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(54) **Tilting device for tilting a panel carrier**

(57) The invention relates to a tilting device (7) for tilting a panel carrier (4), which panel carrier (4) is adapted to support a panel (18) and adapted to be lifted by a vertically movable part of a panel lifting device (1), said tilting device (7) being adapted to move said panel carrier

(4) between a horizontal position and a tilted position, and wherein said tilting device (7) is adapted to remain at its vertical level on the vertical standard (3) when the panel carrier (4) is displaced vertically upwards by said movable part (19) and separated from the panel holder (9).

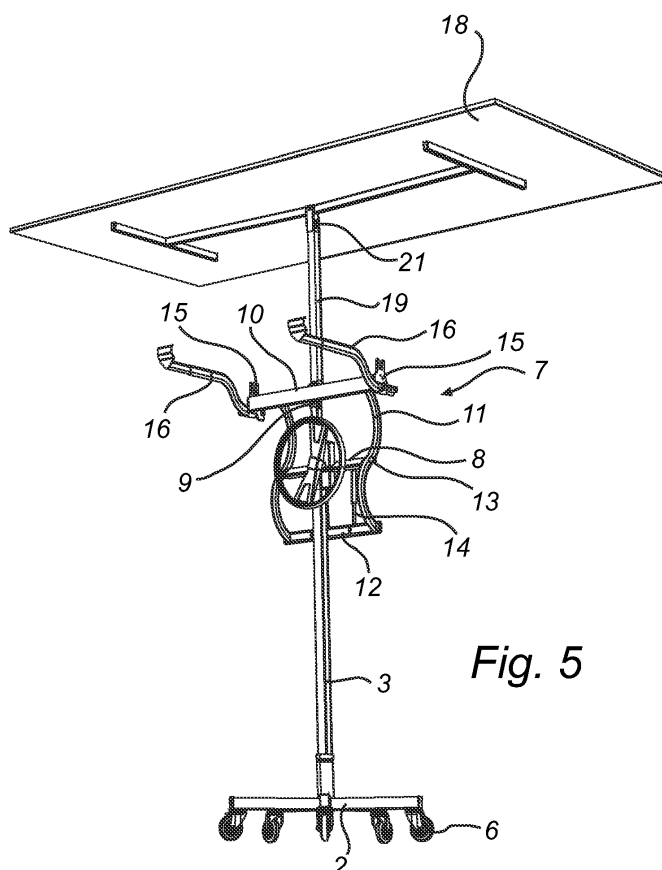


Fig. 5

Description

Field of the Invention

[0001] The present invention relates to a panel lifting device for lifting panels, such as gypsum boards, to an inner ceiling. In particular, the present invention relates to a tilting device for tilting a panel carrier adapted to support a panel that is to be lifted to the inner ceiling.

Background of the Invention

[0002] Lifting panels by hand to an inner ceiling during building is heavy and cumbersome, since the panels are large and heavy. For instance, a weight of a typical gypsum board, having a length of 2.5 metres and a width of 1.2 metres, is about 28 kg. Thus, devices for lifting panels have been developed. One such device is disclosed in WO 92/06257. The device comprises a vertical telescoping standard which supports at its upper end a carrier for a panel. However, the carrier is disposed above the shoulders of a person of general/normal tallness. Hence, for using such a lifting device, the panels have to be lifted above the shoulders of a person to the carrier, which also is heavy and cumbersome. Lifting, for instance, a typical gypsum board of the above described type to the carrier at such height takes normally two persons. Further, persons working with such lifting of heavy items above the shoulders are often subjected to occupational injuries and it takes normally only a few years before a person has worn himself out.

[0003] Hence, there is a need for an improved panel lifting device, and more specifically that overcomes or at least alleviates the prior art problems of panel lifting devices.

Summary of the Invention

[0004] In view of the above-mentioned and other drawbacks of the prior art, a general object of the present invention is to alleviate said drawbacks. According to a first aspect of the invention a tilting device for tilting a panel carrier is provided, which panel carrier is adapted to support a panel and adapted to be lifted by a vertically movable part of a panel lifting device. The invention is based on the insight that a tilting device may be designed to facilitate the loading of a panel onto a panel carrier, but subsequently be disconnected from the panel carrier, when the latter lifts the panel towards the ceiling. The tilting device comprises an attachment part, adapted to be arranged at an upper end portion of a vertical standard of said panel lifting device, and a panel carrier holder adapted to receive said panel carrier. The panel carrier holder is tiltable in relation to said attachment part when said tilting device is arranged at said upper end portion of said vertical standard, such that said panel carrier is tilted between a horizontal position and a tilted position. Further, the tilting device is adapted to remain at its ver-

tical level on the vertical standard when the panel carrier is displaced vertically upwards by said movable part and separated from the panel carrier holder.

[0005] "Upper end portion" of the vertical standard is intended to mean the upper end portion of the vertical standard when the movable part is in its most retracted position. Thus, the movable part can be displaced above the upper end portion of the vertical standard. Further, the upper end portion is intended to mean an upper end portion of a vertically stationary part of the vertical standard.

[0006] Such a tilting device is advantageous since it facilitates arranging panels on a panel lifting device by tilting the panel carrier and the panel carrier holder. At the same time the tilting device decreases the weight that need to be displaced vertically for displacing the panel to the ceiling since the panel carrier is released or separated from the tilting device in the beginning of vertical displacement.

[0007] In an exemplary embodiment, the tilting device is detachably arrangeable at an upper end portion of the vertical standard.

[0008] Such a detachably arrangeable tilting device may be arranged on an existing panel lifting device. In addition, after use it may be desirable to demount the panel lifting device including the tilting device for facilitating transport of the panel lifting device and the tilting device or for space-saving reasons.

[0009] In an exemplary embodiment, the tilting device is formed as an integral part of said panel lifting device.

[0010] In an exemplary embodiment, the tilting device is fixed to the panel lifting device by welding.

[0011] Welding is advantageous, since it is a reliable way of fixing the tilting device to the panel lifting device.

[0012] In an exemplary embodiment, the attachment part comprises a passage adapted to allow said movable part of said panel lifting device to pass freely through it. The passage may be a through recess or a suitable groove that surrounds the movable part. Such a groove may for instance be U-shaped and surround the movable part only partly, or almost entirely.

