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(54) TRANSPORT OF LIGHT BUILDING PANELS

VORRICHTUNG UND VERFAHREN ZUM TRANSPORTIEREN VON LEICHTEN BAUPLATTEN
DISPOSITIF ET PROCEDE DESTINES AU TRANSPORT DE PANNEAU DE CONSTRUCTION
LEGER

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Description

Field of the invention

[0001] Transport of light building panels.

Description of the problem

[0002] The invention relates to the problem of manufacturing for transport and method for transport of light building panels or similar elements, said elements comprised of filling (core) and a shell and are at least on one side designed in such a fashion as to enable overlap of panels. At the same time the solution addresses the problem of mechanical characteristics and possible damage of shell coloring to prevent damage to shell and to its cover during the transport.

State of the Art

[0003] During the process of assembly of light building panels one often encounters problems due to their size. Despite their low density they are heavy because of their size. Cranes must therefore be used during the assembly. There are several methods for connecting of panels to cranes during transport. One of the approaches is attachment of panels using suction pads. These methods require several attachment points due to weight of the panel while at the same time expose the panels to damage, particularly the color. The second family of solutions address the problem by use of hooks which have to be positioned between outer and inner layers of a shell of building panel. Said hooks are limited in size due to edges of building panels. When the hook is positioned between the inner and outer layer of the shell and turned for 90 degrees the limiting factor becomes the size of the hook's main body. Such an example is presented in patent application WO 9320004. not damage an exterior of the coloring yet presents another challenge. Namely, the attachment is pointwise hence several attachment points must be used to prevent damage to the panels. The transport of light building panels with thin shells is to-date still unsolved if relatively few attaching points are to be used. Decreasing of number of attachment points results in decrease of manipulation time.

[0004] In addition, patent document DE 1.756,606 discloses a device for transport of light building panel comprising of a housing, at least one gripping element, and at least one connecting means element to connect the gripping element to the housing, wherein the gripping element comprises a hook, said hook used to engage the light building panel, and a longer leg (upper part of the gripping element 5 or 6), said longer leg used to connect the gripping element to the housing.

Description of new solution

[0005] The subject of new invention is Device and method for transport of light building panels procedure and is solving above described technical problem whereby the invention takes mostly advantage of shape-wise attachment of building panel onto the transporter. The method enables attachment at one, two or several points whereby the gripping elements are of arbitrary length, hence the specific load on the building panel is continuous rather than pointwise which reduces possibility of structural damage and damage of the color. The gripping elements attach to edges of outer and inner layer of the shell from within so there should be no visible tracks of attachment following the transport.

[0006] Light building panels are building elements and are used for facades and roofs. They typically comprise outer layer and inner layer giving the panel form, and filling giving the panel insulation capabilities and appropriate strength.

[0007] The device for transport of light building panels is comprised of at least one attachment head which attaches to the light building panel. Each attachment head is comprised of a cover, a hanging element, and at least one gripping element. The cover and the hanging elements comprise a housing of the attachment head. The gripping element is positioned under folded edges of the panel, fixed in the position relative to the panel, and used for transport of panel using the following algorithm:

- inserting at least one gripping element in such a fashion that lower leg of said element extends under the folded edges of the panel;
- rotation of said gripping element around center of rotation whereby an axis of rotation is positioned essentially parallel to the edge of the panel, said rotation to last until the upper leg of said element leans against a supporting surface which can be either upper leg of another gripping element if used in pair or some other surface;
- fixing of said element rotated into its final position relative to said element;
- attaching of said element to a transporting device, e.g. crane, and transport of the panel to its final destination.

[0008] At least one gripping element with the cover and the hanging element form single element which provides for appropriate force exerted on the panel via principle of the lever during elevation and transport of the panel. The actual level of force is connected to weight of the panel - heavier the panel larger the force. The cover and the gripping element are formed in such a fashion that they fix the edge of the panel between them when ready for transport.

[0009] The hanging element is connected to the cover via flexible (rotatable) connecting element. It connects all parts of the device into single rigid device. The flex-

ible connecting element may be manufactured in such a fashion that a distance between a center of the auxiliary pin (6) and a center of the pin (7) is smaller than a distance between the center of the pin (7) and the center of a hole or other attaching means to attach attachment head to a crane's cable or some other form of transporting device. If such a case the lever mechanism provides for appropriate force exerted between the cover and the gripping element.

