(19) DANMARK

(10) DK/EP 3440285 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *E 04 G 11/38 (2006.01)* *E 04 G 17/00 (2006.01)* *E 04 G 21/32 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2022-06-27**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2022-05-04**

(86) Europæisk ansøgning nr.: **17709026.3**

(86) Europæisk indleveringsdag: **2017-03-01**

(87) Den europæiske ansøgnings publiceringsdag: **2019-02-13**

(86) International ansøgning nr.: **EP2017054812**

(87) Internationalt publikationsnr.: **WO2017174264**

(30) Prioritet: **2016-04-08 DE 102016205957**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **PERI SE, Rudolf-Diesel-Str. 19, 89264 Weißenhorn, Tyskland**

(72) Opfinder: **SCHNEIDER, Werner, Höhenblick 37, 89155 Erbach, Tyskland**
EPPELT, Gisbert, Schulstrasse 6, 89284 Pfaffenhofen, Tyskland

(74) Fuldmægtig i Danmark: **NORDIC PATENT SERVICE A/S, Bredgade 30, 1260 København K, Danmark**

(54) Benævnelse: **DÆKFORSKALLINGSSYSTEM OG FREMGANGSMÅDE TIL AT OPBYGGE ET DÆKFORSKALLINGSSYSTEM**

(56) Fremdragne publikationer:
EP-A1- 2 757 212
DE-U1-202006 003 836
ES-A1- 2 285 959

Description

[0001] The invention relates to a ceiling formwork system comprising at least one side protector for a ceiling formwork, the ceiling formwork comprising at least one formwork element having a frame. The invention furthermore relates to a method for erecting a ceiling formwork system of this kind.

[0002] It is known to use a ceiling formwork consisting of formwork elements in order to manufacture concrete ceilings. In this case, in particular frame panel formwork elements are used, which form, at least in part, a mold for pouring liquid concrete. In order to manufacture a concrete ceiling, firstly a ceiling formwork supported by ceiling supports is erected. In this case, a desired ceiling height can be achieved by positioning the ceiling formwork at a particular height. The standard ceiling height in Germany, for example in detached, semidetached and terraced houses, is at least 2.40 meters, it being possible for properties used for commercial purposes to have a significantly greater ceiling height. The pouring of the liquid concrete onto the ceiling formwork is carried out by workers who have to access the ceiling formwork. In order to protect these workers from a life-threatening fall from the ceiling formwork during pouring of the concrete, a side protector is installed on the ceiling formwork prior to the pouring of the concrete. For this purpose, side railing holders are attached laterally to the ceiling formwork, in which side railings are fastened. The side railings laterally secure the ceiling formwork and prevent workers from falling from the ceiling formwork. In general, the installation of the side protector is carried out by workers who have to access the ceiling formwork for this purpose.

[0003] EP 2 757 212 A1 describes a device for installing a safety railing on a formwork for floor boards which comprises at least two of the following elements: Means for pivoting a first end of an extension element extending largely in the longitudinal direction, under a formwork plate or under the edges of two laterally adjacent formwork plates, means for locking the second end of the extension element extending largely in the longitudinal direction to an edge of the formwork plate, the second end comprising means for installing a contact and fastening portion of a safety railing.

[0004] A problem is that there is an increased risk of workers falling from the ceiling formwork, during installation of the side protector.

[0005] The object of the present invention is therefore that of designing and developing the known side protector in such a way that it allows for reliable mounting.

[0006] This object is achieved according to the invention by a ceiling formwork system having the features of claim 1 and by a method for erecting a side protector of this kind according to claim 11.

[0007] The dependent claims specify expedient developments.

[0008] The object according to the invention is thus achieved by a ceiling formwork system comprising a ceiling formwork having at least one formwork element having a frame, at least one side protector which is mounted on the ceiling formwork in an end position, and an mounting rail. The ceiling formwork comprises at least one formwork element having a frame. The side protector comprises a railing. The side protector furthermore comprises a pivoting frame to which the railing is connected and which is indirectly connected to the frame of a formwork element from the bottom side of the ceiling formwork. The pivoting frame can be pivoted about an axis of rotation A, out of an installation position and into the end position, in which end position the railing secures the ceiling formwork laterally in the region of the free edge of the at least one formwork element. The mounting rail has a horizontal alignment or orientation. Thus, according to the invention, the pivoting frame is first mounted indirectly on the frame of a formwork element, from solid ground. Thereupon, the pivoting frame together with the railing fastened to the pivoting frame is likewise pivoted, from solid ground, out of an installation position and into an end position in such a way that the ceiling formwork is laterally secured by the railing. The free edge of the ceiling formwork is always secured by means of the lateral securing. In the installation position, the pivoting frame is indirectly connected to the frame of the formwork element but the pivoting frame is not yet pivoted. In the end position, the railing protrudes laterally upwards beyond the ceiling formwork. In this case, upwards beyond the ceiling formwork means that the railing extends from the ceiling formwork arranged in parallel with the ground, in a direction facing away from the ground.

[0009] It is thus not necessary for workers to access the unsecured ceiling formwork in order to attach the side protector. When the ceiling formwork is accessed for pouring the liquid concrete onto the formwork elements, the ceiling formwork is already secured laterally. A life-

threatening fall from the ceiling formwork when first accessing the ceiling formwork is thus effectively prevented, according to the invention. Secure installation of the side protector according to the invention is ensured.

[0010] According to the invention, the pivoting frame is pivotably connected to the frame in an indirect manner, specifically via the mounting rail.

[0011] In this case the mounting rail is connected to the frame, and the pivoting frame is connected to the mounting rail so as to be pivotable about an axis of rotation A.

[0012] The pivoting frame can comprise a pivoting base frame and a pivoting flap. The pivoting flap is connected to the pivoting base frame so as to be pivotable about an axis of rotation B. The pivoting base frame can comprise two longitudinal members. The longitudinal members can be interconnected by means of a plurality of crossbeams. Both the longitudinal members and the crossbeams can be of different geometrical shapes in cross-section. For example, a cylindrical or any polyhedral shape would be conceivable. However, the longitudinal members are preferably designed having a rectangular cross section, and the crossbeams having a square cross section. Furthermore, both the longitudinal members and the crossbeams can be formed in a solid manner, from a bulk material. However, the longitudinal members and the crossbeams can preferably be formed as hollow profiles. This has a weight advantage compared with solid manufacture. Alternatively or in addition thereto, the longitudinal members can be interconnected by transverse connectors. The transverse connectors are designed as flat plates. Longitudinal members, crossbeams and/or transverse connectors can be manufactured from plastics material or wood. However, these are preferably made from metal, for example aluminum or a steel. The crossbeams and the transverse connectors can be rigidly connected to the longitudinal members, for example adhesively bonded, latched, screwed or welded.