[0013] Such a passage is advantageous, since it allows the movable part to be retracted within the vertical standard and the attachment part such that the panel carrier holder may be released or separated from the movable part of the vertical standard.

[0014] In an exemplary embodiment, the panel carrier holder comprises a passage adapted to allow the movable part of said vertical standard to pass through it.

[0015] Such a passage is advantageous, since it allows the movable part to be displaced vertically without displacing the panel carrier holder. Thus, the user needs not to lift the weight of the tilting device when the panel is lifted to the ceiling using the panel lifting device.

[0016] Further, it allows the movable part to be retracted from the panel carrier holder such that the panel carrier holder may be released or separated from the movable part of the vertical standard.

[0017] In an exemplary embodiment, the tilting device further comprises a lever, wherein said panel carrier holder is arranged on said lever. The lever may comprise two or several parts, or only one part.

[0018] In an exemplary embodiment, the lever is pivotally arranged at a pivot axis disposed at the upper end portion of said vertical standard at the same vertical level as the lower end of the attachment part. The lever may be pivotally arranged at its end facing away from the panel carrier holder or at an arbitrary point along the longitudinal extension of the lever.

[0019] In an exemplary embodiment, the tilting device further comprises at least one biasing means, such as a gas spring, wherein said biasing means extends from said pivot axis to a point on the lever, which point is separated from the pivot axis. In an exemplary embodiment, the point on the lever is at the end facing away from the panel carrier holder. Alternatively, the biasing means may extend from the pivot axis to the end of the lever facing the panel carrier holder. The invention is not limited to one biasing means, instead the number of biasing means may be arbitrary. However, at least two biasing means are suitable for safety reasons, since if one of the biasing means breaks down the other will still work.

[0020] Such biasing means are advantageous since the relaxing or decompressing force of the biasing means acts against the gravitational force of the panel, panel carrier and panel carrier holder, during movement from a tilted position to a horizontal position increases. Thus, the user needs to apply a smaller vertical force to the panel for moving it to the horizontal position compared to a tilting device without biasing means.

[0021] Especially gas springs are suitable, since they comprise an internal damping. Thus, the control of the movement of the panel, panel carrier and panel carrier holder, during movement from a tilted position to a horizontal position increases.

[0022] In an exemplary embodiment, the tilting device comprises also a limiter for limiting a stroke length of said biasing means. The limiter may be an extendable, such as telescopic, device that extends from said pivot axis to a point on the lever, which point is separated from the pivot axis. In an exemplary embodiment, the point on the lever is at the end facing away from the panel carrier holder. Alternatively, the limiter may extend from the pivot axis to the end of the lever facing the panel carrier holder. Still alternatively, the limiter may be a device arranged on the vertical standard that prevents the panel carrier holder from moving against the vertical standard when the panel carrier holder is tilted as much as desired. Still alternatively, the limiter may be the vertical standard itself.

[0023] In an exemplary embodiment, the biasing means is adapted to provide an over-centre mechanism during movement of said panel carrier holder in relation to said attachment part between said horizontal position and said tilted position. Over-centre mechanism, also called tipping point mechanism, implies that the most

loaded or compressed state of the biasing means is disposed along the path of the carrier holder from the horizontal position to the tilted position, or vice versa. Therefore, the biasing means is first relaxed or decompressed and after the break point, where the biasing means is in its most loaded or compressed state, the biasing means is relaxed or decompressed until the limiter limits the relaxation or decompression of the biasing means. Thus, the biasing means will act against the panel carrier holder being tilted from the tilted position to the horizontal position automatically, that is without applying an external force.

[0024] Such an over-centre mechanism is advantageous, since the mechanism keeps the panel carrier holder in the tilted position. Thus, the panel carrier holder will not be accidentally tilted from the tilted position to the horizontal position.

[0025] In an exemplary embodiment, the tilting device further comprises at least one side support disposed along an imaginary longitudinal extension of said panel carrier when said panel carrier is received and supported by said tilting device.

[0026] Such side support is advantageous, since it increases the stability of the panel carrier during movement using the tilting device and prevents the panel carrier from moving.

[0027] In an exemplary embodiment, the tilting device comprises at least one panel support means comprising a hook-shaped portion, which panel support means extends perpendicularly to an imaginary longitudinal extension of said panel carrier when said panel carrier is received and supported by said tilting device.

[0028] Such panel support means are advantageous, since in the tilted position of the panel carrier holder, the panel support means may receive and support a panel.

[0029] In an exemplary embodiment, the panel support means comprises extendable arms.

[0030] Thus, the support arms may be adjusted to support panels having different widths. Independently of the width of a panel, the panel may be arranged on the panel carrier such that the centre of mass of the panel is substantially in line with the centre of mass of the panel carrier.

[0031] According to another aspect of the invention, there is provided a method for lifting a panel, said method comprising the steps of

- arranging a panel on a tilted panel carrier disposed/ arranged at an upper end of a vertical standard of a panel lifting device;
- moving said panel carrier from a tilted position to a horizontal position using a tilting device; and
- releasing said panel carrier from said tilting device when the panel carrier is displaced vertically upwards by said panel lifting device, such that said tilting device remains at the same vertical level; and
- displacing said panel carrier vertically to a desired higher vertical level.

[0032] Such a method is advantageous since it facilitates arranging panels on a panel lifting device by tilting the panel carrier and the panel carrier holder. At the same time the method decreases the weight that need to be displaced vertically for displacing the panel to the ceiling since the panel carrier is released or separated from the tilting device in the beginning of vertical displacement.

[0033] In an exemplary embodiment of the method, the step of moving said panel carrier from a tilted position to a horizontal position comprises steps of loading a biasing means and relaxing a biasing means.

[0034] Such loading and relaxing/releasing a biasing means allows for using an over-centre mechanism.

[0035] In an exemplary embodiment, the tilting device is a tilting device having any one of the features discussed in connection with the first aspect of the invention, and the embodiments thereof.

[0036] According to another aspect of the invention, there is provided a panel lifting device comprising a vertical standard, a panel carrier adapted to support a panel and adapted to be disposed/arranged at an upper end portion of a vertical standard, and a tilting device according to the first aspect of the invention, and the embodiments thereof.