[0010] The gripping element or plurality thereof may be of various length. They are inserted through the cover and may be of such design that they cannot be separated from the cover and the hanging element. The upper leg of the gripping element should be long enough to provide for easy enough handling (due to use of principle of the lever) with hands and without tools or accessories not usually found on the building site.

[0011] The new invention is described in more detail below with description of embodiments and drawings whereby the drawings make integral part of this patent application and show:

Figure 1 shows cross section through the attachment head for transport of light building panel in position on the edge of the panel and in locked (closed) position ready for transport whereby the figure shows an insulation filling - core (1), a shell (2) of the light building panel, a cover (3), a gripping element (4), a hanging element (5), and pin (7).

Figure 2 shows the attachment head from the side look and from the bird's view showing the cover (3), the gripping element (4), the hanging element (5), an auxiliary pin (6), and the pin (7).

Figure 3 shows a principle the attachment head operation whereby one observes the insulation filling - core (1), the shell (2) of the light building panel, the cover (3), and the gripping element (4) in various positions.

Figure 4 shows the attachment head in its unlocked (opened) position whereby the figure shows the cover (3), the gripping element (4), the hanging element (5), and the auxiliary pin (6).

Figure 5 shows an example of attaching the light building panel for embodiment with two attachment heads.

[0012] The material of the top layer (the shell) of the light building panels (2) can be different, from steel sheet, aluminum, copper, or other metal sheet to plastics. It must provide for suitable mechanical properties, particularly in part of the shell which attaches to the attachment head which attaches to the folded edge of the panel. Should the shell be made of brittle or soft material the edge can be manufactured using double or multiple

folded edge of the shell or with adding of reinforcing elements which further distribute the load arising of attachment across larger area hence reducing the stress in the shell.

[0013] During locking of the attachment head the attachment head is positioned onto the attaching edge of the panel. The cover (3) of the attachment head is positioned on the top of attaching side of the panel. The hooks of the gripping elements (4) are positioned underneath the edges of the attaching side (as presented in the figure 3) which requires appropriate design of the core (1) and the shell (2) of the light building panel. The design must allow for positioning of the hooks of the gripping elements and process of locking and unlocking. During the operation of locking the hooks are extending more and more underneath the edges while the longer legs (as opposed to the shorter legs which are also known as hooks for purposes of this application) of the gripping elements (4) are closing in and the hooks engage the panel.

[0014] When the gripping elements (4) which are two in this embodiment are in their final position, in this embodiment in essentially vertical position they should be locked in this position and at the same time hanged using the hanging element (5) and secured using pin (7). The pin (7) extends through both longer legs of the gripping elements and through the hanging element (5). The hanging element (5) clasps (hugs) around both gripping elements (figure 2).

[0015] The hanging element (5) closes (locks) by rotating around the center the rotation which is signified by auxiliary pin (6). By rotating the hanging element (5) clasps around both longer legs of the gripping elements (4) or plurality thereof. The hanging and gripping elements are connected to each other by pin (7). The pin (7) may also feature security element against pin falling out. The cover (3) and the gripping element (4) are designed to clutch the edges of the attaching between the cover and respective hook of the gripping element (4) thereby providing for solid connection between attachment head and the panel.

[0016] The transport is performed using two attachment heads as presented in figure 5, however this does not exclude possibility to perform the transport with a single or multiple attachment heads.

[0017] Due to the principles of lever one can change the level of force exerted on the edge of the panel as experienced due to clutching of the edge between the cover (3) and the hook of the gripping element (4) or plurality thereof

Claims

1. Device for the transport of a light building panel having a core (1) and a shell (2) with folded edges on its attaching side, whereby said device comprises a cover (3) to be positioned on the top of the attach-

ing side of the light building panel, at least one gripping element (4) with a hook to be positioned underneath the edges of the light building panel, at least one hanging element (5) to be attached to a transporting device, said gripping (4) and hanging elements (5) being connected to each other using connecting means (7), **characterized in that** said hanging element (5) is rotatably connected to said cover (3) and **in that** said connecting means (7) can lock said hanging element (5) with said at least one gripping element (4) so that said at least one gripping element (4) and said cover (3) can clutch the edges of the shell of the light building panel.