[0013] The longitudinal members can be formed in two parts, specifically can comprise a first longitudinal member part and a second longitudinal member part which is angled with respect to the first longitudinal member part. The first longitudinal member part and the second longitudinal member part can be rigidly interconnected. A connection by means of a connection element would be conceivable. It is also conceivable for the first longitudinal member part and the second longitudinal member to be adhesively bonded, latched or screwed

together, or interconnected in a form-fitting or force-fitting manner. However, the first longitudinal member part and the second longitudinal member are preferably welded together. The angle between the first longitudinal member part and the second longitudinal member part can be from 90 degrees to almost 180 degrees. However, the angle between the first longitudinal member part and the second longitudinal member part is preferably approximately 90 degrees.

[0014] A pin can protrude from each of the two first longitudinal member parts, in the region of the free ends thereof. In principle, the pin can merely be arranged on those side surfaces of the respective first longitudinal member which make it possible for the longitudinal axis of the pin arranged on one of the two first longitudinal members and the longitudinal axis of the pin arranged on the other of the two first longitudinal members to be located in the common axis of rotation A. The side surface of the respective longitudinal member part which is opposite the side surface comprising the pin can also comprise a pin. In this case, it is very particularly important for the longitudinal axes of all the pins to necessarily lie in the common axis of rotation A. However, it is preferable for each of the two first longitudinal member parts to comprise a passage through which a pin extends. The pin extends away from the respective first longitudinal member part on both sides, and/or protrudes out of the respective first longitudinal member part on both sides. Here, too, the longitudinal axis of the pin extending through the passage of one of the two first longitudinal member parts and the longitudinal axis of the pin extending through the passage of the other of the two first longitudinal member parts must be located in the common axis of rotation A.

[0015] In a further embodiment, the axis of rotation A can extend in a manner spaced apart from the two first longitudinal member parts. In this embodiment, spacer support pieces are formed on the ends of the two first longitudinal member parts, which spacer support pieces extend substantially at right angles to the first longitudinal member parts. The pins which are then located in the axis of rotation A are formed in the free end region of the spacer support pieces.

[0016] If spacer support pieces are provided on the first longitudinal member parts, then these are also formed between the first longitudinal member parts and the second longitudinal member parts.

[0017] If pivoting frames with and without spacer support pieces are provided, then these pivoting frames can be arranged in a crisscross manner. That is to say that pivoting frames with spacer support pieces can extend underneath pivoting frames without spacer support pieces. It is thus possible to simultaneously equip longitudinal and transverse sides of a ceiling formwork with the side protector, by means of the pivoting frame with and without spacer support pieces.

[0018] For both embodiments of pivoting frames with and without spacer pieces, structurally identical mounting rails can be used. The pivoting flap can comprise two side parts. The side parts can be formed as elongate plates, which comprise a profiling on the side regions thereof. The side parts can preferably comprise a step, on one of the longitudinal sides thereof, in the edge region, for bearing on the formwork element. The side parts can be made of plastics material, metal or wood. However, the side parts are preferably made of metal. The side parts can be interconnected at least by means of a further crossbeam. The cross section of the at least one further crossbeam can be of different geometrical shapes. For example, a rectangular, a cylindrical or any polyhedral shape would be conceivable. However, the at least one further crossbeam is preferably formed having a square cross section. The at least one further crossbeam can be rigidly connected, for example adhesively bonded, screwed or welded, to the side parts.

[0019] A coupling element can be arranged on the further crossbeam. The coupling element can be rigidly connected, for example adhesively bonded, screwed or welded, to the at least one further crossbeam. A locking element is hinged to the coupling element so as to be pivotable about an axis of rotation C. The locking element can comprise at least one lug for engaging behind one of the plurality of crossbeams. The locking element preferably comprises two side plates which are identically designed and which each comprise a lug, and which are interconnected by a connection plate. The coupling element is arranged between the two side plates of the locking element and is pivotably mounted by means of a further pin which extends through the side plates of the locking element and the coupling element. In order to prevent unintentional release of the rear engagement of one of the plurality of crossbeams, a resilient means may be provided between the locking element and coupling element, in order to generate a restoring force. The resilient means can for example be a spring or a rubber band.

[0020] The mounting rail can be designed as a beam. The cross section of the beam can be of different geometrical shapes. For example, a rectangular, a cylindrical or any polyhedral shape

would be conceivable. However, the beam is preferably formed having a square cross section.

[0021] At least one mounting bracket, in particular two pairs of mounting brackets, can be arranged on the beam. The mounting brackets are designed as plates which are substantially S-shaped. At the end thereof remote from the beam, each of the mounting brackets can comprise a first notch for receiving the pin. The notch for receiving the pin can be formed as a curved finger. In addition, the mounting brackets together with the beam can in each case form a further second notch for engaging behind a projection of the frame. The beam and/or the mounting brackets can be manufactured from wood, plastics material or metal, for example aluminum or steel. The mounting brackets can be rigidly connected, for example adhesively bonded, screwed or welded, to the beam. The two first longitudinal member parts can in each case be positionable between one of the pairs of mounting brackets. In this case, one mounting bracket is arranged on each side of the respective first longitudinal member part. In this case, the pin extending away from the respective first longitudinal member part or the spacer support piece, on both sides, can be pivotably mounted in the notches of the pair of mounting brackets, such that a mounting bracket can come to bear, on both sides, in one notch in each case.

