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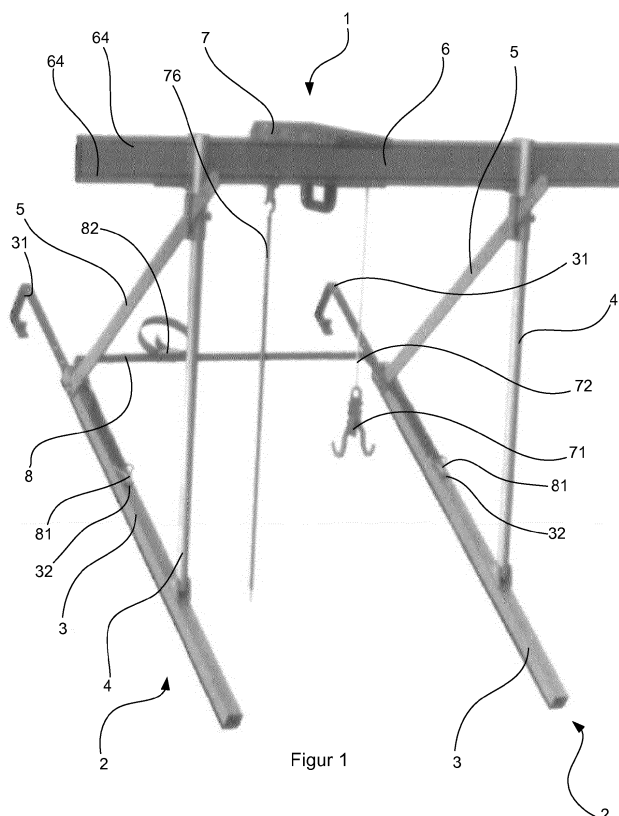
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(54) **LIFTING TOOL FOR A MOUNTING AND DISMOUNTING A ROOF WINDOW AND A METHOD FOR MOUNTING AND DISMOUNTING A ROOF WINDOW USING SUCH A LIFTING TOOL**

(57) A lifting tool (1) for mounting and dismounting of a sash of a roof window in an inclined roof construction, said lifting tool (1) comprising two support stands (2) adapted to be placed on the roof at opposite sides of a mounted window frame of the roof window, each support stand (2) comprising a support base (3), a support leg

(4), and an angle bar (5) which together forms a triangle with a connection point at each corner, a cross bar (6) which can be releasably attached between the support stands (2), and a winch (7) which can be mounted on the cross bar (6).



Figur 1

Description

[0001] The invention relates to a lifting tool for mounting and dismantling the sash of a roof window in an inclined roof, the lifting tool comprising support stands adapted for being arranged on the roof on opposite sides of an installed window frame of the roof window, each support stand comprising a support base, a support leg, and an angle bar which together forms a triangle with a connection point at each corner; a cross bar which can be releasably attached between the support stands; and a winch which can be mounted on the cross bar. The invention further relates to a method for mounting and dismantling the sash of the roof window in an inclined roof.

Background of the invention

[0002] Mounting and dismantling roof windows are often associated with heavy lifting as the processes include lifting the sash a window pane into position or out of the window frame. Such lifting is usually performed manually by the workers installing or renovating the roof window, which may, in the long run, result in work injuries. Furthermore, this work is performed under difficult conditions where both the inclination of the roof and wind and weather may make the work process difficult.

[0003] DE 202016001203 U1 relates to a lifting tool for mounting and maintenance of a roof window. The lifting tool is composed of a frame with two support stands which are placed on opposite sides of the installed window frame, so that a winch arranged on a cross bar of the frame can lift the window pane and the sash by a suction assembly. To be able to adjust the lifting tool to the width of the window frame and the angle of the window, the components of the frame can be adjusted telescopically in their lengths.

[0004] Although the telescopic adjustment enables the lifting tool to be adapted to different kinds of windows and roof constructions, it also makes the lifting impractical in that when it is put in position and dismantled, it is required that the lifting tool is assembled/disassembled at every single telescopic connection, which is time consuming and delays the work for the worker.

[0005] A further problem with this way of assembling and disassembling the lifting tool is that the lifting tool, when it is disassembled, is separated into many separate parts, which makes it difficult for the worker to keep track of every single part.

[0006] On this background, it is an object of the invention to provide a lifting tool which assists the workers in their job of dismantling and mounting the sash of the window, while at the same time being manageable and practical when it is put in position and dismantled.

Summary of the invention

[0007] In a first aspect of the invention, this is achieved

by a lifting tool as described in the background section, wherein two of the connection points between the support base, the support leg, and the angle bar of each support stand is pivotable and the third connection point is releasable, when the lifting tool is not in use, so that the lifting tool can be folded together.

[0008] The advantage of this is that the lifting tool can be disassembled by removing the cross bar from the support stands and the support stands are separated at the releasable connection point, thereby allowing the support stands to be folded together about the two pivotable connection points. The support stands thereby remain in one easily manageable piece in a folded condition. The entire lifting tool can therefore be transported in fewer parts than the lifting tools disclosed in the prior art. This is particularly advantageous when the lifting tool is to be assembled on the roof, as transport from the ground and up to the roof construction often involves manoeuvring narrow passages such as scaffolding, where the lifting tool of the prior art will be problematic getting through with.

[0009] Each support stand is constructed such that the support base is adapted to abut against the roof construction adjacent and substantially parallel to a respective one of the window frame's two side frame elements, so that the roof construction provides a resting surface for the lifting tool. In an assembled condition, the support leg extends substantially vertically from the support base, whereby the weight of the sash and window pane is transferred optimally when the lifting tool is used.

[0010] In an embodiment of the invention, at least one of the connection points of each support stand is displaceable so that the support stand can be adjusted to the inclination of the roof. By providing a lifting tool, wherein at least one of the connections points between the angle bar, the support base, and the support leg is displaceable, it becomes possible for the support leg to extend vertically regardless of the roof inclination. This means the lifting tool will be usable on roof constructions of all inclinations.

[0011] In an embodiment of the invention, the displaceable connection point can be provided by making one of the pivotable connection points displaceable under assembly of the lifting tool, e.g. by arranging the pivotable connection point on slide shoe which can be locked in position during the assembled condition of the lifting tool.

[0012] In a presently preferred embodiment, the displaceable connection point by allowing the releasable connection point to be displaceable along the length of one of two of the support base, the support leg, and the angle bar which are connected by the releasable connection point.

[0013] In such an embodiment, the displaceable connection point is provided by an elongate slot in either the support base, the support leg, and the angle bar so that the releasable connection point can be positioned along the length of the elongate slot during assembly of the support stands.

[0014] In another such embodiment, the displaceable connection point is provided by a row of connection holes arranged in either the support base, the support leg, and the angle bar so that the releasable connection point can be positioned in the connection hole best suited for the inclination of the roof.

[0015] The advantage of using an elongate slot to provide the displaceable connection is that each support stand may be adjusted more precisely for the inclination of the roof, as the elongate slot allows placement of the releasable connection point along the entire length of the elongate slot. The disadvantage of using an elongate slot, is that both support stands must be adjusted precisely in order to avoid the lifting being crooked. To facilitate this, the elongate slot on each support stand can be provided with markings along the length of the elongate slot, so that correct positioning of the releasable connection point is made simpler.

[0016] The advantages of using a row of connection holes to provide the displaceable connection is that the assembly of each support stand can be done quicker, as it is made easier for the worker to adjust each support stand to the inclination of the roof. To facilitate assembly, each hole may be provided with markings showing the interval of roof inclinations the respective hole is suited for.

[0017] In an embodiment of the invention, the lifting tool further comprises a mounting strap which can be spanned between the support bases. By providing a mounting strap which can be spanned between the support bases it is prevented that the two support bases slip away from each other. The mounting strap is adapted to extend along the upper side of the top element of the window frame so that the mounting strap also prevents the lifting tool from slipping downwards on the inclined tool during assembly and/or during use.

[0018] In a preferred embodiment, the length of the mounting strap is adjustable so that it can be adapted to the width of the window frame. The mounting strap may be replaced by a rigid rod or beam, if it is also needed to prevent the support bases from slipping towards each other. In assembled condition, this is however usually prevented the side elements of the window frame, for which reason a lighter and more manageable mounting strap is preferred over a rigid bar/beam.

[0019] In an embodiment of the invention, at least one of, preferably both, support bases comprise a batten hook adapted to grip a batten close to the window. By providing the lifting tool with a batten hook extending down towards the roof construction, it is made possible to fasten the lifting tool to one or more of the roof construction's transverse battens. In a preferred embodiment, the batten hook of each support stand extend from an upper end of the support base, from where it can grip an adjacent batten above the window frame. In an embodiment, the batten hooks are arranged telescopically in the support bases so that they can be adjusted in relation to the distance from the window to the batten.