2. Device for transport of light building panel according to claim 1, **characterized in that** it comprises at least two gripping elements (4), and is capable of positioning of each gripping element (4) to extend a hook underneath a fold forming an edge of the light building panel shell, said gripping elements (4) positioned in such a way that hooks of each neighboring gripping element (4) extend in essentially collinear but opposite direction, each of said gripping elements (4) rotating around virtual center of rotation until longer legs of said gripping elements (4) lean against each other, and locking of said gripping elements with connecting means.

3. Device for the transport of light building panel according to any of the preceding claims, **characterized in that** connecting means comprise at least one pin (7), said pin (7) serving as connection between said hanging element (5) and at least one gripping element (4).

4. Device for the transport of light building panel according to any of the preceding claims, **characterized in that characterized in that** the hanging element (5) is freely rotatable around an auxiliary pin (6) and when locked extends around at least one gripping element (4).

5. Device for the transport of light building panel according to any of the preceding claims, **characterized in that** the gripping element (4) is placed through the cover (3), said cover (3) designed in such a way that once assembled the gripping element (4) cannot be nondestructively separated from the cover (3) and the hanging element (5), and forms a unit with the cover (3) and the hanging element (5).

6. Device for the transport of light building panel according to any of the preceding claims, **characterized in that** the gripping element (4) comprises an upper leg which is long enough that the gripping element (4) can be turned into final position ready for locking using power of an average construction

worker without additional tools or equipment.

7. Device for the transport of light building panel according to any of the preceding claims, **characterized in that** the gripping element (4) forms a unit with the cover (3) and the hanging element (5), and that said unit taking advantage of lever mechanism exerts force on the panel during transport, said force increasing with increased weight of the panel transported.

8. Device for the transport of light building panel according to claim 4, or to any of claims 5 to 7 when dependent upon claim 4, **characterized in that** the freely rotatable junction around the auxiliary pin (6) is designed in such a fashion that a distance between the center of the auxiliary pin (6) and the pin (7) is smaller than a distance between the center of the pin (7) and opening in the hanging element (5) used to attach the unit to the transporting means.

Patentansprüche

1. Vorrichtung für den Transport einer Leichtbauplatte, die einen Kern (1) und eine Schale (2) mit gefalteten Rändern an ihrer Halterungsseite, wobei diese Vorrichtung eine Abdeckung (3), die an der Oberseite der Halterungsoberseite der Leichtbauplatte positionierbar ist, mindestens ein Greiferelement (4) mit einem Haken, der unter den Rändern der Leichtbauplatte positionierbar ist, und mindestens ein Hängeelement (5) aufweist, das an einer Transportvorrichtung anbringbar ist, wobei diese Greifer-(4) und Hängeelemente (5) unter Verwendung einer Verbindungseinrichtung (7) miteinander verbunden sind, **dadurch gekennzeichnet, daß** dieses Hängeelement (5) drehbar an dieser Abdeckung (3) angeschlossen ist, und daß diese Verbindungseinrichtung (7) dieses Hängeelement mit diesem mindestens einen Greiferelement (4) verriegeln kann, derart, daß dieses mindestens eine Greiferelement (4) und diese Abdeckung (3) die Ränder der Schale der Leichtbauplatte ergreifen können.

2. Vorrichtung für den Transport einer Leichtbauplatte nach Anspruch 1, **dadurch gekennzeichnet, daß** sie mindestens zwei Greiferelemente (4) aufweist und in der Lage ist, jedes Greiferelement (4) zu positionieren, um einen Haken unter eine Falte zu stellen, die einen Rand der Leichtbauplattenschale bildet, wobei diese Greiferelemente (4) in einer solchen Weise positioniert sind, daß Haken von jedem benachbarten Greiferelement (4) sich im wesentlichen kollinear aber in entgegengesetzter Richtung erstrecken, wobei jedes dieser Greiferelemente (4) sich um ein virtuelles Rotationszentrum dreht, bis längere Schenkel dieser Greiferelemente gegen-

einander zur Anlage kommen, wobei diese Greiferelemente mit der Verbindungseinrichtung verriegelt werden.