[0022] Alternatively or in addition to the mounting brackets, a securing flap can be arranged on the beam. The securing flap can comprise an abutment element. The abutment element can be formed as a substantially sickle-shaped plate and can be manufactured from wood, plastics material or metal, for example aluminum or steel. Furthermore, the abutment element can be rigidly connected, for example adhesively bonded, screwed or welded, to the beam. The abutment element, just like the mounting brackets, can, together with the beam, form a further notch for engaging behind a projection of the frame. The abutment element can furthermore comprise a taper for engaging in an aperture opening of the frame. The taper may be designed so as to be wedge-shaped. The securing flap can furthermore comprise a securing lever. The securing lever is pivotably connected to the beam. For this purpose, the securing lever can comprise a further feed-through, and a further pin can be provided on the beam. The further pin arranged on the beam can extend through the further feed-through of the securing lever. Release of the securing lever from the further pin can be preventable by a splint inserted into the further pin.

[0023] The railing can comprise two longitudinal struts. The longitudinal struts can be interconnected by means of a plurality of transverse struts. The longitudinal struts and/or the

transverse struts can be manufactured from wood, plastics material or metal, and rigidly interconnected, for example adhesively bonded, screwed or welded together. The longitudinal struts and/or the transverse struts can be manufactured so as to be solid or can be formed as hollow profiles. The connection of the longitudinal struts with the transverse struts results in a lattice. The railing can be rigidly connected to the second longitudinal member part, for example a respective longitudinal strut of the railing can be adhesively bonded, screwed or welded to a respective second longitudinal member part. However, the railing is preferably inserted into the pivoting frame. For this purpose, the second longitudinal member parts of the pivoting frame are designed as hollow profiles, and the railing is inserted, by one of the longitudinal struts thereof in each case, into one of the hollow profiles in each case. For this purpose, the longitudinal struts must necessarily have a smaller outside diameter than inside diameter of the second longitudinal member parts which are designed as hollow profiles. The respective longitudinal struts can be fastened in a form-fitting and/or force-fitting manner, in the relevant hollow profile.

[0024] In the case of the ceiling formwork system according to the invention, the at least one side protector is mounted on the ceiling formwork. The ceiling formwork comprises at least one formwork element. The at least one formwork element comprises a frame. The at least one side protector is mounted indirectly on the frame of said formwork element. If the ceiling formwork comprises a plurality of formwork elements one side protector can preferably be installed on the frame of some of said formwork elements.

[0025] If the pivoting frame is pivoted fully into the end position, the first longitudinal member parts are oriented so as to be substantially in parallel with the formwork elements. In order to secure the pivoting frame on the formwork element in this position, the pivoting flap is pivoted fully, with respect to the pivoting frame, in the direction of the pivoting frame, about the axis of rotation. In this case, the step formed in each of the side parts of the pivoting flap comes to bear on the top side of the formwork element, as a result of which the pivoting frame is held in a supported manner on the formwork element. At the same time, the lug formed on each of the side plates of the locking element engages behind the nearest of the plurality of crossbeams and latches thereto, as a result of which slipping of the step, formed in each side part of the pivoting flap, from the top side of the formwork element, is effectively prevented. As a result, the side protector is secured in a fixed manner and immovably installed on the ceiling formwork.

[0026] In order to release the side protector from the ceiling formwork, first of all it is necessary to release the rear engagement of the lug formed on each of the side plates from the nearest of the plurality of crossbeams, and to then pivot the pivoting flap away from the pivoting frame, relative to the pivoting frame, about the axis of rotation B, as a result of which the steps, formed in each of the side parts of the pivoting flap, no longer bear on the top side of the formwork element. However, the release of the rear engagement of the lug from the nearest of the plurality of crossbeams can be achieved only from the bottom side of the ceiling formwork. The side protector therefore cannot be released proceeding from the ceiling formwork by incorrect operation by the persons working on the ceiling formwork.

[0027] The object is furthermore achieved by a method according to claim 11.

[0028] The method comprises a process step of indirect connection of the pivoting frame to the frame. The method furthermore comprises a process step of connecting the railing to the pivoting frame. Furthermore, the method comprises a process step of pivoting the pivoting frame out of an installation position, about an axis of rotation A, into an end position. In this case, the pivoting frame is pivoted such that the railing laterally secures the ceiling formwork.

[0029] Lateral securing is to be understood as securing of the free edge of the ceiling formwork. In the end position, the railing protrudes upwards beyond the ceiling formwork. In this case, upwards beyond the ceiling formwork means that the railing extends from the ceiling formwork arranged in parallel with the ground, in a direction facing away from the ground.

[0030] In order to extend a pre-existing ceiling formwork protected by ceiling supports, individual formwork elements are mounted, at two corners of the frame thereof, in a guide bracket of a ceiling support, in each case, and subsequently pivoted from solid ground.

[0031] In a process step, not according to the invention, of connecting the pivoting frame to the frame, the pivoting frame can be rigidly connected to the frame, for example by means of adhesive bonding, screwing or welding. This can already take place prior to the pivoting, for example, when the respective formwork element to be pivoted is still located on the ground. In this case it should be noted that the pivoting frame is to be pivoted together with the formwork element, in the process step of pivoting of the pivoting frame. In the case of such pivoting, the

weight of the formwork element and pivoting frame is to be pivoted all at once, in one step.

[0032] According to the invention, in the process step of connecting the pivoting frame, the pivoting frame is indirectly connected to the frame, as a result of which the pivoting frame is hinged to the frame, via the mounting rail, so as to be pivotable about the axis of rotation A.

[0033] This connection can take place before or after the pivoting of the formwork element. The formwork element is first pivoted alone, and subsequently the pivoting frame is pivoted. A pivoting of the formwork element and of the pivoting frame taking place separately from one another in the operating sequence is advantageous in that the weights of the formwork element and of the pivoting frame do not have to be pivoted at the same time. Of course, pivoting of the formwork element together with the pivoting frame in one step is also conceivable in this variant.

[0034] Alternatively, the formwork element can be pivoted in a first step, without already being connected to the pivoting frame. If the formwork element is positioned as a ceiling formwork element, then in a subsequent process step the mounting rail is connected to the frame of the pivot element. Subsequently, the pivoting frame is connected to the mounting rail, i.e. mounted in the first notches by means of the pins. Alternatively, the mounting rail can also be installed on the frame of the formwork element prior to the pivoting of the formwork element, when the formwork element is still located on the ground. In these variants, the formwork element and the pivoting frame are pivoted separately.