[0037] Further features of, and advantages with, the present invention will become apparent when studying the appended claims and the following description. The skilled addressee realizes that different features of the present invention may be combined to create embodiments other than those described in the following, without departing from the scope of the present invention.

Brief Description of the Drawings

[0038] The various aspects of the invention, including its particular features and advantages, will be readily understood from the following detailed description and the accompanying drawings, in which:

Fig. 1 is a schematic illustration of a prior art panel lifting device;

Fig. 2 is a schematic illustration of an embodiment of a tilting device according to the invention;

Fig. 3 illustrates the tilting device in Fig. 2 mounted on a panel lifting device of prior art with the panel carrier in a tilted position.

Fig. 4 illustrates the tilting device in Fig. 2 mounted on a panel lifting device of prior art with the panel carrier in a horizontal position.

Fig. 5 illustrates the tilting device in Fig. 2 mounted on a panel lifting device of prior art with the panel carrier vertically displaced in relation to the tilting device.

Detailed Description of Exemplary Embodiments

[0039] Throughout the whole description words as upper, lower, above, and below are intended to have their

ordinary meaning when the tilting device is arranged on the panel lifting device.

[0040] Fig. 1 schematically illustrates a prior art panel lifting device 1. The panel lifting device comprises a base 2, a vertical standard 3, a panel carrier 4, and a hand wheel 5. The vertical standard 3 is formed by telescoping sections of which the outer telescoping section is carried at its lower end by the base 2. A movable part of the panel lifting device 1, in the embodiments below in form of an inner telescoping section 19 (see Fig. 5), supports at its upper end the panel carrier 4, which is adapted to support panels to be handled by the device 1. The panel carrier 4 is I-shaped, and has a rectangular cross-section. The panel carrier 4 has a short tubular shaft 21 that extends downwards from the plane of the panel carrier 4 and surrounds the upper end of the inner telescoping section 19 of the vertical standard 3, (see Fig. 5).

[0041] By rotating the hand wheel 5 the user may displace the inner telescoping section 19 vertically in relation to the outer telescoping section for lifting panels to a ceiling. The base 2 is provided with wheels 6 for allowing the user to easily move the device on the supporting ground.

[0042] Fig. 2a and 2b schematically illustrates an embodiment of the tilting device 7 according to the invention. The tilting device 7 comprises an attachment part 8 and a panel carrier holder 9, which are separate from each other.

[0043] The attachment part 8 comprises a vertical portion 22 and two horizontally protruding portions 23. The vertical portion 22 comprises a passage in form of a through recess 24. Thus, the attachment part 8 may be mounted to an upper end portion of the vertical standard 3 by inserting the vertical standard through the through recess 24. The through recess 24 allows the inner telescoping member 19 of the vertical standard 3 to pass freely through the attachment portion such that the inner telescoping member 19 may be vertically displaced vertically through the attachment part 8. Alternatively, the passage may be in form of a groove, which may for instance be U-shaped and surround the vertical standard 3.

[0044] The attachment part 8 may be fixed to the vertical standard by welding. Alternatively, the attachment part 8 may be fixed to the vertical standard by using suitable fastening means, such as screws, rivets, snap fits or an adhesive. Still alternatively, the attachment part 8 may be formed as an integral part of the vertical standard 3.

[0045] The panel carrier holder 9 is adapted to receive and support a panel carrier 4. In the embodiment in the figures, the panel carrier holder 9 is formed such that the shape corresponds to the shape of the tubular shaft of the panel carrier 4. Further, the panel carrier holder 9 comprises a passage in form of a through recess 25, which allows a movable part, for instance in form of the inner telescoping section 19 of the prior art panel lifting device 1, to pass through the panel carrier 9. In the embodiment in the figures, the panel carrier holder 9 is

formed as a rectangular tubular cylinder having a cross-section that is slightly larger than the cross-section of the tubular shaft 21 of the panel carrier 4 (see Fig. 1). Alternatively, the panel carrier holder 9 may comprise a magnet that is strong enough such that an attracting force of the magnet is large enough to attract the panel carrier 4. Suitably, the force is large enough to counteract the gravitational force of the panel carrier 4 and a panel, when the panel carrier holder 9 and the panel carrier 4 is tilted an a panel is arranged on the panel carrier 4. In such a case the passage 25 may be omitted.

[0046] The panel carrier holder 9 is arranged on a rod 10, which connects the carrier holder to a lever. The lever in the embodiment in the figure is formed by two S-shaped lever portions 11. Each of the S-shaped lever portions 11 are in one end attached to the rod 10 and in the other end attached to connection rod 12. Thus, the two S-shaped lever portions 11 are connected to each other by the connection rod 12. Even if the two lever portions 11 are S-shaped in the embodiment in the figure, they may alternatively have any other form that allows them to function as intended, such as straight, angular or semicircular. In such case the other parts may be modified to allow such form.

[0047] The lever 11, 12 is pivotally arranged around a pivot axis 13, which is connected to a lower end of the attachment part 12 and disposed approximately at the middle of a longitudinal extension of the lever portions 11.

[0048] The tilting device 7 in Fig. 2 comprises also biasing means, in form of two gas springs 14. One end of each of the gas springs 14 is fixed to the attachment part 8 and each of the opposite ends is fixed to the connection rod 12 of the lever. The invention is not limited to two biasing means, instead the number of biasing maybe arbitrary. In the horizontal position in Fig. 2, the gas springs 14 are slightly pre-compressed. Further, the tilting device 7 comprises also a limiter 20 for limiting the length of stroke of the gas springs 14. The limiter is in form of two telescoping tubes. The ends of the limiter are fixed to the attachment part 12 and the connection rod 12 of the lever, respectively.

[0049] The gas springs 14 are arranged such that an over-centre mechanism is provided, which mechanism is explained further below. One end 26 of each of the gas springs 14 is fixed to the pivot axis 13 of the lever portions 11, or in the vicinity thereof, and the other end 30 to the end of the lever portions 11. Since a break point corresponding to the totally compressed state of the gas springs 14 is disposed along the path of the panel carrier holder 9 between a horizontal and a tilted position of the panel carrier holder 9, the gas springs 14 will first be more compressed and then decompressed during moving of the panel carrier holder 9 from the horizontal position to the tilted position or vice versa. Since the gas springs 14 are partly decompressed in the tilted position, an external force is required for compressing the gas springs 14 and moving the panel carrier holder 9 to the horizontal position. Thus, the panel carrier holder 9 and the panel carrier

4 may stay in the tilted position without any applied external force. The decompression of the gas springs 14 after the break point is limited by the limiter 20 such that the gas springs 14 may not be decompressed more than the maximum length of the limiter 20.