[0020] In an embodiment of the invention, the cross bar is provided with two connection element which are adapted to connect the support stands to the cross bar and are displaceable along the length of the cross bar, so that the distance between the support stands can be adjusted according to the width of the window frame.

[0021] In an embodiment of the invention, each connection element comprises a cavity with an internal shape corresponding to the external shape of the support legs so that the connection elements can grip around the support legs. In a preferred embodiment, the connection elements are separate elements displaceable along the length of the cross bar so that the distance between the support stands can be adjusted in accordance to the width of the window.

[0022] In a second aspect, the invention relates to use of the lifting tool of the first aspect of the invention to mount and dismount a window pane and a sash of a roof window in an inclined roof construction.

[0023] In a third aspect, the invention relates to a method for mounting or dismounting a window pane and a sash into/out of a roof window in an inclined roof with a lifting tool, said method comprising the steps of arranging a support stand parallel to each of the side elements of the window frame, assembling each support stand by connecting the third connection point which is releasable, connecting the cross bar to the support stands, mounting the winch on the cross bar, attaching the window pane and the sash to the winch, and mounting/dismounting the window pane and the sash into/out of the window frame.

[0024] The advantage of a method, wherein a lifting tool as described is used, is that both assembly and transport is simplified. The method is therefore quicker and thus more effective for the worker mounting/dismounting the roof window.

[0025] In an embodiment, the method further comprises the step of arranging the displaceable connection point of each support stand so that the support legs are substantially vertical. This ensures that the weight from the window frame and the sash is transferred optimally from the support leg to the support bases, and that the connection point between these two components are not subjected to unnecessary strain during use of the lifting tool.

[0026] In an embodiment of the invention, the method further comprises the step of spanning the mounting strap between the support bases along the upper side of a top element of the window frame. In a preferred embodiment, this step further comprises adjusting the length of the mounting strap to the width of the window. By using a mounting strap during assembly of the lifting tool, a quick and secure way of fastening the lifting tool is provided, so that it will not slip of the roof during assembly.

[0027] In an embodiment, the method further comprises the step of attaching the batten hooks to a nearby batten of the roof construction. By using batten hooks to fasten the lifting tool to the roof construction, the lifting

tool is secured so that it will remain in place and steady, even when it is carrying the full weight of the window pane and the sash of the window. This step can further comprise exposing a batten in the roof construction by removing a roof covering, such as tile or roof plates.

Short description of the figures

[0028] The invention will be described in more detail below by means of nonlimiting examples of embodiments and with reference to the schematic drawings, in which:

- fig. 1 shows a lifting tool of the invention in an assembled condition,
- fig. 2 shows a support stand of the lifting tool of the invention in a disassembled, folded condition,
- fig. 3 shows a lifting tool of the invention in a disassembled, folded condition,
- fig. 4 shows a lifting tool of the invention set up on an inclined roof, carrying the window pane and the sash of a roof window,
- fig. 5 shows a cross bar of the lifting tool of the invention,
- fig. 6 shows a mounting strap of the lifting tool of the invention,
- fig. 7 shows a winch of the lifting tool of the invention,
- fig. 8a shows the winch during mounting on the cross bar,
- fig. 8b shows a schematic drawing of the winch mounted on the cross bar,
- fig. 8c shows a perspective drawing of the winch mounted on the cross bar,
- fig. 9a shows the lifting hooks of the winch,
- fig. 9b shows the lifting hooks of the winch in engagement with a suction assembly of the lifting tool in an unlocked condition,
- fig. 9c shows the lifting hooks of the winch in engagement with a suction assembly of the lifting tool in a locked condition,
- fig. 10a shows a first step of the method for setting up the lifting tool of the invention,
- fig. 10b shows how the lifting tool is set up,
- fig. 10c shows how the cross bar is mounted on the support stands,
- fig. 11a shows a window pane and a sash being lifted through the window frame of a roof window by a suction assembled sucked thereon,
- fig. 11b shows a window pane and a sash being lifted through the window frame of a roof window, and
- fig. 11c shows a window pane and a sash being lifted into position or out of the window frame.

Detailed description of the invention

[0029] Fig. 1 shows a lifting tool 1 of the invention. The lifting tool 1 comprises two support stands 2 which together carries a cross bar 6 adapted for, in an assembled condition, extending across a mounted window frame of

a roof window, to thereby be able to lift the sash and the window pane of the window into position in the window frame if the window is being mounted, or lift the sash and the window pane out of the window frame if the window is being removed/refurbished.

[0030] Each support stand 2 comprises a support base 3, a support leg 4, and an angle bar 5. The support base 3 is adapted to abut the roof to provide a stable grounding for the lifting tool 1 and distribute the weight of the lifting tool 1 and the window pane and sash of the window evenly across the roof construction. The support leg 4 is adapted to carry the cross bar 6. In the shown embodiment, the support leg 4 is provided by a cylindrical metal tube with the required structural strength to carry the weight of the window pane and the sash of the window. The angle bar 5 is adapted to extend between the support base 3 and the support leg 4 to stabilize the support leg 4. The two support stands 2 hereby forms a triangle adapted to be set up along respective side elements of the window frame to carry the cross bar 6.

[0031] To have the best possible carrying capacity, the support legs 4 must in an assembled condition be substantially vertical, whereby each support leg 4 will not experience torque during use, which would put an unnecessary strain on the support stands 2. For the simplest embodiment of the support stands 2 of the lifting tool 1, this means that the lifting tool 1 will be adapted for roof constructions of a certain inclination, as the triangle formed by the support base 3, the support leg 4, and the angle bar 5 has fixed side lengths and therefore also fixed angles, amongst which is the angle between the support base 3 and the support leg 4 which defines the support leg's 4 angle in relation to the roof and thereby also the ground.

[0032] However, in almost all embodiments of the invention, the lifting tool can be adjusted for roof constructions with arbitrary inclinations. This is made possible by at least one of the connection points between the support base 3, the support leg 4, and the angle bar 5 is displaceable along the length of one of the three mentioned components, so that at least one side length of the triangle formed by the support base 3, the support leg 4, and the angle bar 5 is adjustable, whereby the angles of the triangle also becomes adjustable. The support leg 4 will thereby be able to be put in a vertical position regardless of the inclination of the roof.

[0033] Fig. 2 shows an embodiment of a support stand 2 of the lifting tool 1 of the invention in a folded condition. In the shown embodiment, the support base 3 of the support stand 2 is pivotably connected to the support leg 4 and the angle bar 5 about pivotable connection points adapted to not be easily releasable but instead to remain connected in all conditions of the lifting tool 1. By easily releasable, it is meant that the connection points can be released by use of tools, but are not adapted to be separated unless smaller parts of the lifting stand 2 are being replaced.

[0034] In contrast, the connection point between the

angle bar 5 and the support leg 4 is adapted to be releasable so that the angle bar 5 and the support leg 4 can be connected to bring the lifting tool 1 into an assembled condition, and so that the angle bar 5 and the support leg 4 can be separated to bring the lifting tool 1 into the folded condition.

[0035] In other embodiments an arbitrary of the three connection points between the support base 3, the support leg 4, and the angle bar 5 can in principle be configured to be the releasable connection point. The connection point between the support leg 4 and the angle bar 5 is however preferred as it is not subjected to the same load as the connection point between the support base and the support leg 4, and because it, in an assembled condition, is placed highest, thereby allowing the worker the connect or disconnect the connection point from a standing work position.

[0036] In the shown embodiment the angle bar 5 of each support stand 2 is provided by a flat bar which is pivotally mounted on the side of the support base 3 at a top end of the support base 3, i.e. the end which, in an assembled condition is near the upper side of the roof window. Because the angle bar 5 is connected to the side of the support base 3, the angle bar 5 will fold down along the side of the support base 3 in the folded condition, whereby it will not occupy the same room as the support leg 4 which in the folded condition folds down along the top side of the support base 3.

[0037] Because the angle bar 5 is not carrying a significant weight, but merely supports the support leg 4, the angle bar 5 can be made from a lighter and weaker material and/or formed into a lighter and/or weaker shape than the support leg 4. The angle bar 5 is therefore provided by a flat metal bar which do not have the same structural strength as the support leg 4.

[0038] In Fig. 2 it can be seen how the displaceable connection point mentioned above is provided. Along the angle bar 5 a row of connection holes 51 which allows the connection point between the angle bar and the support leg 4 to be displaced along the length of the angle bar 5, whereby the support stand 2 can be adjusted according to the roof inclination, so that the support leg 4 is substantially vertical in an assembled condition. Each connection hole 51 is provided with a marking 52 indicating which roof inclination interval the respective connection hole 51 is adapted for.