3. Vorrichtung für den Transport einer Leichtbauplatte gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** die Verbindungseinrichtung mindestens einen Zapfen (7) aufweist, und daß dieser Zapfen (7) als Verbindung zwischen diesem Hängeelement (5) und mindestens einem Greiferelement (4) dient.
4. Vorrichtung für den Transport einer Leichtbauplatte gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Hängeelement (5) frei drehbar um einen Hilfszapfen (6) ist und sich, wenn verriegelt, um mindestens ein Greiferelement (4) erstreckt.
5. Vorrichtung für den Transport einer Leichtbauplatte gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Greiferelement (4) durch die Abdeckung (3) angebracht ist, daß die Abdeckung (3) derart konstruiert ist, daß, sobald montiert, das Greiferelement (4) nicht zerstörungsfrei von der Abdeckung (3) und dem Hängeelement (5) getrennt werden kann und eine Einheit mit der Abdeckung (3) und dem Hängeelement (5) bildet.
6. Vorrichtung für den Transport einer Leichtbauplatte nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Greiferelement (4) einen oberen Schenkel aufweist, der lang genug ist, daß das Greiferelement (4) in die für das Verriegeln fertige Endposition verschwenkt werden kann, indem die Kraft eines durchschnittlichen Bauhandwerkers ohne zusätzliche Werkzeuge oder Ausrüstung verwendet wird.
7. Vorrichtung für den Transport einer Leichtbauplatte nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Greiferelement (4) eine Einheit mit der Abdeckung (3) und dem Hängeelement (5) bildet, und daß diese Einheit unter Zurnutzemachung eines Hebelmechanismus während des Transports Kraft auf die Platte ausübt, wobei diese Kraft mit erhöhtem Gewicht der transportierten Platte größer wird.
8. Vorrichtung für den Transport einer Leichtbauplatte nach Anspruch 4 oder einem der Ansprüche 5 bis 7 sofern abhängig von Anspruch 4, **dadurch gekennzeichnet, daß** die frei drehbare Verbindung um den Hilfszapfen (6) in einer solchen Weise konstruiert ist, daß ein Abstand zwischen dem Zentrum dieses Hilfszapfens (6) und dem Zapfen (7) kleiner ist als ein Abstand zwischen dem Zentrum des Zapfens (7) und einer Öffnung in dem Hängeelement

(5) die benutzt wird zur Befestigung der Einheit an der Transportvorrichtung.

5 Revendications

1. Dispositif pour le transport d'un panneau de construction léger comprenant un coeur (1) et une gaine (2) avec des bords pliés sur son côté de fixation, moyennant quoi ledit dispositif comprend un couvercle (3) à positionner au sommet du côté de fixation du panneau de construction léger, au moins un élément de préhension (4) avec un crochet à positionner sous les bords du panneau de construction léger, au moins un élément suspenseur (5) à attacher à un dispositif de transport, lesdits éléments de préhension (4) et suspenseur (5) étant raccordés l'un à l'autre en utilisant des moyens de raccord (7) **caractérisé en ce que** ledit élément suspenseur (5) est raccordé avec faculté de rotation audit couvercle (3) et **en ce que** les moyens de raccord (7) peuvent bloquer ledit élément suspenseur (5) avec ledit au moins un élément de préhension (4) de sorte que ledit au moins un élément de préhension (4) et ledit couvercle (3) peuvent embrayer les bords de la gaine du panneau de construction léger.
2. Dispositif pour le transport d'un panneau de construction léger selon la revendication 1, **caractérisé en ce qu'il** comprend au moins deux éléments de préhension (4), et est capable de positionner chaque élément de préhension (4) pour étendre un crochet sous un pli formant un bord de la gaine de panneau de construction léger, lesdits éléments de préhension (4) étant positionnés de telle manière que les crochets de chaque élément de préhension voisin (4) s'étendent dans une direction essentiellement colinéaire mais opposée, chacun desdits élément de préhension (4) tournant autour d'un centre de rotation virtuel jusqu'à ce que les jambes plus longues desdits éléments de préhension (4) s'appuient l'une contre l'autre, et bloquant lesdits éléments de préhension avec les moyens de raccord.
3. Dispositif pour le transport d'un panneau de construction léger selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de raccord comprennent au moins une cheville (7), ladite cheville (7) servant de raccord entre ledit élément suspenseur (5) et au moins un élément de préhension (4).
4. Dispositif pour le transport d'un panneau de construction léger selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément suspenseur (5) est librement rotatif autour d'une cheville auxiliaire (6) et lorsqu'il est bloqué, s'étend autour d'au moins un élément de préhension

sion (4).