[0035] When securing the edge of a ceiling formwork by means of a side protector, the mounting rail is fastened to the bottom side of any formwork element. The pivoting frame together with the railing (in this case, the pivoting frame together with the railing is to be understood as the side protector which is made up of first and second longitudinal member parts, the railing, and locking elements) is mounted in the mounting rail, and the railing is to be pivoted, by pivoting the pivoting frame from below in front of the free edge of the ceiling formwork, such that the railing protrudes beyond the formwork element to such an extent that secure occupational safety for persons working on the ceiling formwork is provided.

[0036] In a particular embodiment, the pivoting frame is hinged, in the region of a formwork element, via a mounting rail which is fastened to a formwork element, which is spaced apart

from the edge formwork element by a further formwork element.

[0037] Should a transverse side of a formwork element be secured by a side protector, then the pivoting frame can be hinged to the bottom side of a formwork element via a mounting rail which is fastened to a formwork element directly following an edge formwork element.

[0038] Consequently, the side protector can be installed, unchanged in design, on the longitudinal side or on the transverse side of a formwork element as a result of which the free edge of the ceiling formwork can be secured on the longitudinal side of the formwork elements or on the transverse side of the formwork elements. If the pivoting frames intersect on the bottom side of formwork elements, together with simultaneous securing of a ceiling edge, in a longitudinal and transverse side corner, then either spacer piece supports are provided on a pivoting frame such that it is possible for a pivoting frame to engage under a pivoting frame located directly thereabove, in an overlapping manner, or notches must be provided on the pivoting frame therebelow, at locations at which two pivoting frames, positioned one above the other, coincide in the fully pivoted state.

[0039] Further features and advantages of the invention can be found in the following description of a plurality of embodiments of the invention, in the claims, and with reference to the figures of the drawings.

[0040] The features shown in the drawings are set out such that the embodiments of the ceiling formwork system according to the invention can be made clearly visible.

[0041] In the figures:

Fig. 1: is a perspective view of a ceiling formwork system supported by ceiling supports, comprising a side protector attached to longitudinal sides of the formwork elements;

Fig. 2: is a perspective view of a pivoting frame;

Fig. 3: is a perspective view of a mounting rail;

Fig. 4: is a perspective view from above of the mounting rail, connected to the formwork element, having a pivoted securing lever;

Fig. 5: is a perspective view from below of the mounting rail, connected to the formwork element, having a pivoted securing lever;

Fig. 6: is a perspective view from above of the mounting rail, connected to the formwork

element, having a securing lever in the rest position (secured state);

Fig. 7: is a perspective view from below of the arrangement from Fig. 6 comprising the pivoting frame, connected to the mounting rail, in the installation position;

Fig. 8: is a further perspective view from below of the arrangement from Fig. 6 comprising the pivoting frame, connected to the mounting rail, in the installation position;

Fig. 9: is a perspective view of a railing;

Fig. 10: is a perspective view of the railing connected to the pivoting frame arranged in the installation position;

Fig. 11: is a perspective view of the railing connected to the pivoting frame;

Fig. 12: is a side view of the pivoting frame pivoted virtually into the end position thereof;

Fig. 13: is a sectional view from the side of the arrangement from Fig. 12 comprising a locking element which does not engage behind a nearest of the plurality of crossbeams;

Fig. 14: is a perspective view from above of the arrangement from Fig. 12 comprising a locking element which does not engage behind the nearest of the plurality of crossbeams;

Fig. 15: is a perspective view of the pivoting frame in the end position thereof, comprising a locking element which engages behind the nearest of the plurality of crossbeams;

Fig. 16: is a side view of the arrangement from Fig. 15;

Fig. 17: is a sectional view from the side of the pivoting frame in the end position thereof, comprising the locking element which engages behind the nearest of the plurality of crossbeams;

Fig. 18: is a perspective view from below of the pivoting frame in the end position thereof, comprising the locking element which engages behind the nearest of the plurality of crossbeams;

Fig. 19: is a perspective view of a second embodiment of a pivoting frame comprising spacer support pieces;

Fig. 20: is a side view comprising overlapping pivoting frames with and without spacer support pieces.

[0042] Fig. 1 shows a ceiling formwork system 100 supported by ceiling supports 1. The ceiling formwork system 100 comprises, in addition to a ceiling formwork 2, a plurality of elements of a side protector 3. The ceiling formwork 2 comprises a plurality of formwork elements 4. In each case two side protectors 3 are mounted on some of the plurality of formwork elements 4.

[0043] The formwork elements 4 are designed in the form of frame panel formwork elements. The formwork elements 4 comprise a frame 5 and a formwork skin 6. The formwork elements 4 are oriented having the formwork skin 6 thereof upwards, and are laterally joined to one another. The formwork elements 4 comprise a longitudinal side and a transverse side. Accordingly, the frame 5 comprises two longitudinal frame parts 7 which extend in parallel with one another, and two transverse frame parts 8 which extend in parallel with one another. The longitudinal frame parts 7 and the transverse frame parts 8 are oriented so as to be perpendicular to one another. The longitudinal frame parts 7 are twice the length of the transverse frame parts 8. The longitudinal frame parts 7 extend on the longitudinal side of the formwork element 4. The transverse frame parts 8 extend on the transverse side of the formwork element 4.

[0044] The side protector 3 comprises a pivoting frame 10, a railing 11 and a mounting rail 9. The mounting rail 9 is arranged under the ceiling formwork 2, covered by the formwork skin 6, and is indicated in Fig. 1 by a black bar (mounting rail 9). The railing 11 is connected to the pivoting frame 10.

[0045] If, as shown in Fig. 1, side protectors 3 are provided to the side of the longitudinal side of the formwork elements 4 arranged in the edge region of the ceiling formwork 2, in each case two mounting rails 9 are mounted side-by-side on the longitudinal frame part 7, facing the longitudinal side to be protected, of the third formwork element 4, viewed from the longitudinal side to be protected of the formwork element 4.

[0046] If side protectors 3 are provided to the side of the transverse side of the formwork elements 4 arranged in the edge region of the ceiling formwork 2 (not shown in Fig. 1), then the mounting rail 9 is mounted on the transverse frame part 8, facing the transverse side to be protected, of the second formwork element 4, viewed from the transverse side to be protected of the formwork element 4.