[0039] In an alternative embodiment, the row of connection holes 51 can be replaced by a single elongate slot, whereby continuous and not discrete adjustment of the connection point will be possible. An embodiment with an elongate slot instead of a row of connection holes 51 will be able to be adjusted more precisely in relation to the roof inclination. However, this requires finer adjustment and therefore more time for the worker during assembly to avoid crookedness in the lifting tool 1.

[0040] In the shown embodiment, each support stand 2 further comprises a batten hook 31 arranged at the top end of the support base 3. The batten hook 31 is adapted

to grip a batten in the roof construction over the top element of the window frame, so that the batten hook 31 prevents the lifting tool 1 from slipping down off the inclined roof construction. In the shown embodiment the batten hook 31 can be withdrawn or inserted telescopically from/into the support base 3, whereby the batten hook 31 can be adjusted in relation to the distance between the window frame and the nearest batten.

[0041] Fig. 3 shows a lifting tool 1 of the invention in the folded condition. Because of the releasable connection point in each support stand 2, it is possible the fold each support stand 2 together to a very compact assembly. This construction further means, that the lifting tool 1, when it is disassembled only comprises three parts besides a winch 7, a drive extender 76, and a mounting strap 8.

[0042] Fig. 4 shows a lifting tool 1 of the invention in a packed condition, in which the two folded support stand 2 lies side-by-side alongside the cross bar 6. To keep the three parts together, the parts can either be provided with snap locks or other attachment means which can be released. Alternatively, the three parts 2, 6 can be held together by the mounting strap 8 or a case designed to hold them. The possibility of keeping and handling the lifting tool 1 as one connected unit when it is in the packaged condition makes the lifting tool 1 manageable and allows it to be transported easily to and from the roof and take up little space during storage.

[0043] Fig. 5 shows the cross bar 6 of the lifting tool 1 of the invention. To be usable for roof window of different widths, it is possible to attach the support stands 2 at variable positions along the length of the cross bar 6. In the shown embodiment this is made possible by the cross bar 6 being provided with two individual connection elements 61 for connecting the cross bar 6 to respective ones of the support stands 2. The connection is provided by each of the connection elements 61 having a connection part 62 with a cavity with an internal shape which substantially corresponds the outer shape of the support leg 4 of the respective support stand 2. In the shown embodiment each support leg 4 is provided by a metal tube with a cylindrical shape, so each connection element 61 therefore has a connection portion 62 with a cylindrical cavity which can receive a portion of the support leg 4.

[0044] To secure the connection elements 61 at the right position along the length of the respective support leg 4, the support leg 4 and/or the connection element 61 can be provided with a protrusion which functions as a stopper such that the support leg 4 and the connection element 61 abuts each other when the connection element 61 is in the correct position. Alternatively, the connection element 61 can be provided with an attachment element, e.g. a screw, which can be fastened against the support leg 4 so that the connection element 61 can be fastened releasably to the support leg 4.

[0045] In the shown embodiment the cross bar 6 is provided with engagement grooves 64 extending along the length of the cross bar 6. In the shown embodiment

the engagement grooves 64 extend along the top and bottom of the cross bar 6 at both sides of the cross bar 6. These engagement grooves 64 ensures that the connection elements engage securely around the cross bar 6. In the shown embodiment the attachment of each connection element 61 to the cross bar 6 happens by means of a fastening element 63 on the connection element 61. The fastening element 63 can preferably be operated by hand, whereby quick assembly and packaging of the lifting tool 1 is made possible.

[0046] Fig. 6 shows an embodiment of the mounting strap 8 of the lifting tool 1. The mounting strap 8 is adapted to keep the two support stands 2 from sliding apart. This is achieved by spanning the mounting strap out between the support bases 3. To be able to attach the mounting strap 8 to the support bases 3 the mounting strap 8 is provided with a hook 81 at each end, said hook 81 being adapted to engage a hole 32 at the side of a respective of the support bases 3.

[0047] There mounting strap 8 is further adapted for preventing the lifting tool 1 from sliding down off the roof construction. This is achieved by spanning the mounting strap 8 over the upper side of the top element of the window frame so that the window frame carries a part of the weight of the lifting tool 1. Embodiments wherein the lifting tool 1 comprises batten hooks 31, this function may be temporary, i.e. the mounting strap 8 only holds the lifting tool 1 in place while the batten hooks 31 are attached to a batten. Embodiments which do not comprise batten hooks 31, the mounting strap 8 can be adapted to carry the entire weight of the lifting tool 1 and the sash and the window pane of the window.

[0048] To be able to adjust the width of the lifting tool 1 in the assembled condition, i.e. the distance between the support stands 2, it is possible to adjust either the length of the mounting strap 8 or attach the hooks 81 at variable positions along the length of the support bases 3. The later can be achieved by arranging a row of holes 32 at the side of each support base 3 and use a mounting strap of a fixed length, so that the length of the mounting strap 8 which spans between the support bases 3 depend on which hole 32 the hooks 81 are inserted into.

[0049] In the shown embodiment the mounting strap 8 is divided in two and connected by a buckle 82, whereby the length of the mounting strap 8 can be adjusted to fit the width of the window frame. The mounting strap 8 can be provided with length markings showing where the buckle 82 should be tightened to achieve the correct length of the mounting strap 8. In cases where the lifting tool 1 is designed for certain windows of particular brands and models, where the standard dimensions are known, the length markings can indicate where the buckle 82 should be tightened to adjust the length of the mounting strap 8 to the model of the window being mounted/dismounted.

[0050] In the shown embodiment, where the length of the mounting strap 8 can be adjusted, the mounting strap 8 further comprises two rigid angle brackets 83 adapted

to abut against the top element of the window frame and along a respective side element of the window frame or the sides of the support bases 3, so that the mounting strap 8 is protected from the hard corner of the support bases 3 or the window frame and is subjected to less wear exposure during use.

[0051] Fig. 7 shows a close-up of the winch 7 of the lifting tool 1. The winch 7 is adapted for being mounted on the cross bar 6 and for lifting the sash and the window pane of the window. In the shown embodiment, the winch 7 comprises two lifting hooks 71 connected to a hoisting reel 72 via a cable 73. The two lifting hooks 71 are adapted to attach the winch 7 to the window pane and sash of the window. In some embodiments, the lifting hooks 71 are adapted to, by them self, grip around the sash of the window. However, in the shown embodiment, the lifting hooks 71 are adapted to engage a suction assembly 9 which can be sucked onto the window pane to provide and engagement surface for the lifting hooks 71.

[0052] The hoisting reel 72 is connected to an eye 78 on the underside of the winch 7, said eye 78 driving the hoisting reel 72 by rotation. The eye 78 is adapted for connection with either a turning handle allowing the winch 7 to be driven manually by hand, or in a preferred embodiment with a drive extender 76 allowing a motorized drive unit to be coupled to drive the winch 7. The motorized drive unit is preferably provided by a screwdriver/power drill or a similar standard tool, wherein the drive extender 76 comprises a coupling part adapted to engage the standard tool, e.g. a hexagonal male part for connection with a bit holder of a screwdriver or a drill chuck of a screwdriver.

[0053] The winch 7 further comprises two mounting flanges 74, 75 protruding outwards from a surface of the winch 7, said mounting flanges 74, 75 being adapted for abutting the cross bar 6. As can be seen in Fig. 8a-c, the first mounting flange 74 is adapted for extending over the cross bar 6 and engage one of the engagement grooves 64 on the opposite side of the cross bar 6, so that the weight of the winch 7 and the window pane and sash pulls the first mounting flange 74 into the engagement groove 64, whereby the winch is secured to the cross bar 6. In the mounted condition of the winch 7, the second mounting flange 75 extends along the underside of the cross bar 6. The two mounting flanges 74, 75 hereby ensures, that the winch 7 can only be dismounted by pivoting it off opposite of how it was mounted.

[0054] Fig. 9a-c show a suction assembly 9 of the lifting tool 1 of the invention. The suction assembly 9 is adapted for sucking itself onto the window pane of the window, so that an engagement surface for the hook 71 of the winch 7 is provided. As it is shown in Fig. 9b, the suction assembly 9 comprises a frame 92, on which three suction discs 91 are mounted, said suction discs 91 being adapted for carrying the weight of a window pane and a sash of the window. The suction discs 91 are symmetrically distributed about a central axis of the frame 92 so that the weight of the window pane and sash of the window

is distributed evenly such that the window pane and sash will now slope to one side when they are suspended by the lifting tool 1.