[0050] The limiter 20 may have any suitable form that allows the desired function described above, such as two plates which are connected to each other such that they may be displaced in relation to each other, for instance along a groove. Alternatively, the limiter 20 may be omitted. In such a case, the length of the stroke is limited by the connection rod 12 of the lever that is moved against the vertical standard 3 of the panel lifting device 1.

[0051] Further, the tilting device 7 comprises two side supports 15 arranged at the ends of the rod 10. Each of the side supports 15 extend upwards from the rod 10 and comprises a recess 27 that may receive and support a panel carrier 4 (see Fig. 1). The form of the recess 27 corresponds to the form of the section of the panel carrier 4 that is received by the recess 27. Thus, in use, the side support 15 prevents instability of the panel carrier 4 during movement using the tilting device 7 by hindering the panel carrier from moving in its transversal direction. In case of circular cross-sections the side support 15 hinders the panel carrier 4 also from rotating around its tubular shaft. Alternatively, there may be only one side support 15. Instead of being disposed at the end of the rod 12, the side support 15 may be disposed anywhere along the rod 12 provided that the intended function of the side support is maintained.

[0052] The tilting device 7 comprises also two panel support means in form of two panel support arms 16 comprising hook-shaped portions 17. Each of the panel support arms 16 is attached to each end of the rod 12 and extends perpendicularly to the longitudinal extension of the rod 10. Each of the panel support arms 16 is formed of an inner telescoping tubular member 28 and an outer telescoping tubular member 29. Hence, the panel support arms 16 are extendable and may be adapted to receive panels of different sizes without displacing a centre of mass of the panel in relation to the centre of mass of the panel carrier 4. That is, independently of the width of a panel, the panel may be arranged on the panel carrier 4 such that the centre of mass of the panel is substantially in line with the centre of mass of the panel carrier 4. Each hook-shaped portion 17 is arranged at each free end of the panel support arms 16. Thus, the hook-shaped portions 17 may be moved between an extended and a retracted position. The inner tubular member 28 of the support arms may be locked to a desired position by suitable locking means, such as resilient locking pin that protrudes through holes in the outer tubular member 29.

[0053] Fig. 3-5 illustrates the function of the tilting device 7 when the tilting device 7 is arranged on a prior art panel lifting device 1. Hence, the figures illustrate the method for lifting a panel according to the invention. In the preferred embodiment in the figures 3-5, the tilting device 7 is mounted to the panel lifting device 1 by weld-

ing.

[0054] Fig. 3 illustrates the tilting device 7 arranged on the upper end portion of the vertical standard 3 with the panel carrier 4 in a tilted position, tilted by the tilting device 7. A panel 18 is arranged on the hook-shaped portions 17 of the panel support arms 16 such that a centre of mass of the panel 18 is located substantially adjacent to a centre of mass of the panel carrier 4. That is, the centre of mass of the panel 18 is located substantially adjacent to the panel carrier holder 9. Before the panel carrier 4 was tilted to the illustrated tilted position, using the tilting device 7, the panel carrier 4 was received by the panel carrier holder 9 and released from the inner telescoping member 19 of the panel lifting device 1. The longitudinal part of the panel carrier 4 is received and supported by the side supports 15.

[0055] In the tilted position of the panel carrier 4 and the panel carrier holder 9, the gas springs 14 are partly decompressed, since the over-center mechanism of the tilting device 7 has a break point between the tilted and the horizontal positions of the panel carrier holder 9. Thus, the panel carrier 4 may not be accidentally tilted to a horizontal position. Here, "break point" is intended to mean the position of the panel carrier holder 9 where the gas springs 14 are fully compressed. The decompression of the gas springs in the tilted position is limited by the limiter 20. Thus, the panel carrier 4 and the panel carrier holder 9 have an end position, in which the plane of the panel carrier 4 is inclined in relation to the vertical standard 3. The panel carrier holder 9 and the panel carrier 4 are moved to a horizontal position by applying a force at the lower end of the panel support arms 16. Even if the panel carrier 4 is unloaded, that is no panel 18 is arranged on the hook-shaped portions of the panel support arms 16, such a force is needed.

[0056] Fig. 4 illustrates the panel carrier 5 and the panel carrier holder 9 in a horizontal position after the panel 18 tilted together with the panel carrier 4 around the pivot axis 13. The panel 18 is supported by the panel carrier 4 which is still supported by the panel carrier holder 9. The centre of mass of the panel 18 is located substantially adjacent to the panel carrier holder 9 and the upper end of the vertical standard 3. The gas springs 14 are almost totally decompressed and the decompression of the gas springs 14 is limited by the connection rod 12 abutting the vertical standard 3.

[0057] During movement of the panel 18 from the tilted position in Fig. 3 to the horizontal position in Fig. 4, decompression of the gas springs 14 contributes to lifting the weight of the panel 18 after the panel carrier 4 has passed the break point between the tilted and the horizontal positions of the panel carrier holder 9.

[0058] Fig. 5 illustrates the tilting device 7 remaining at its vertical level when the panel carrier 4 is lifted by a movable part of the panel lifting device, here in form of an inner telescoping member 19 of the vertical standard 3. When the panel carrier is lifted by rotating the hand wheel 5, the inner telescoping member 19 is vertically

displaced out from through recess 24 of the attachment part 8. Thereafter, the inner telescoping member 19 passes through the through recess 25 of the panel carrier holder 9, and is inserted into the tubular shaft of the panel carrier 4. Thereafter, the inner telescoping member 19 lifts the panel carrier 4 upwards, and the panel carrier is released from the panel carrier holder 9 of the tilting device 7.

[0059] Since the tilting device 7 remains at its vertical level during lifting of the panel 18, the person using the panel lifting device 1 and the tilting device 7 needs to lift less weight than if the tilting device 7 would follow the vertical movement of the panel carrier 4.