[0047] Following installation of the mounting rail 9 on the frame 5 of the formwork element 4, the pivoting frame 10 is mounted in the mounting rail 9 from the ground, and is mounted there so as to be pivotable relative to the mounting rail 9, about an axis of rotation A. Directly following the mounting, the pivoting frame 10 is initially positioned in an installation position. In the installation position, the pivoting frame 10 is mounted in the mounting rail 9 but not

pivoted. From said installation position, the pivoting frame 10 is then pivoted about an axis of rotation A into an end position. In the end position, the side protector 3 secures the ceiling formwork 2 laterally by means of the railing 11. In the end position, the railing 11 of the side protector 3 protrudes upwards beyond the ceiling formwork 2.

[0048] Fig. 2 shows the pivoting frame 10. The pivoting frame 10 comprises a pivoting base frame 14 and a pivoting flap 15. The pivoting base frame 14 comprises two longitudinal members 16 which are arranged in parallel. The longitudinal members 16 are designed as hollow profiles having a rectangular cross section. The longitudinal members 16 in each case comprise a first longitudinal member part 17 and a second longitudinal member part 18. The second longitudinal member part 18 is arranged at an angle of 90 degrees with respect to the first longitudinal member part 17. The first longitudinal member parts 17 are interconnected by means of crossbeams 19. The crossbeams 19 have a square cross section. In each case a through-hole 13 is provided in the end region of the first longitudinal members 17. A pin 20 is arranged in the through-hole 13, which pin extends through the first longitudinal member 17 in each case, and protrudes out of the first longitudinal member 17 in each case, on both sides, beyond the side surfaces. The longitudinal axis of the pin 20 extending through the passage of one of the two first longitudinal member parts 17 and the longitudinal axis of the pin 20 extending through the passage of the other of the two first longitudinal member parts 17 are located in the common axis of rotation A. The second longitudinal member parts 18 are interconnected by means of a transverse connector 21. The transverse connector 21 is designed as round bar/pipe.

[0049] In a further embodiment shown in Fig. 19 and 20, the pin(s) 20 are not formed or arranged in the longitudinal member parts 17, but rather in end regions of spacer support pieces which are directed upwards at right angles, in the extension direction of the second longitudinal member 18, on which ends of the longitudinal member parts 17 are fastened in a rigid manner. In this embodiment, the spacer support pieces are also provided in the region between the longitudinal member parts 17 and the longitudinal member parts 18. The embodiment shown in Fig. 2 and the embodiment shown in Fig. 19 can be attached to the bottom side of formwork elements 4 in an overlapping manner, without colliding with one another. If these two embodiments are combined, then the side protector can also be attached in corner regions of mutually adjoining transverse and longitudinal sides of formwork elements 4, and side a side protector around the entire ceiling formwork 2 (comprehensively) is also possible.

[0050] In the end region of the second longitudinal members 18, the pivoting base frame 14 is connected to the pivoting flap 15 so as to be pivotable about an axis of rotation B. The pivoting flap 15 comprises two side parts 22 which are interconnected by means of two further crossbeams 23. The side parts 22 are designed as flat plates which have a profiling in a side region. The profiling is designed as a step 24 for bearing on the top side of the formwork element 4 (Fig. 1). One of the further crossbeams 23 connects the side parts 22 in the end region of the pivoting flap 15. Said further crossbeam 23 comprises a coupling element 25 in the central region thereof. A locking element 26 is hinged to the coupling element 25 so as to be pivotable about an axis of rotation C. The locking element 26 comprises two side plates 27 which are identically designed and which each comprise a lug 28, and which are interconnected by a connection plate (not shown in Fig. 2). The coupling element 25 is arranged between the two side plates 27 of the locking element 26 and is pivotably mounted by means of a further pin 30 which extends through the side plates 27 of the locking element 26 and the coupling element 25.

[0051] **Fig. 3** is a perspective view of the mounting rail 9. The mounting rail 9 comprises a beam 31, in each of the end regions of which a pair of mounting brackets 32 is arranged, and in the central region of which a securing flap 33 is arranged. The beam 31 is designed as a hollow profile and has a square cross section. The mounting brackets 32 are formed as flat, substantially S-shaped plates and comprise, at the ends thereof remote from the beam 31, first notches 34 for receiving a respective one of the pins 20 extending through the first longitudinal member parts 17 (Fig. 2). Each of the mounting brackets 32 together with the beam 31 forms a further second notch 35 for engaging behind a projection of the frame 5 (Fig. 1). The securing flap 33 comprises an abutment element 37 and a securing lever 38 pivotably connected to the beam 31 for fastening the mounting rail 9 on the frame 5 (Fig. 1). The abutment element 37 is designed as a substantially sickle-shaped plate. The abutment element 37 together with the beam 31, just like the mounting brackets 32 together with the beam 31, forms a further notch 35 for engaging behind the projection of the frame 5 (Fig. 1). The abutment element 37 comprises, at one end thereof, a wedge-shaped taper 39 for engaging in an aperture opening 40 of the frame 5. The securing lever 38 is pivotably connected to the beam 31. For this purpose, the securing lever 38 comprises a further feed-through 41 and the beam 31 comprises a further pin 42. The further pin 42 arranged on the beam 31 extends through the further feed-through 41 of the securing lever 38. Release of the securing lever 38 from the further pin 42 is prevented

by a splint 43 inserted into the further pin 42.

[0052] In the rest position of the securing lever 38, in which this is oriented transversely to the beam 31, the securing lever 38 blocks the further notches 35. A free end of the securing lever 38 protrudes beyond the surface of the beam 31. Insertion of the projection of the frame 5 into the further notches 35 is therefore not possible. Fig. 3 shows the securing lever 38 in the rest position thereof (blocking position). If the mounting rail 9 is installed on the frame 5 and the securing lever 38 is in the position shown in the figure, then the mounting rail 9 cannot be dismantled.