[0055] The suction assembly further comprises a lifting bar 93 extending across the central axis for being gripped by the lifting hooks 71 of the winch 7. To be able to securely grip the lifting bar 93, the lifting hooks 71 are mounted facing each other. Additionally, the lifting hooks 71 are arranged so that they are pivotable about a rotation point 94, which allows the lifting hooks 71 to move between an open and a closed position. To lock the lifting hooks 71 in the locked position, such that the suction assembly 7 will not fall off the lifting hooks 71, each lifting hook 71 comprises a securing hole 95. When the lifting hooks 71 are rotated into the locked position about the rotation point 94, the two securing holes 77 are aligned, whereby a rod or another stopping element can be placed through the securing holes 77 so that the lifting hooks 71 are prevented from rotation about the rotation point 76. In the shown embodiment, the stopping element is provided by a shackle 79. The shackle 79 thereby functions as both stopping element to lock the two lifting hooks 71 in the locked position and coupling element for the cable 73 in the winch 7.

[0056] Fig. 10a-c show the method for setting up a lifting tool 1 of the invention. If the lifting tool 1 comprises batten hooks 31, the method may start with the step of providing access to a first batten over the window frame in the roof construction, in line with the outside of the long sides of the window frame. This step can comprise removing roof tile or roof covering and inspecting that the batten and nailing is in good condition.

[0057] Hereafter, the support stands 2 are set up parallel to the side elements of the window frame at respective sides of the window. If the lifting tool 1 comprises a mounting strap 8, the method comprises inspecting the mounting strap 8 for damages before use, and adjusting the distance between the angle brackets 83 by adjusting the buckle 82 of the mounting strap 8. The mounting strap 8 is placed around the upper side of the top element of the window frame and is adjusted so that the angle brackets 83 engage the corners of the window frame closely.

[0058] Hereafter, the support stands 2, in the folded condition, are arranged on the roof at respective sides of the window frame, parallel and flush with the outer side of the side elements of the window frame. The support stands 2 are secured against falling down by attaching the hooks 81 of the mounting strap 8 in the holes 32 of the support bases 3. The batten hooks 71 length are now adjusted to keep the support stands 2 secured to a batten of the roof construction. This is done by extracting the batten hooks 31 out of the support bases 3 until the batten catcher of the batten hook 31 abuts around a batten of the roof construction. Hereafter, the mounting strap 8 only holds a part or none of the weight of the support stands 2, while the batten hooks 31 carries the majority or all of the weight.

[0059] Each support leg 4 are raised into a position

suited for the inclination of the roof so that the support legs 4 are substantially vertical. In the shown embodiment, the releasable connect point is the connection point between the angle bar 5 and the support leg 4. The support stands 2 are therefore brought into the assembled position by connecting the support leg 4 and the angle bar 5. The support stands 2 are correctly assembled, when the angle bar 5 and the support leg 4 are connected at the hole 51 of the angle bar 5, in which the interval for the relevant roof inclination is marked. If the inclination of the roof is unknown, the support legs 4 are raised to the position in which they are closest to being vertical.

[0060] The method hereafter comprises the step of mounting the cross bar 6 onto the support stands 2. This step comprises adjusting the distance between the connection elements 61 on the cross bar 6, so that the distance corresponds to the distance between the erected support stands 2. When the distance between the connection elements 61 are correct, the fastening elements 63 are tightened so that the connection elements 61 are attached to the cross bar 6. The cross bar 6 is hereafter mounted on the vertically standing support legs 4, such that each support leg goes through the part 62 of the connection elements 61, whose internal shape corresponds to the external shape of the support legs 4.

[0061] In the shown embodiment, the assembly of the lifting tool 1 comprises mounting the winch 7 on the cross bar 6. In the embodiment shown in Fig. 8a-b, this step is performed by bringing the mounting flange 74 of the winch 7 into engagement with an engagement groove 64 on the cross bar 6.

[0062] Fig. 11a-c show the method of mounting/dismounting the window pane and sash of the window after the lifting tool 1 of the invention has been assembled over the window frame. In an embodiment the method comprises the step of mounting the suction assembly 9 onto the window pane to be able to attach the winch 7 to the window pane and the sash of the window. This step may comprise cleaning the window pane, so that a clean surface is provided for the suction assembly 9 to be sucked onto.

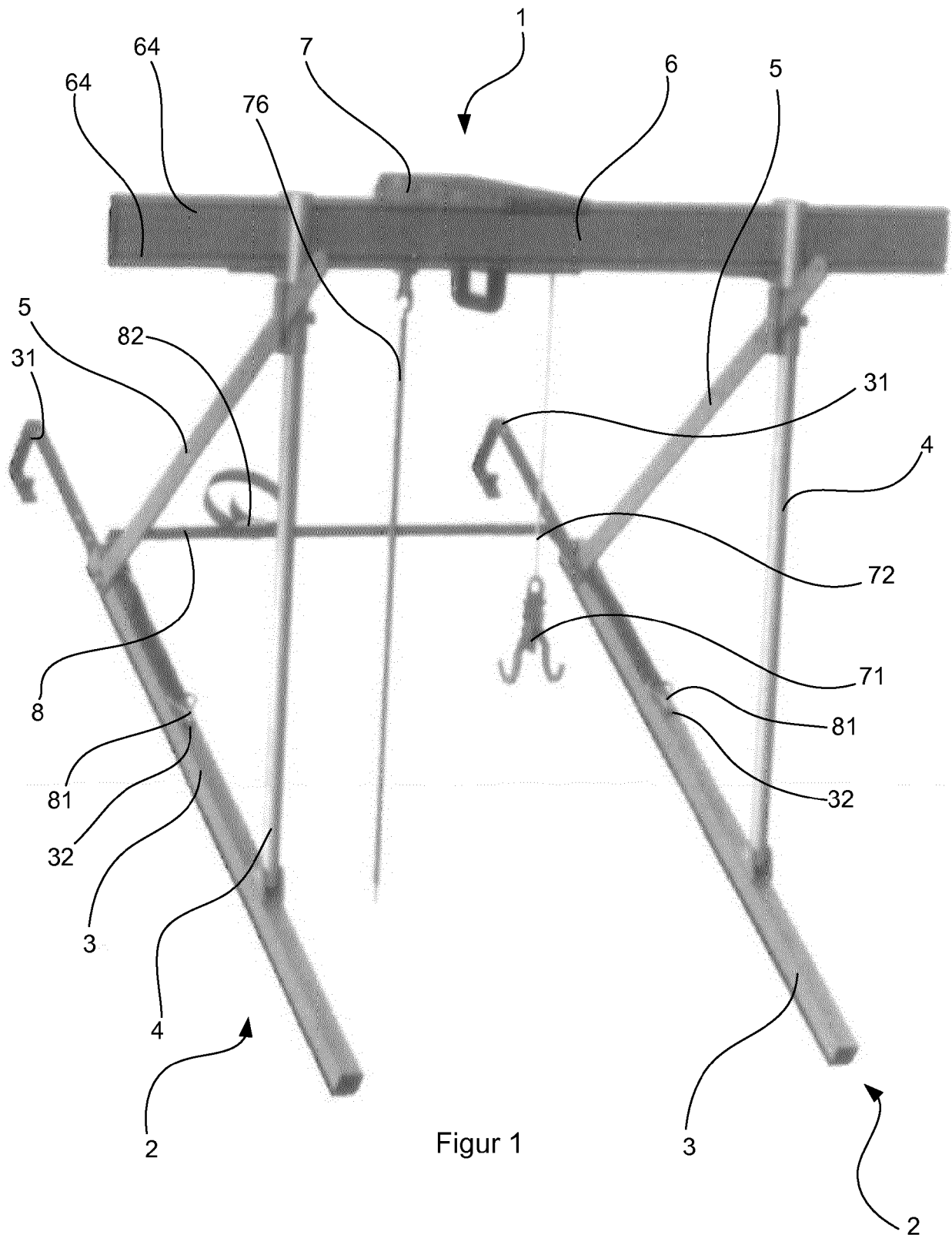
[0063] The method hereafter comprises the step of lifting the window pane and the sash of the window into/out of the window frame. This step is preferably performed by lifting the window pane through the opening in a vertical position rotated 90 degrees as shown in Fig. 11b, such that the window pane and the sash achieves the greatest possible clearance to the window frame.

