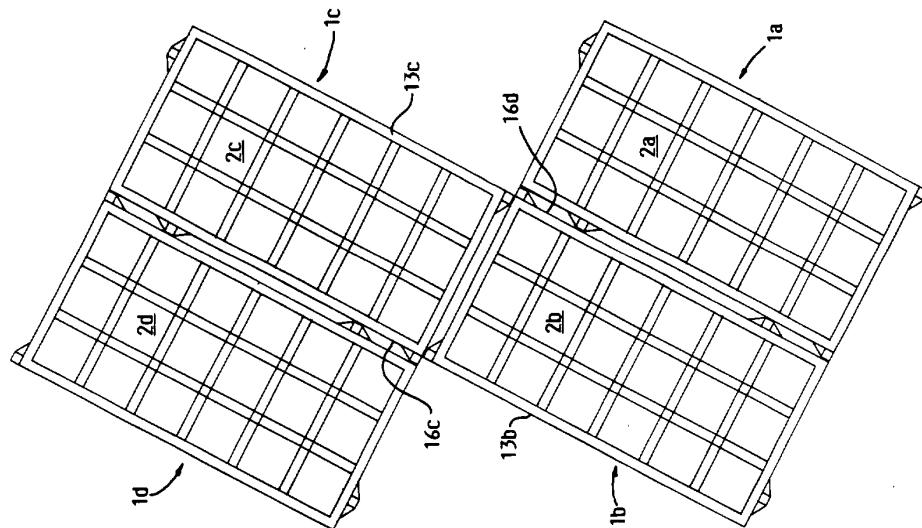


Fig. 3

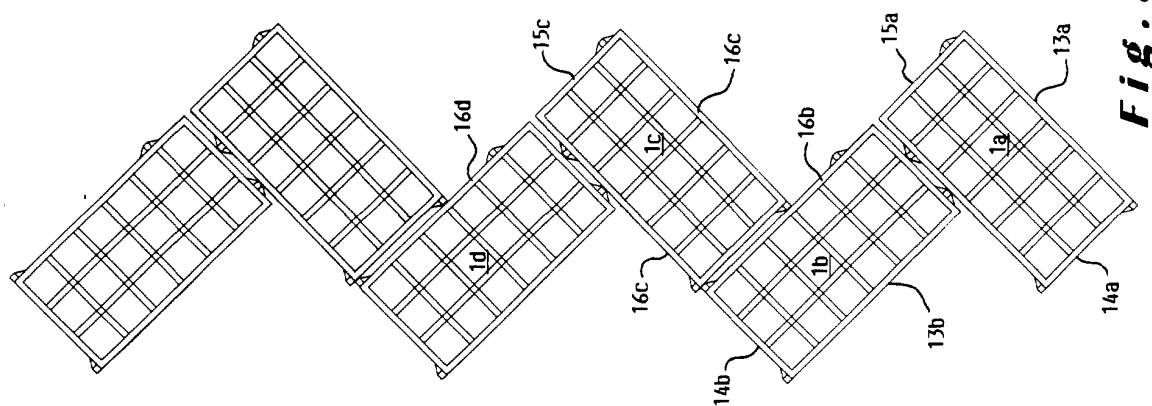


Fig. 5

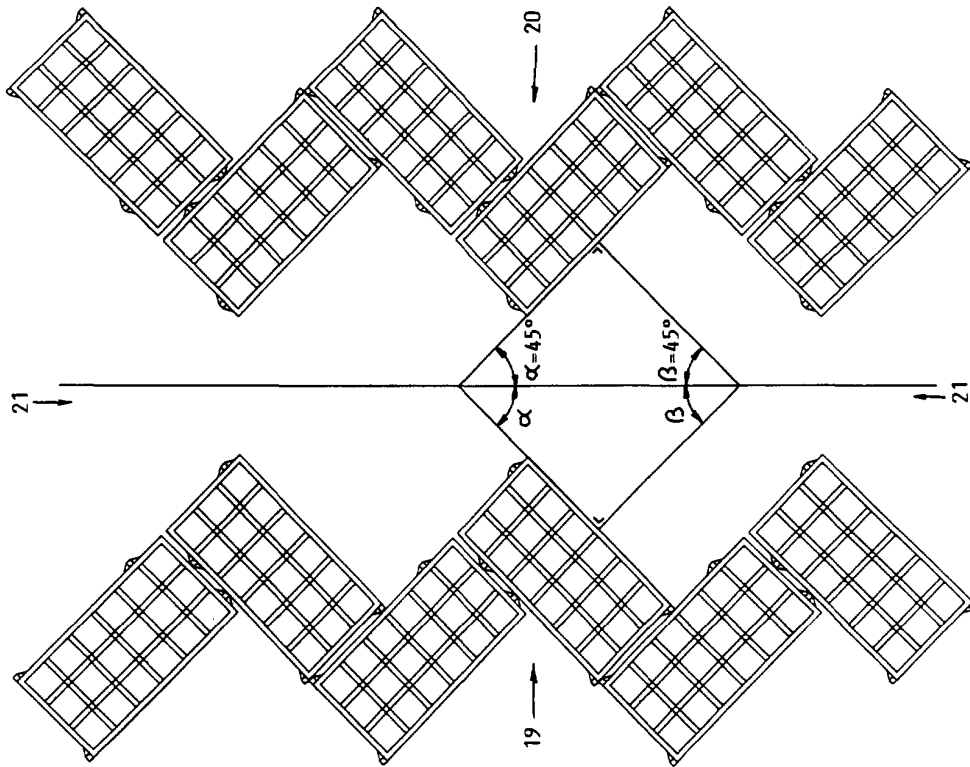


Fig. 6

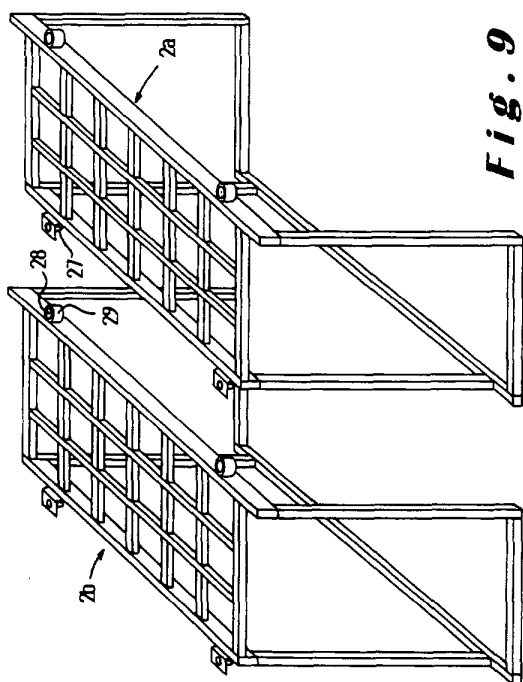


Fig. 9

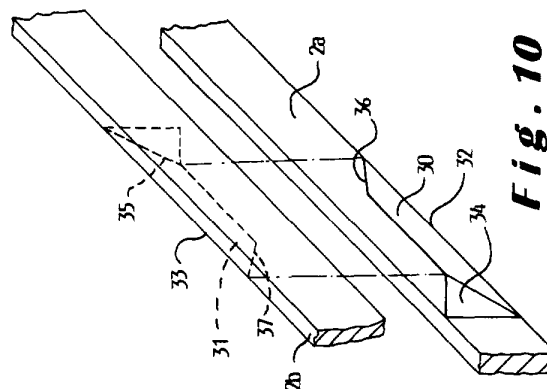


Fig. 10

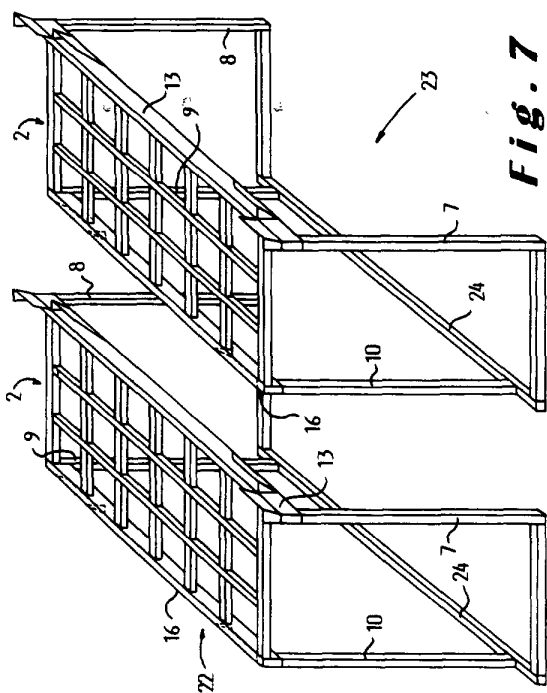


Fig. 7

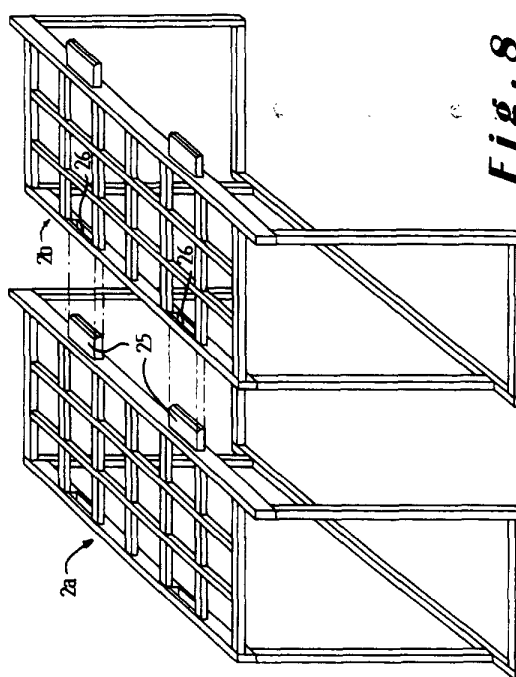


Fig. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 00 87 0031

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 971 174 A (STROCK DOUGLAS J) 26 October 1999 (1999-10-26) * abstract; figures 1-6 *	1,11	A47B87/02 A47B87/00
Y	* column 3, line 50 - column 4, line 42 *	2-4,7	
Y	US 5 190 171 A (CHRISTMAN JR GEORGE W) 2 March 1993 (1993-03-02)	2-4	
A	* claim 1; figures 1,2 *	5	
Y	DE 88 08 226 U (GÖTTFERT) 18 August 1988 (1988-08-18) * claim 1; figures 1,2 *	7	
A	WO 94 15505 A (HUTTER FREDERICK) 21 July 1994 (1994-07-21) * abstract; figure 3 *	9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A47B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 August 2000	Examiner Jones, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503/03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 87 0031

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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07-08-2000

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5971174	A	26-10-1999	NONE		
US 5190171	A	02-03-1993	NONE		
DE 8808226	U	18-08-1988	DE	3842051 A	28-12-1989
WO 9415505	A	21-07-1994	AT	400389 B	27-12-1995
			AT	241191 A	15-05-1995
			AU	3250593 A	15-08-1994
			ZA	9209333 A	04-06-1993

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82