[0053] **Fig. 4** shows a mounting rail 9 connected to the frame 5, having a securing lever 38 oriented in parallel with the beam 31. In order to install the mounting rail 9 on the frame 5, the securing lever 38 is pivoted out of its rest position, e.g. counter to a spring force, until it is oriented in parallel with the beam 31. As a result, insertion of the projection of the frame 5 into the further second notches 35 is made possible. At the same time, the wedge-shaped taper 39 of the abutment element 37 is inserted into the aperture opening 40 of the frame 5. This additionally stabilized the mounting rail 9 on the frame 5.

[0054] **Fig. 5** shows the projection 36 of the frame 5 being encompassed by the mounting brackets 32 and the beam 31, as well as the abutment element 37 which, together with the beam 31, forms a further notch 35. The securing lever 38 is oriented so as to be in parallel with the beam 31, such that the mounting rail 9 is plugged onto the frame 5 and can be securely fastened there, in the rest position thereof, by turning the safety lever 38.

[0055] **Fig. 6** shows the mounting rail 9 connected to the frame 5, having the securing lever 38 in the rest position. After complete insertion of the projection 36, on the inside of the frame 5, into the further second notches 35, the securing lever 38 is pivoted back into the rest position thereof, e.g. automatically under a spring force. In the event of the projection 36 of the frame 5 slipping out of the further second notches 35, an outside of the frame 5 opposite the projection 36 of the frame 5 comes to bear on the securing lever 38, as a result of which the projection 36 of the frame 5 is prevented from slipping out of the further second notches 35. This mounting rail 9 is thus fastened on the frame 5, i.e. captively secured.

[0056] **Fig. 7** and **Fig. 8** show a pivoting frame 10, mounted in the mounting brackets 32 of the

mounting rail 9 by means of the pins 20 thereof, in the installation position. In order to connect the pivoting frame 10 to the mounting rail 9, the pins 20 extending through the first longitudinal member parts 17 are mounted in the first notches 34 of the mounting brackets 32. For this purpose, the two first longitudinal member parts 17 are in each case arranged between one of the pairs of mounting brackets 32. In this case, one mounting bracket 32 is arranged on each side of the respective first longitudinal member part 17. The pin 20 extending away from the respective first longitudinal member part 17, on both sides, is mounted in the first notches 34 of the pair of mounting brackets 32 so as to be rotatable about the axis of rotation A, and comes to bear in a first notch 34 of a mounting brackets 32, on each side of the respective first longitudinal member part 17.

[0057] Fig. 9 shows a railing 11. The railing 11 comprises two longitudinal struts 44. The longitudinal struts 44 are interconnected by means of a plurality of transverse struts 45. The connection of the longitudinal struts 44 with the transverse struts 45 results in a lattice. The longitudinal struts 44 and the transverse struts 45 are formed as hollow profiles.

[0058] Fig. 10 shows a railing 11 that is connected to the pivoting frame 10 arranged in the installation position. The railing 11 is inserted into the pivoting frame 10. For this purpose, the railing 11 is inserted, by one of the longitudinal struts 44 thereof in each case, into one of the second longitudinal member parts 18, formed as hollow profiles, in each case.

[0059] Fig. 11 shows a railing 11 that is connected to the pivoting frame 10, the pivoting frame 10 being pivoted out of the installation position towards the end position.

[0060] Fig. 12 shows the pivoting frame 10 virtually pivoted into the end position thereof, in a detail in the railing 11/pivoting frame 10 region.

[0061] Fig. 13 shows parts of the pivoting frame 10 virtually pivoted into the end position thereof, in a sectional view from the side, comprising the locking element 26.

[0062] Fig. 14 shows the pivoting frame 10 virtually pivoted into the end position thereof, in a perspective view from above. In Fig. 12, Fig. 13 and Fig. 14, the pivoting flap 15 is not completely pivoted about the axis of rotation B in the direction of the pivoting frame 10, and the lug 28 of the locking element 26 does not engage behind the nearest of the plurality of

crossbeams 19.

[0063] Fig. 15 shows the pivoting frame 10 in the end position thereof at the transverse side of a formwork element 4, comprising the locking element 26 which engages behind the nearest of the plurality of crossbeams 19.

[0064] Fig. 16 is a side view of the pivoting frame 10 in the end position thereof, comprising the locking element 26 which engages behind the nearest of the plurality of crossbeams 19.

[0065] Fig. 17 is a sectional view from the side of the pivoting frame 10 in the end position thereof, comprising the locking element 26 which engages, by means of the lug 28 thereof, behind the nearest of the plurality of crossbeams 19.

[0066] Fig. 18 is a perspective view from the below of the pivoting frame 10 in the end position thereof, comprising the locking element which engages, by means of the lug 28 thereof, behind the nearest of the plurality of crossbeams 19. If the pivoting frame 10 is pivoted fully into the end position, the first longitudinal member parts 17 are oriented so as to be substantially in parallel with the formwork element 4. In order to secure the pivoting frame 10 in this position on the formwork element 4, the pivoting flap 15 is pivoted fully, with respect to the pivoting frame 10, in the direction of the pivoting frame 10, about the axis of rotation B. In this case, the step 24 (see Fig. 16) formed in each of the side parts 22 of the pivoting flap 15 comes to bear on the top side of the formwork element 4, as a result of which the pivoting frame 10 is supported on the formwork element 4. At the same time, the lug 28 engages behind the nearest of the plurality of crossbeams 19 and latches thereto, as a result of which slipping of the step 24, formed in each side part 22 of the pivoting flap 15, from the top side of the formwork element 4, is effectively prevented.

[0067] Fig. 19 shows a second embodiment of a pivoting frame 50 comprising spacer support pieces 52, 54, 56, 58 which are provided on first longitudinal member parts 17 and second longitudinal member parts 18'. Pins 20 are formed in the end region of the spacer support pieces 52, 54, which pins form the axis of rotation A between the pivoting frame 50 and the mounting rail (not shown in the figure).

[0068] All further embodiments of the pivoting frame 50 correspond to the technical

embodiments as are described in particular in Fig. 2 and with regard to the pivoting frame 10 in Fig. 1 to 18. **Fig. 20** is a side view showing the way in which two pivoting frames intersect and are fastened to the bottom side of formwork elements.