Claims

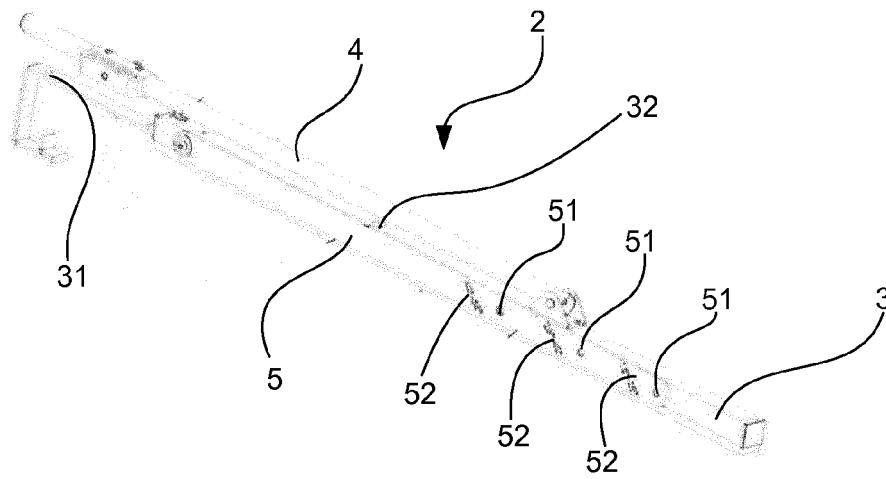
1. A lifting tool for mounting and dismounting of a sash of a roof window in an inclined roof construction, said lifting tool comprising:

two support stands adapted to be placed on the roof at opposite sides of a mounted window

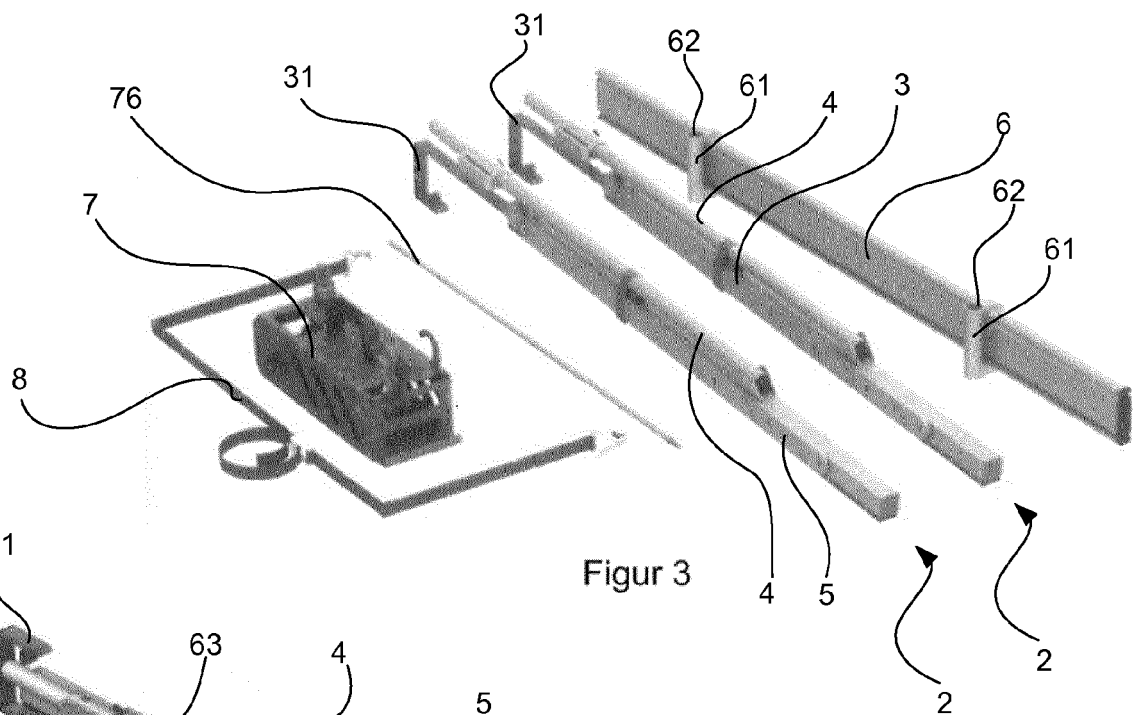
- frame of the roof window, each support stand comprising a support base, a support leg, and an angle bar which together forms a triangle with a connection point at each corner; a cross bar which can be releasably attached between the support stands; and a winch which can be mounted on the cross bar;
- characterized in that**
- two of the connection points between the support base, the support leg, and the angle bar of each support stand is pivotable and the third connection point is releasable, when the lifting tool is not in use, so that the lifting tool can be folded together.
2. The lifting tool of claim 1, wherein at least one of the connection points of each support stand is displaceable so that the support stand can be adjusted to the inclination of the roof.
 3. The lifting tool of any of the previous claims, further comprising a mounting strap which can be spanned between the support bases.
 4. The lifting tool of any of the previous claims, wherein the supports stands each comprise a batten hook.
 5. The lifting tool of any of the previous claims, wherein the support stands can be releasably attached to the cross bar at several positions along the length of the cross bar.
 6. The lifting tool of any of the previous claims, further comprising a suction assembly adapted to be sucked onto the window pane of the window.
 7. A method for mounting or dismounting a window pane and a sash into/out of a roof window in an inclined roof with a lifting tool, said lifting tool comprising two support stands adapted to be placed on the roof at opposite sides of a mounted window frame of the roof window, each support stand comprising a support base, a support leg, and an angle bar which together forms a triangle with a connection point at each corner; a cross bar which can be releasably attached between the support stands; and a winch which can be mounted on the cross bar; wherein two of the connection points between the support base, the support leg, and the angle bar of each support stand is pivotable and the third connection point is releasable, when the lifting tool is not in use, so that the lifting tool can be folded together, said method comprising the steps of:
 - a) arranging a support stand parallel to each of the side elements of the window frame,
 - b) assembling each support stand by connecting the third connection point which is releasable,
 - c) connecting the cross bar to the support stands,
 - d) mounting the winch on the cross bar,
 - e) attaching the window pane and the sash to the winch, and
 - f) mounting/dismounting the window pane and the sash into/out of the window frame.
 8. The method of claim 7, wherein at least one of the connection points of each support stand is displaceable so that the support stand can be adjusted to the inclination of the roof, and wherein the method further comprises the step of arranging the displaceable connection point of each support stand so that the support legs are substantially vertical.
 9. The method of claim 7 or 8, wherein the lifting tool further comprises further comprising a mounting strap which can be spanned between the support bases, and wherein the method further comprises the step of spanning the mounting strap between the support bases along the upper side of a top element of the window frame.
 10. The method of any one of claims 7 to 9, wherein the supports stands each comprise a batten hook and wherein the method further comprises the step of attaching the batten hooks to a nearby batten of the roof construction.