[0060] When the panel 18 is fixed to the ceiling and the panel carrier 4 is lowered to the vertical level of the tilting device 7, the panel carrier holder 9 will receive the panel carrier 4. Thereafter, the inner telescoping member 19 will be drawn to a level beneath the lower end of the tubular shaft 21 of the panel carrier 4, such that the panel carrier 4 is released from the inner telescoping member 19. Still later, the inner telescoping member 19 will be drawn to a level beneath the lower end of the panel carrier holder 9 and into the attachment part 8, such that the panel carrier holder 9 is released from the inner telescoping member 19. Thus, the panel carrier 4 and the panel carrier holder may be tilted again using the tilting device 7.

[0061] Even though the invention has been described with reference to moving both the panel carrier holder 4 and the panel carrier 9, the invention functions similarly if the panel carrier 4 is omitted.

[0062] Even though the invention has been described with reference to specific exemplifying embodiments thereof, many different alterations, modifications and the like will become apparent for those skilled in the art. For example, the lever 11, 12 may be formed in one piece arranged centred over the vertical standard 3, the lever 11, 12 may be pivotally arranged at the end of the lever, such that the pivot axis is disposed at the end of the lever portions 11, or the lever may be a combination of the features above.

[0063] In an alternative embodiment, instead of being pivotally arranged, the end of the lever 11, 12 which is facing away from the panel carrier holder 9 may be arranged to follow a groove, which is formed as a circular arc protruding out from the vertical standard 3. Thus the panel carrier holder 9 may be tilted in relation to the attachment part 8 by moving the end of the lever 11, 12 along said groove.

[0064] The gas springs 14 may be replaced using any other suitable biasing means such as a mechanical spring.

[0065] Even if the tilting device 7 according to the invention is described in combination with a panel lifting device 1 comprising two telescoping members, the tilting device 7 may be adapted for other types of movable parts 19 of vertical standards 3, such as two parallel members, one of which is movable in relation to the other.

[0066] Additionally, variations to the disclosed embod-

iments can be understood and effected by the skilled addressee in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single processor or other unit may fulfil the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. Tilting device (7) for tilting a panel carrier (4), adapted to support a panel (18) and adapted to be lifted by a vertically movable part of a panel lifting device (1), said tilting device (7) comprising:

- an attachment part (8) adapted to be arranged at an upper end portion of a vertical standard (3) of said panel lifting device (1),
- a panel carrier holder (9) adapted to receive said panel carrier (4), wherein said panel carrier holder (9) is tiltable in relation to said attachment part (8) when said tilting device (1) is arranged at said upper end portion of said vertical standard (3), such that said panel carrier (4) is tilted between a horizontal position and a tilted position, and wherein said tilting device (7) is adapted to remain at its vertical level on the vertical standard (3) when the panel carrier (4) is displaced vertically upwards by said movable part (19) and separated from the panel carrier holder (9).

2. Tilting device (7) according to claim 1, wherein said tilting device (7) is detachably arrangeable at an upper end portion of the vertical standard (3).
3. Tilting device (7) according to any one of preceding claims, wherein said attachment part (8) comprises a passage (26) adapted to allow said movable part (19) of said panel lifting device (1) to pass freely through it.
4. Tilting device (7) according to any one of preceding claims, wherein said panel carrier holder (9) comprises a passage (25) adapted to allow the movable part (19) of said vertical standard (3) to pass through it.
5. Tilting device (7) according to any one of preceding claims, further comprising a lever (11, 12), wherein said panel carrier holder (9) is arranged on said lever (11, 12).

6. Tilting device (7) according to claim 5, wherein said lever (11, 12) is pivotally arranged at a pivot axis (13) disposed at the upper end portion of said vertical standard (3) at the same vertical level as the lower end of the attachment part (8).

7. Tilting device (7) according to claim 6, wherein said tilting device (7) further comprises at least one biasing means (14), such as a gas spring (14), wherein said biasing means (14) extends between said pivot axis (13) and a point on the lever (11, 12), which point is separated from the pivot axis (13).

8. Tilting device (7) according to claim 7, wherein said biasing means (14) is adapted to provide an over-centre mechanism during movement of said panel carrier holder (9) in relation to said attachment part (8) between said horizontal position and said tilted position.

9. Tilting device (7) according to any one of preceding claims, wherein said tilting device (7) further comprises at least one side support (15) disposed along an imaginary longitudinal extension of said panel carrier (4) when said panel carrier (4) is received and supported by said tilting device (7).

10. Tilting device (7) according to any one of preceding claims, wherein said tilting device (7) comprises at least one panel support means (17) comprising a hook-shaped portion, which panel support means (17) extends perpendicularly to an imaginary longitudinal extension of said panel carrier (4) when said panel carrier (4) is received and supported by said tilting device (7).

11. Tilting device (7) according to claim 10, wherein said panel support means (17) comprises extendable arms (16).

12. Method for lifting a panel (18), said method comprising the steps of

- arranging a panel (18) on a tilted panel carrier (4) disposed/arranged at an upper end of a vertical standard (3) of a panel lifting device (1);
- moving said panel carrier (4) from a tilted position to a horizontal position using a tilting device (7); and
- releasing said panel carrier (4) from said tilting device (7) when the panel carrier (4) is displaced vertically upwards by said panel lifting device (1), such that said tilting device (7) remains at the same vertical level; and
- displacing said panel carrier (4) vertically to a desired higher vertical level.

13. Method for lifting a panel according to claim 12,

wherein said step of moving said panel carrier (4) from a tilted position to a horizontal position comprises steps of loading a biasing means (14) and releasing a biasing means (14).

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- 14.** Method for lifting a panel according to claim 13, wherein said tilting device (7) is a tilting device (7) according to any one of claims 1-11.

- 15.** Panel lifting device (1) comprising a vertical standard (3), a panel carrier (4) adapted to support a panel (18) and adapted to be disposed/arranged at an upper end portion of a vertical standard (3), and a tilting device (7) according to any one of claims 1-11.