[0069] The formwork elements 4 form and show the detail of a ceiling formwork. Mounting rails 9, as described in the figures, are fastened on the bottom side of the formwork elements, both on a longitudinal side and on a transverse side of formwork elements. On the longitudinal side, the pivoting frame 50 is mounted in the mounting rail 9, and the pivoting frame 10 is held in a pivotably guided manner in the mounting rail 9 which is furthermore shown. The pivoting frame 50 is also held in a pivotably guided manner, by means of pins 21 which are formed in the supporting spacer piece 52.

[0070] Fig. 20 also shows the supporting spacer piece 56 which allows for a pivotable side part 22 to surround a formwork element 4 on the top side of the formwork element 4. The side part 22 <λ> is shown in the locked position and holds the side protector securely on the edge of the ceiling formwork. The pivoting frame 50 protects the longitudinal side with the railing 11.

[0071] The pivoting frame 10, which protects the transverse side of a ceiling formwork with a railing 11, is fastened between the pivoting frame 50 and the bottom side of the formwork element 4. Fig. 20 shows a corner covering comprising a side protector, in each case, on the transverse and longitudinal side.

[0072] According to claim 1, a ceiling formwork system comprising a ceiling formwork and at least one side protector 3 mounted on the ceiling formwork is disclosed. The ceiling formwork 2 comprises at least one formwork element 4 having a frame 5. The side protector 3 comprises a railing 11. The side protector 3 furthermore comprises a pivoting frame 10. The railing 11 is connected to the pivoting frame 10. The pivoting frame 10 is indirectly connected to the frame 5 from the bottom side of the ceiling formwork 2.

[0073] The pivoting frame 10 can be pivoted out of an installation position, about an axis of rotation A, into an end position, such that the ceiling formwork 2 is laterally secured by the railing 11. Furthermore, according to claim 11 a method for erecting a ceiling formwork system of this kind is specified.

Patentkrav

1. Dækforskallingssystem (100) omfattende

- en dækforskalling (2) med mindst et skalelement (4) med en ramme (5),
- mindst en sidebeskyttelse (3) monteret i en endepostion på dækforskallingen (2), og
- en ophængsliste (9),

hvor sidebeskyttelsen (3) omfatter følgende:

a) et rækværk (11) ; og

b) en svingramme (10), som rækværket (11) er forbundet med, og som er indirekte forbundet med rammen (5) fra undersiden af dækforskallingen (3), hvor svingrammen (10) fra en monteringsposition kan drejes om en drejeakse (A) til endepositionen, i hvilken endeposition dækforskallingen (2) er sikret sideværts af rækværket (11), og svingrammen (10) er drejeligt forbundet med ophængslisten (9) om drejeaksen (A), hvor ophængslisten (9) er forbundet med rammen (5), **kendetegnet ved, at** ophængslisten (9) har en horisontal retning eller orientering.

2. Dækforskallingssystem (100) ifølge krav 1, **kendetegnet ved, at** svingrammen (10) omfatter en svingbasisramme (14) og en svingklap (15), hvor svingklappen (15) er drejeligt forbundet med svingbasisrammen (14) om en drejeakse (B).

3. Dækforskallingssystem (100) ifølge krav 2, **kendetegnet ved, at** svingbasisrammen (14) har to længdedragere (16), hvor de to længdedragere (16) er forbundet med hinanden ved hjælp af flere tværdragere (19) og/eller tværforbindere (21).

4. Dækforskallingssystem (100) ifølge krav 3, **kendetegnet ved, at** hver af de to længdedragere (16) har en gennemgangsboring (13), hvor der i gennemgangsboringen (13) er anbragt en stift (20), som strækker sig gennem hver af de to længdedragere (16) og stikker ud af længdedragerne (16) på begge sider, eller der i hver frie ende af længdedragerne (16) er tilvejebragt et afstandsbærestykke, som hver har stiften (20) i området med den frie ende.

5. Dækforskallingssystem (100) ifølge et af kravene 2 til 4, **kendetegnet ved, at** svingklappen (15) har to sidedele (22), som er forbundet med hinanden i det mindste ved hjælp af en yderligere tværdrager (23), hvor hver af de to sidedele (22) i sit kantområde har et trin (24) til

anbringelse på oversiden af skalelementet (4).

6. Dækforskallingssystem (100) ifølge krav 5, **kendetegnet ved, at** der på den mindst ene yderligere tværdrager (23) er anbragt et koblingselement (25), hvor der på koblingselementet (25) er påhængslet et sikringselement (26) drejeligt om en drejeakse (C) til at gribe bag om en af de flere tværdragere (19).

7. Dækforskallingssystem (100) ifølge et af kravene 1 til 6, **kendetegnet ved, at** ophængslisten (9) er udformet som bjælke (31), på hvilken to sæt ophængsbeslag (32) og/eller en sikringsklap (33) er anbragt.

8. Dækforskallingssystem (100) ifølge krav 7 i forbindelse med krav 4, **kendetegnet ved, at** hvert af ophængsbeslagene (32) i sin ende med afstand til bjælken (31) i den ene ende har en første udsparing (34) til optag af stiften (20).

9. Dækforskallingssystem (100) ifølge krav 7 eller 8, **kendetegnet ved, at** sikringsklappen (33) har et anslagselement (37) og/eller et sikringshåndtag (38), drejeligt forbundet med bjælken (31), til at fastgøre ophængslisten (9) på rammen (5).

10. Dækforskallingssystem (100) ifølge krav 8 eller 9, når der refereres tilbage til krav 8, **kendetegnet ved, at** bjælkens (31) ophængsbeslag (32), og/eller bjælkens (31) anslagselement (37) hvert udgør en yderligere udsparing (35) til at gribe bag om et fremspring (36) på rammen (5).

11. Fremgangsmåde til at opbygge et dækforskallingssystem (100) ifølge et af kravene 1 til 10, hvor dækforskallingen (2) i det mindste omfatter et skalelement (4) med en ramme (5), med følgende arbejdstrin:

- indirekte forbindelse af svingrammen (10) med rammen (5);
- forbindelse af rækværket (11) med svingrammen (10);
- opsvingning af svingrammen (10) fra en monteringsposition om en drejeakse (A), som i en udformning ifølge krav 4 er tilvejebragt i det frie endeområde af afstandsbærestykket, til en endeposition på en sådan måde, at dækforskallingen (2) er sikret sideværts af rækværket (11).