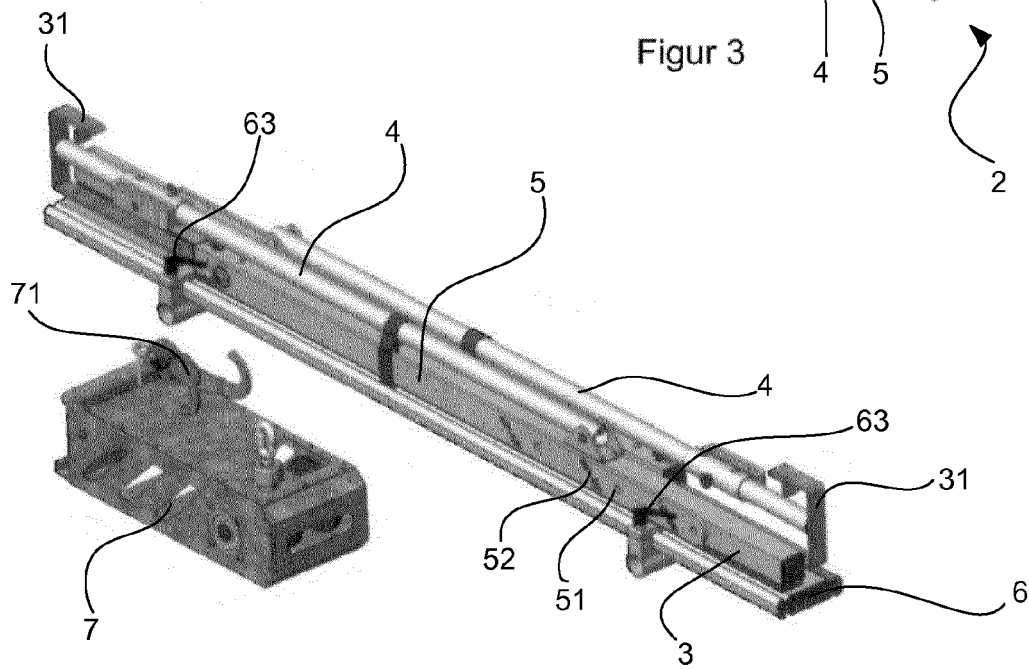
Figur 1



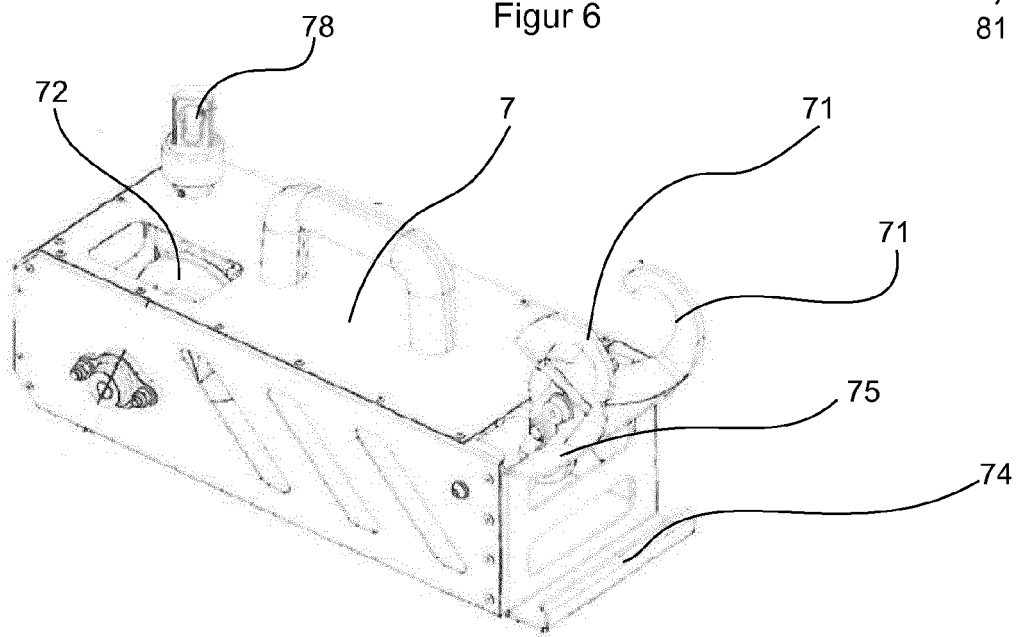
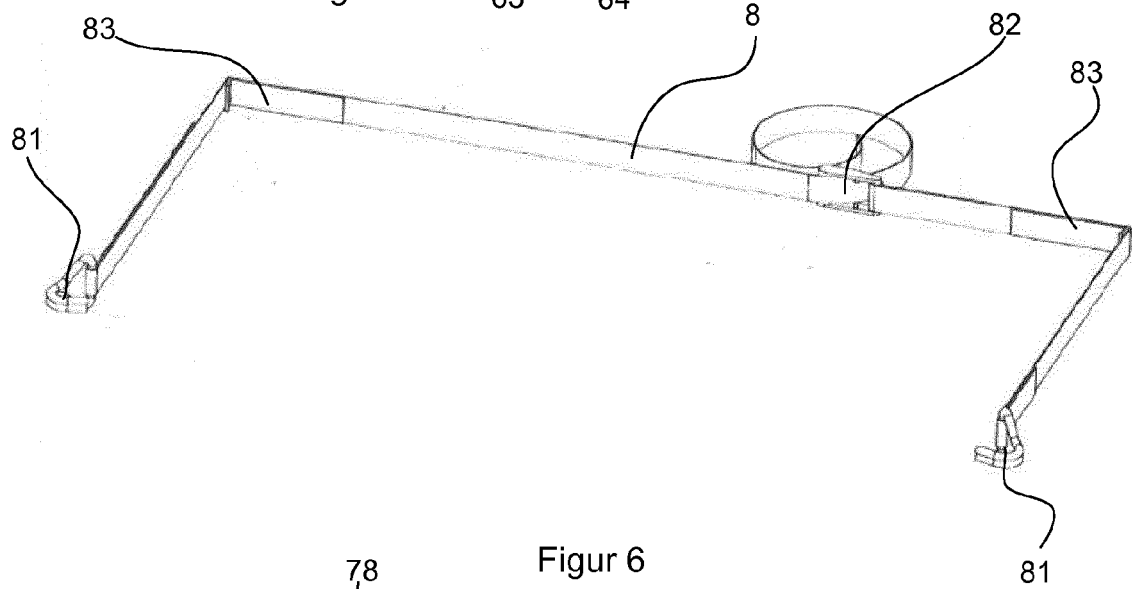
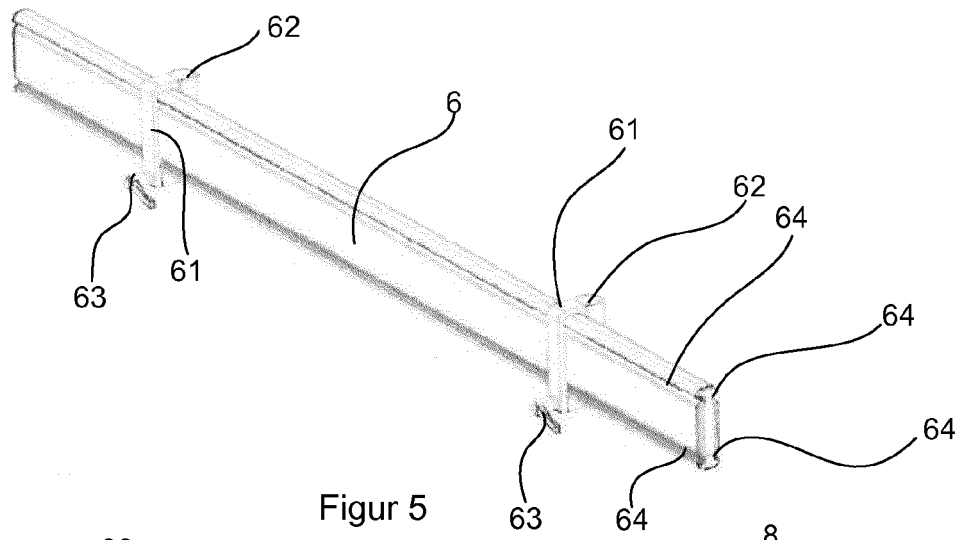
Figur 2