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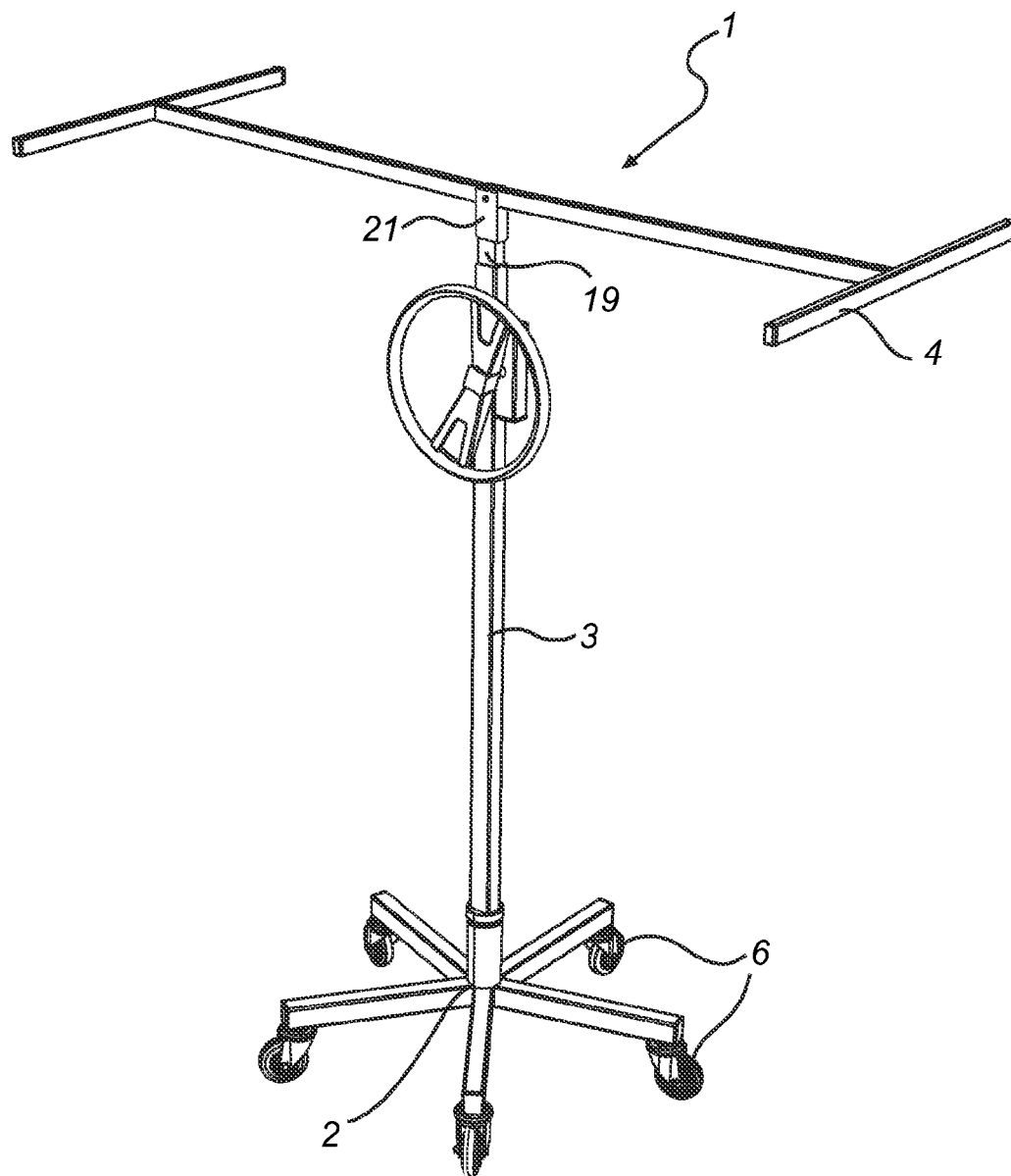
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40