5. Dispositif pour le transport d'un panneau de construction léger selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de préhension (4) est placé à travers le couvercle (3), ledit couvercle (3) étant conçu de telle manière qu'une fois assemblé, l'élément de préhension (4) ne peut pas être séparé de manière non destructive du couvercle (3) et de l'élément suspenseur (5), et forme une unité avec le couvercle (3) et l'élément suspenseur (5). 5
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6. Dispositif pour le transport d'un panneau de construction léger selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de préhension (4) comprend une jambe supérieure qui est suffisamment longue pour que l'élément de préhension (4) puisse être tourné en position finale, prête pour un blocage, en utilisant la puissance d'un travailleur dans la construction moyen sans outil ou équipement supplémentaire. 15
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7. Dispositif pour le transport d'un panneau de construction léger selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de préhension (4) forme une unité avec le couvercle (3) et l'élément suspenseur (5), et **en ce que** ladite unité, tirant profit du mécanisme de levier, exerce une force sur le panneau pendant le transport, ladite force augmentant avec un poids croissant du panneau transporté. 25
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8. Dispositif pour le transport d'un panneau de construction léger selon la revendication 4, ou l'une quelconque des revendications 5 à 7 lorsqu'elles dépendent de la revendication 4, **caractérisé en ce que** la jonction librement rotative autour de la cheville auxiliaire (6) est conçue de telle manière qu'une distance entre le centre de la cheville auxiliaire (6) et la cheville (7) est plus petite qu'une distance entre le centre de la cheville (7) et une ouverture dans l'élément suspenseur (5) utilisé pour fixer l'unité aux moyens de transport. 35
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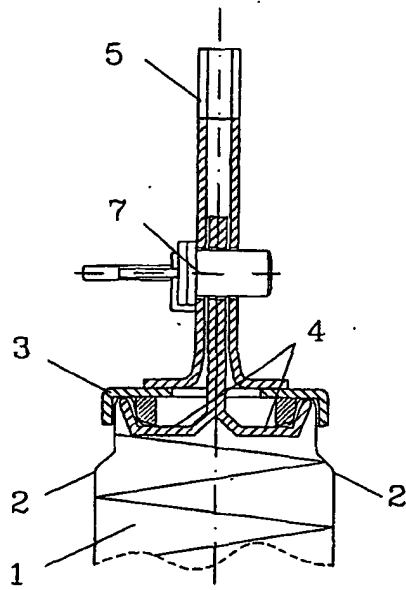