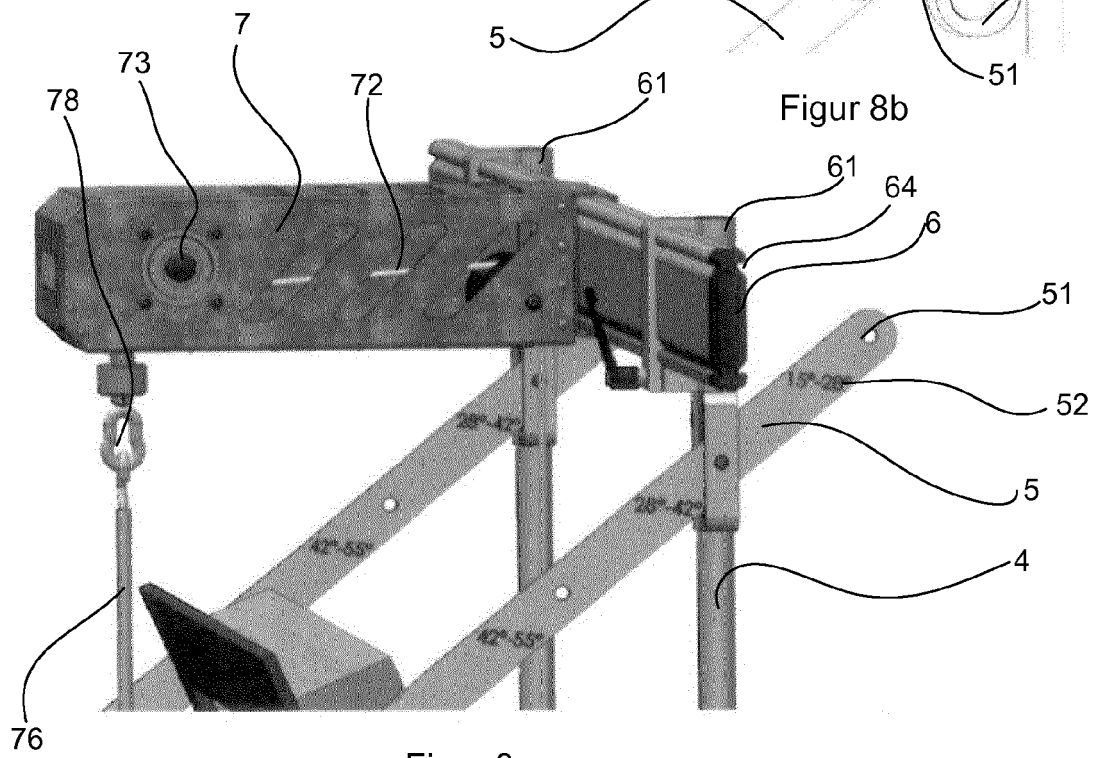
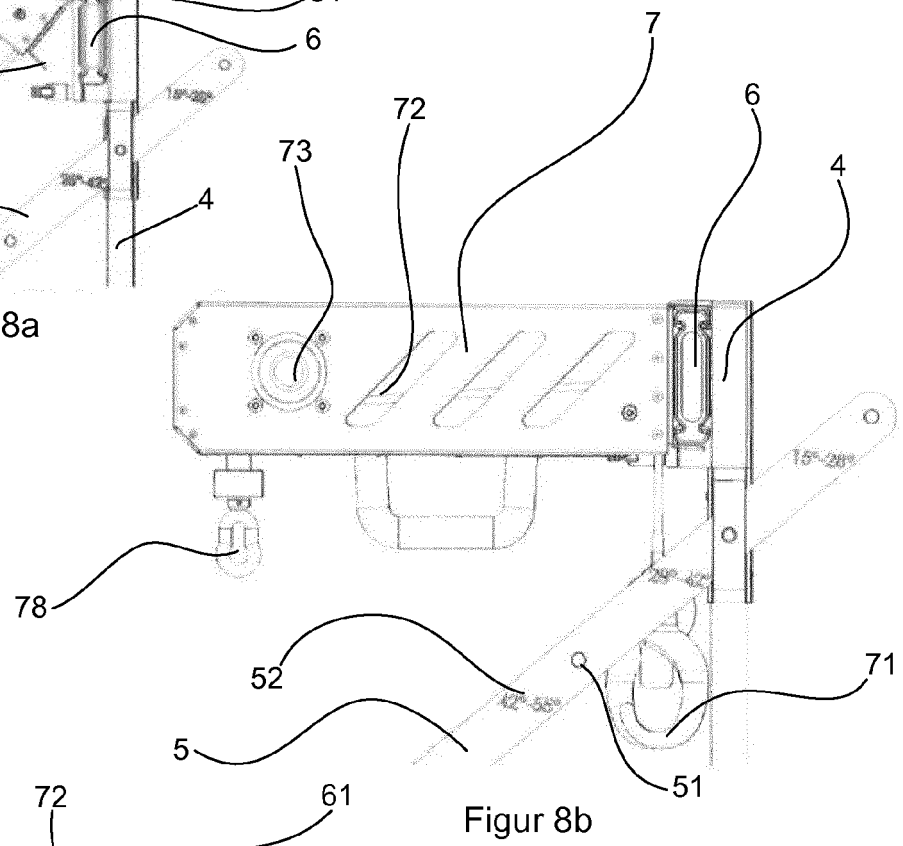
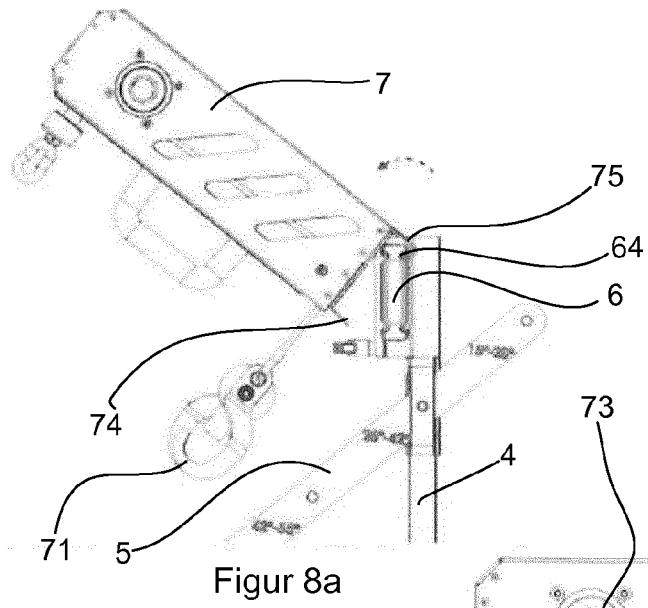


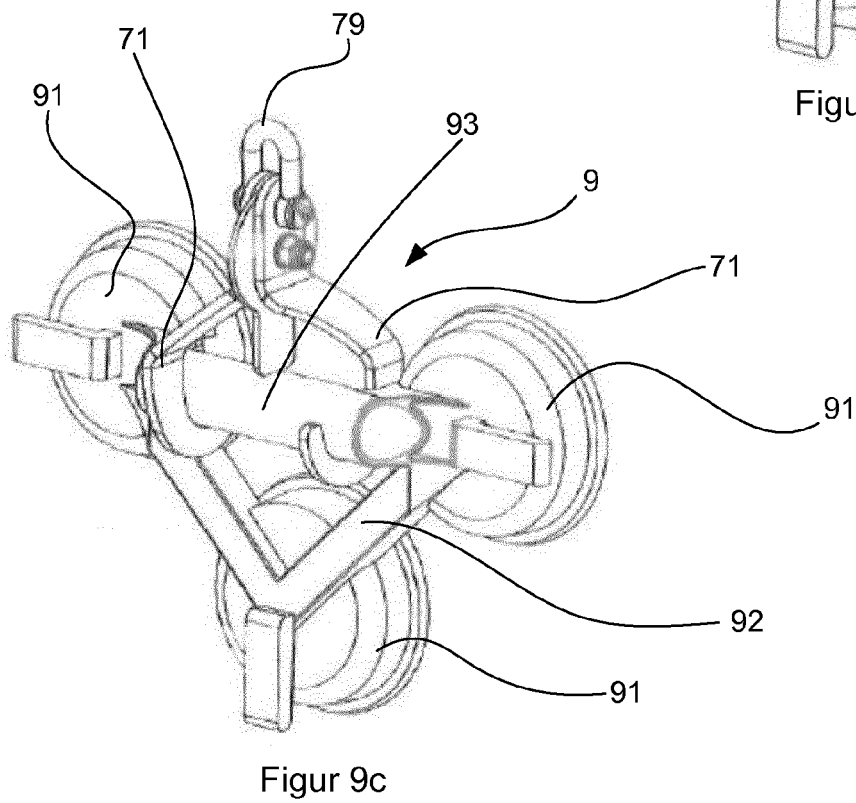
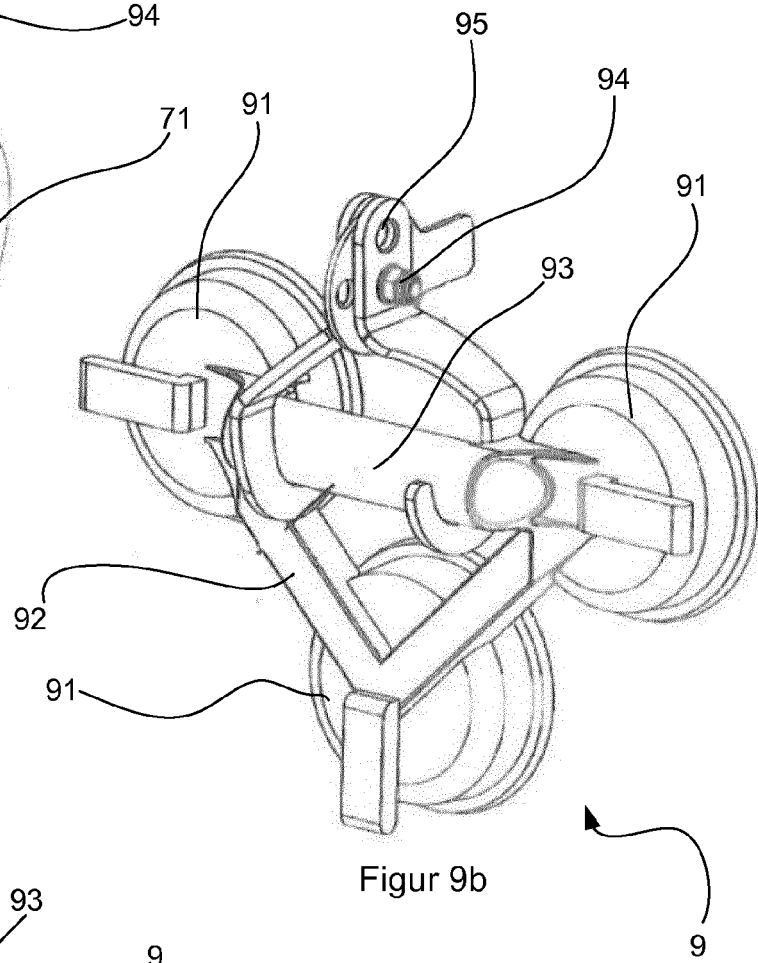
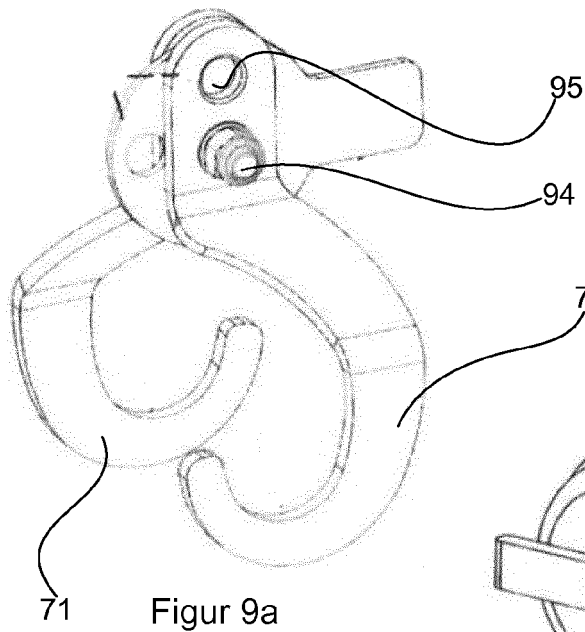
Figur 3