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Prior art

Fig. 1

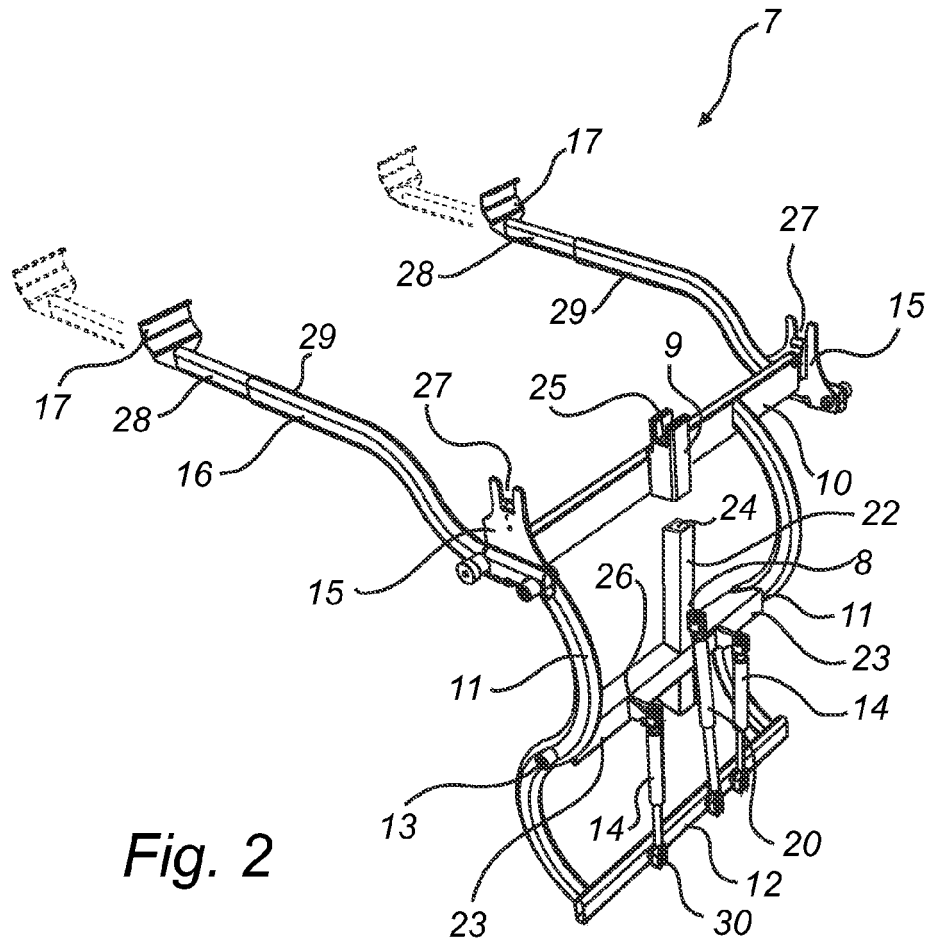


Fig. 2

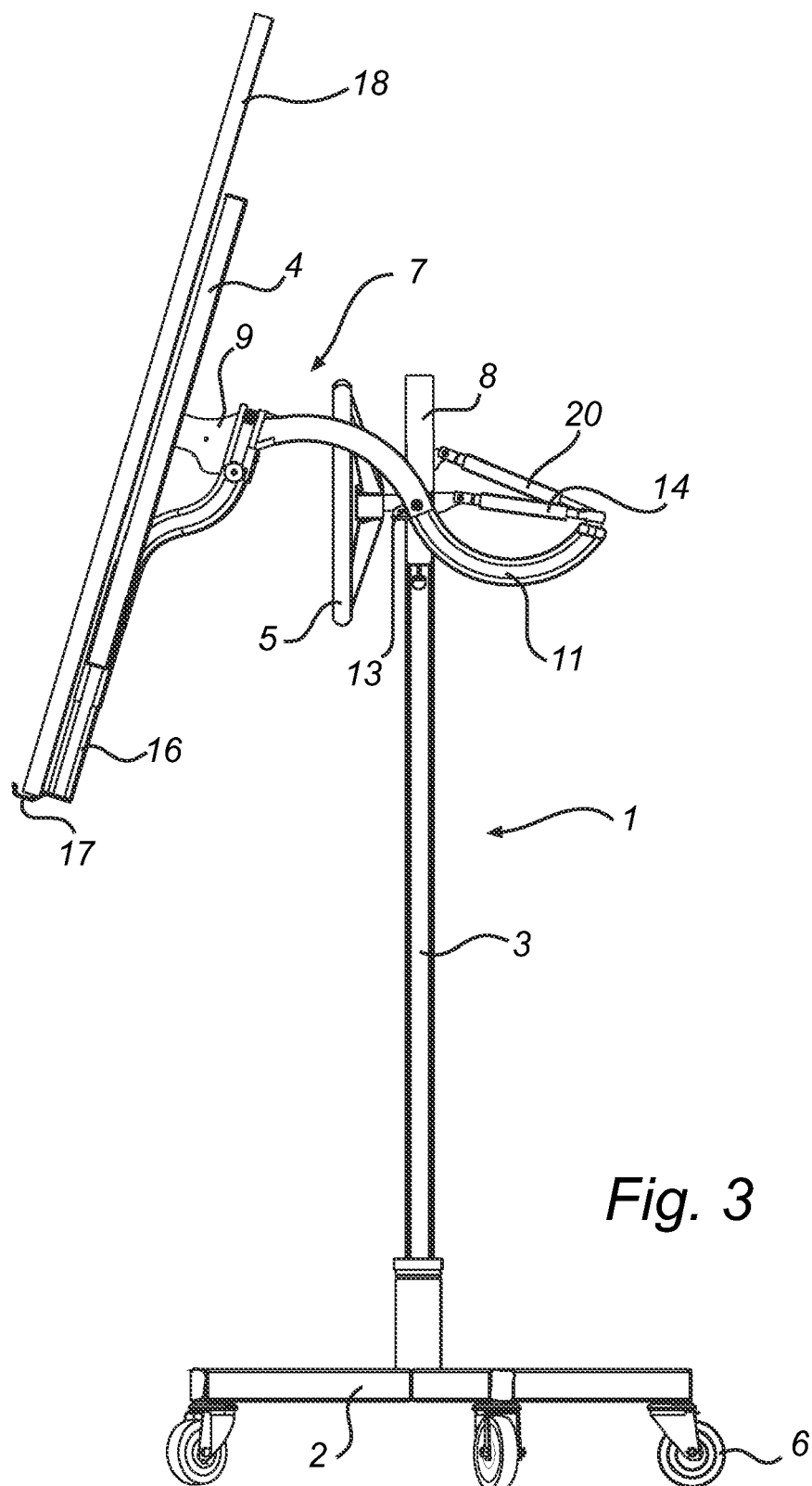
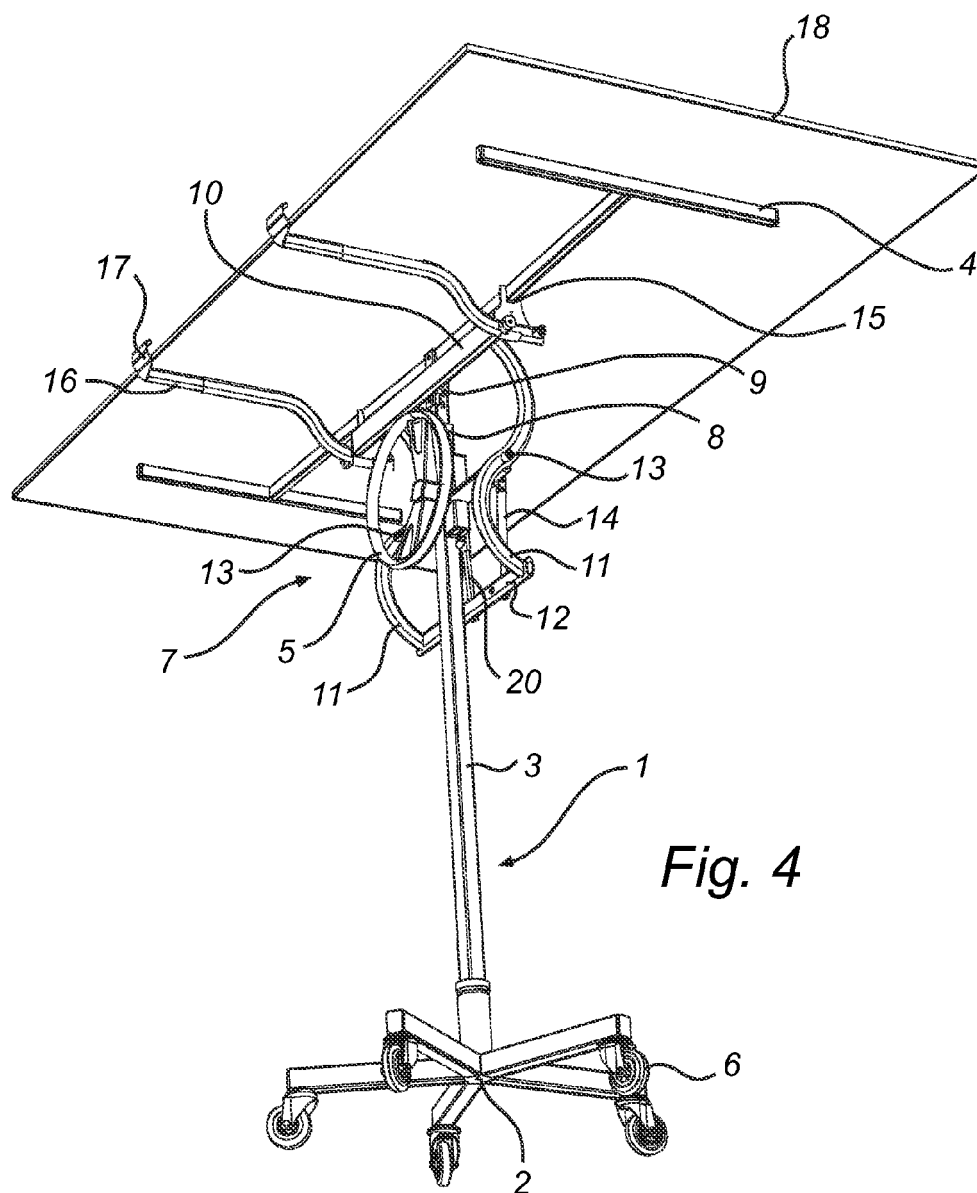