Fig. 1

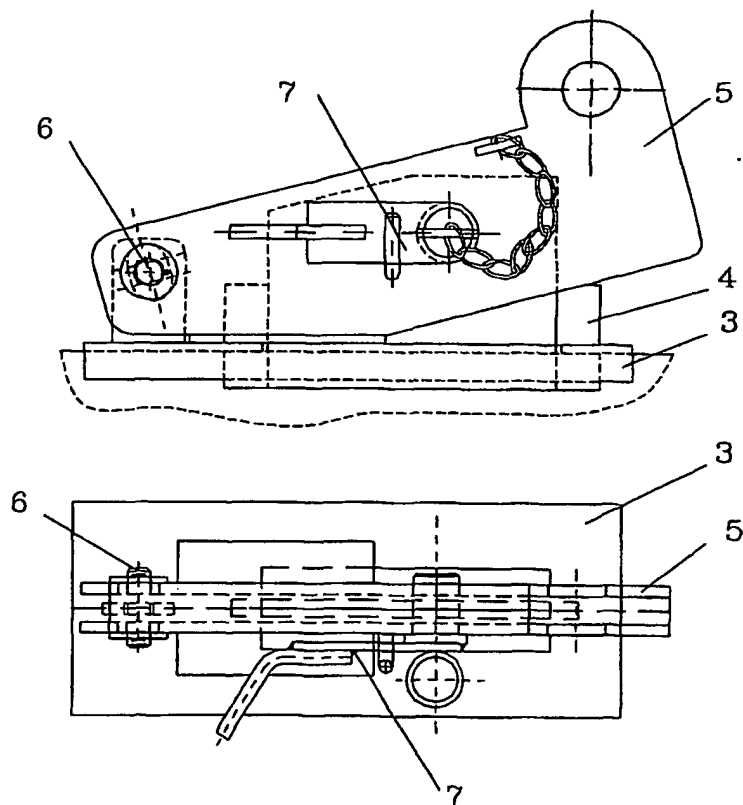


Fig. 2

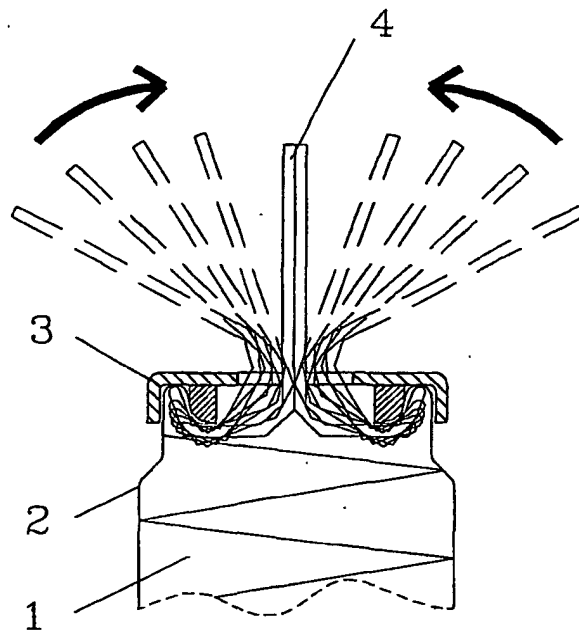


Fig. 3

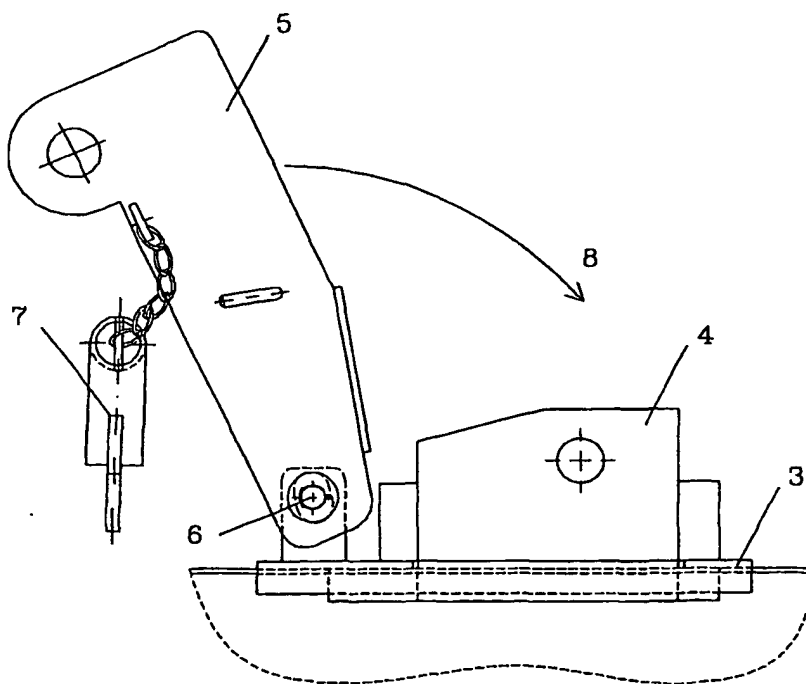


Fig. 4

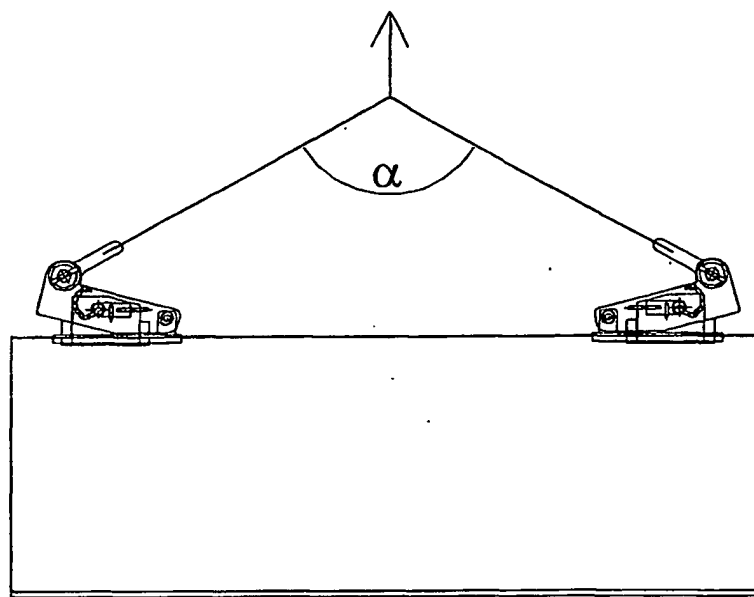


Fig. 5