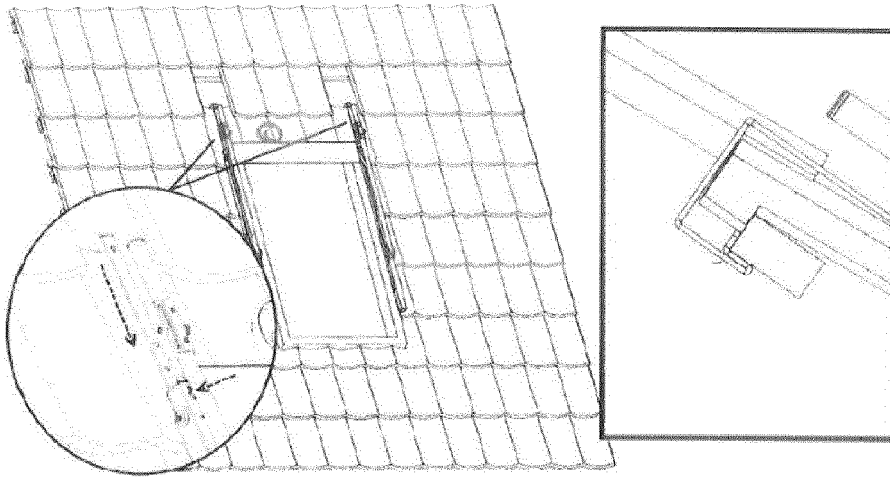


Figur 4

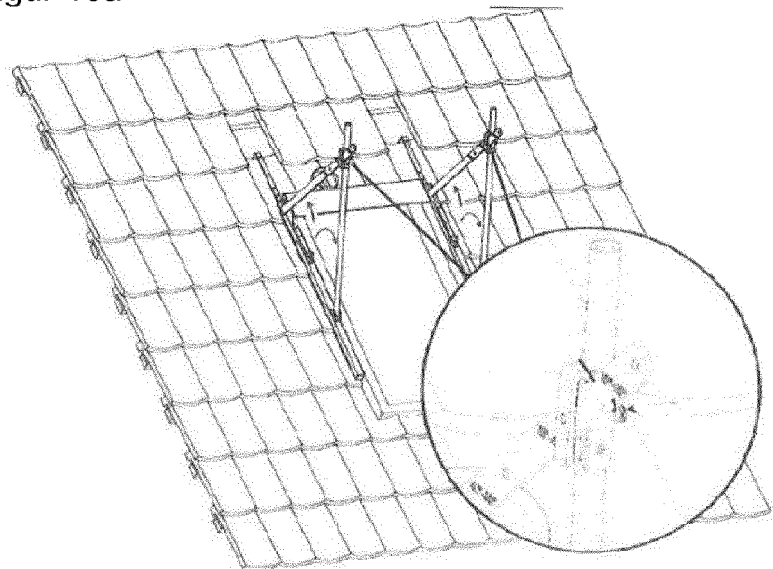




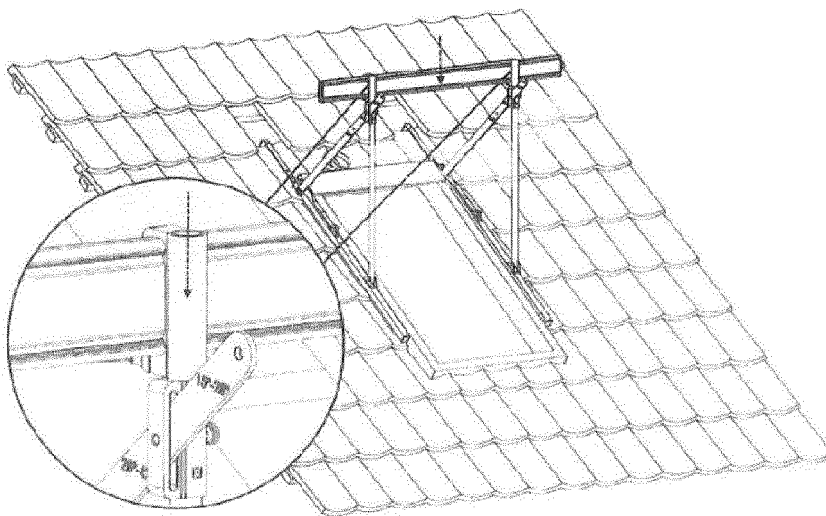




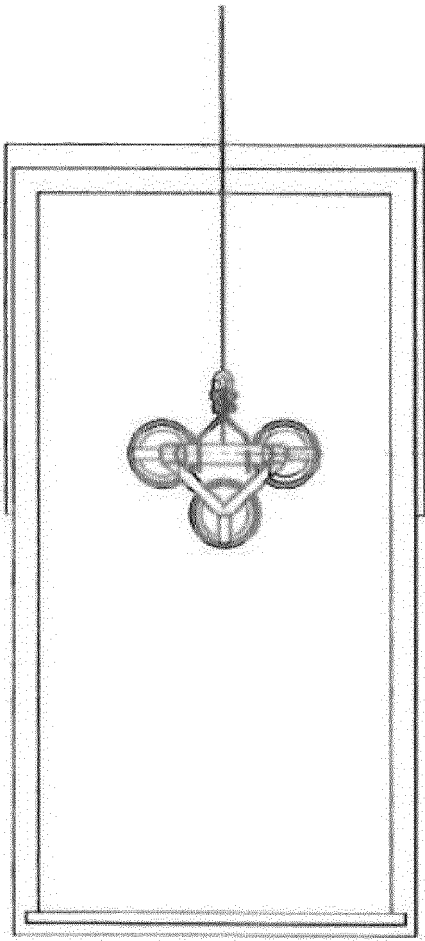
Figur 10a



Figur 10b



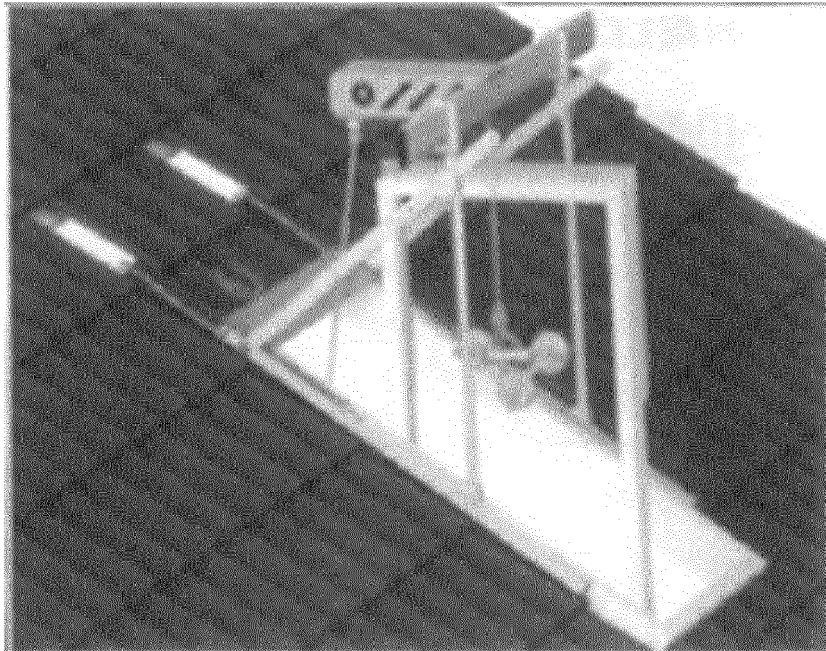
Figur 10c



Figur 11a



Figur 11b



Figur 11c



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 15 1862

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Y	US 2012/298939 A1 (ANDREWS JESS PAUL [US]) 29 November 2012 (2012-11-29) * figures 1,2b,3,9 *	1-10	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 March 2018	Examiner Manera, Marco
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29-03-2018

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