Fig. 3



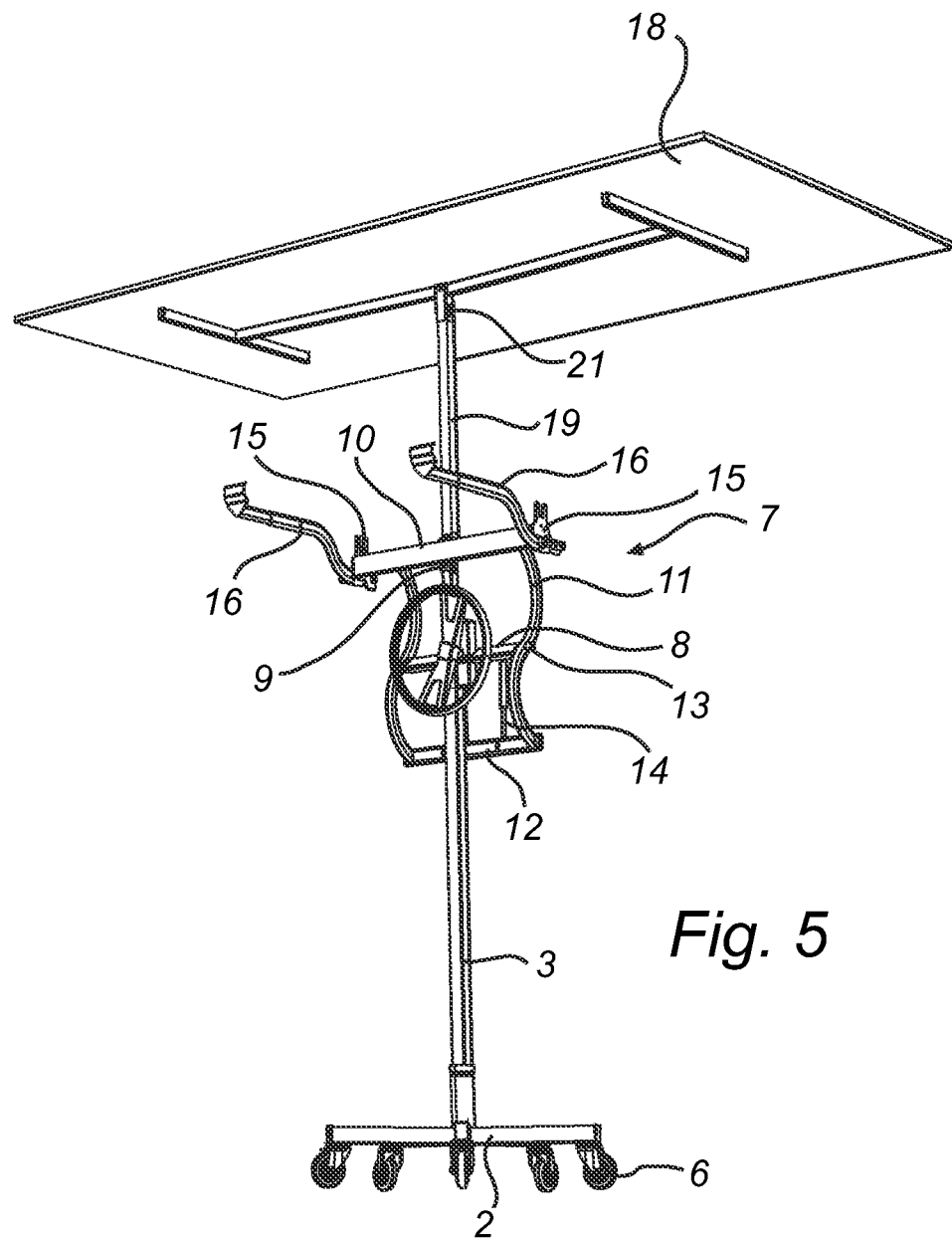


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 10 16 7523

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 92/06257 A1 (CHARLEZ RUNE [SE]) 16 April 1992 (1992-04-16) * the whole document *	1,12	INV. E04F21/18
A	US 5 129 774 A (BALSEIRO LAZARO [US] ET AL) 14 July 1992 (1992-07-14) * column 4, line 5 - line 12; figure 3 *	1,12	
A	US 3 178 038 A (LOVE LESLIE G) 13 April 1965 (1965-04-13) * figure 2 *	1,12	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 October 2010	Examiner Bastian, Almut
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			

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

EP 10 16 7523

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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26-10-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9206257	A1	16-04-1992	AU 8763391 A	28-04-1992
US 5129774	A	14-07-1992	NONE	
US 3178038	A	13-04-1965	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 9206257 A [0002]