12. Fremgangsmåde til at opbygge et dækforskallingssystem (100) ifølge krav 11, **kendetegnet ved, at** svingrammen (10) er lejret drejeligt på ophængslisten (9), som er fastgjort på undersiden af et skalelement (4) eller på undersiden af et direkte tilstødende skalelement (4), for så vidt dette angår sidebeskyttelsen (3) for en tværside af et skalelement (4), som afslutter en dækforskalling (4) på begrænsende måde.

13. Fremgangsmåde til at opbygge et dækforskallingssystem (100) ifølge krav 11, **kendetegnet ved, at** svingrammen (10) er lejret drejeligt på ophængslisten (9), som er fastgjort på undersiden af et skalelement (4) eller på undersiden af et skalelement (4) med afstand til et skalelement (4), som begrænser en dækforskalling (2) ved indføjelse af et yderligere skalelement (4), for så vidt dette angår sidebeskyttelsen (3) for en længdeside af et skalelement (4).

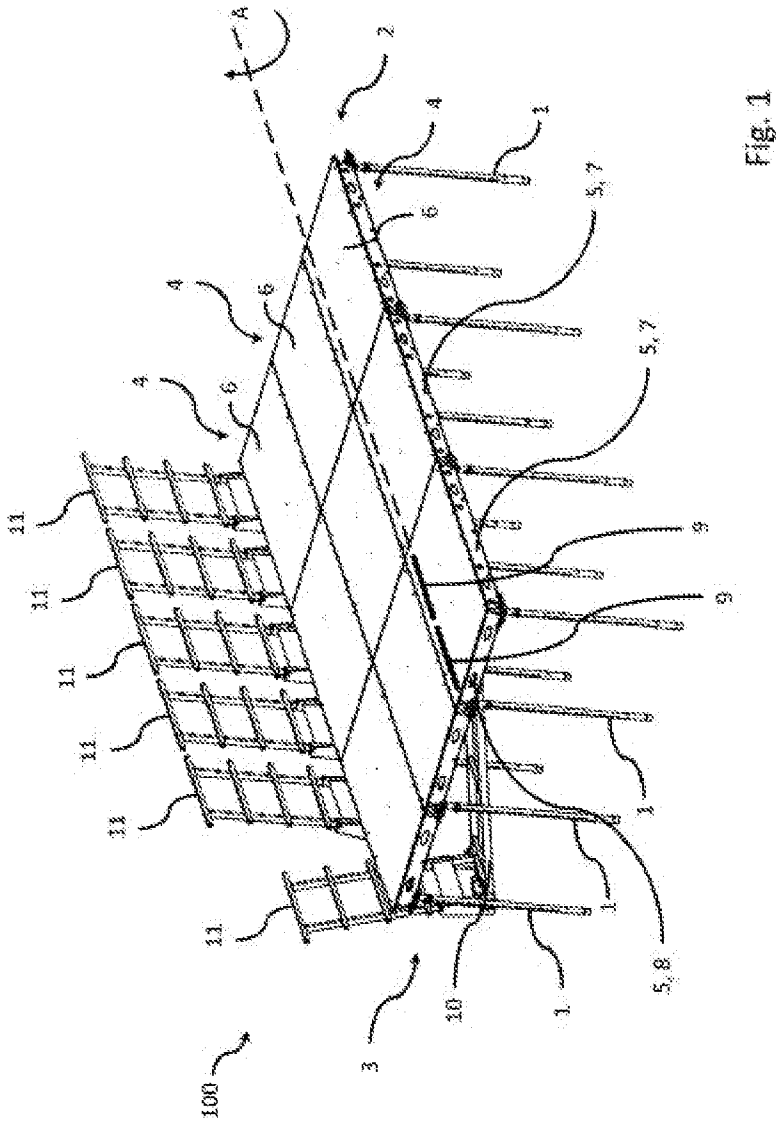

Fig. 1

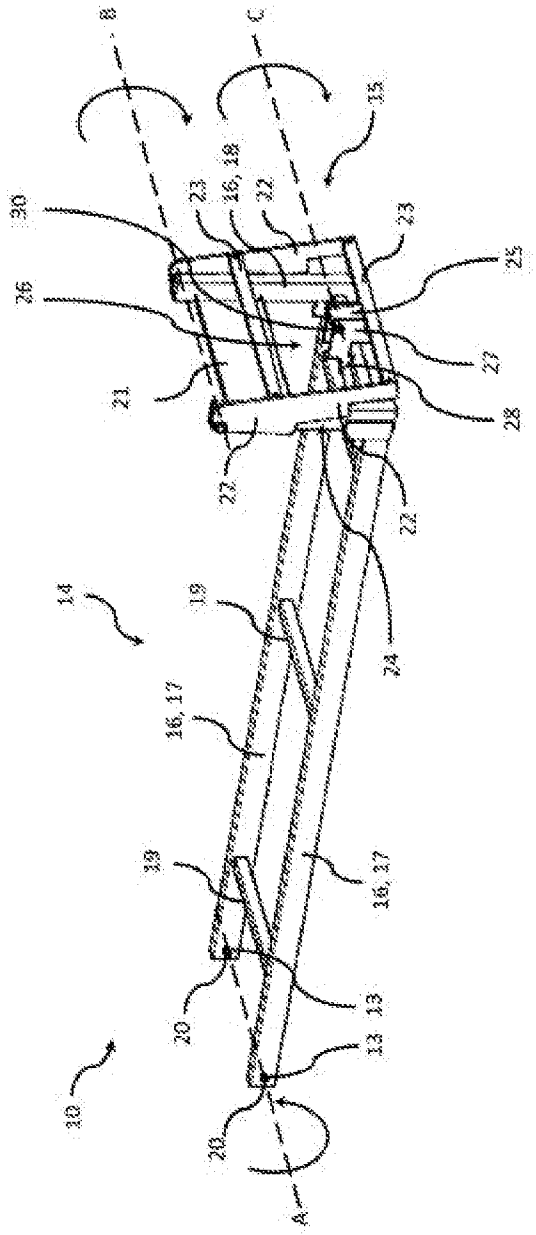
B
C
15
16, 18
22
23
30
23
25
26
27
21
28
22
22
14
19
24
16, 17
19
16, 17
20
13
13
10
20
A

Fig. 2

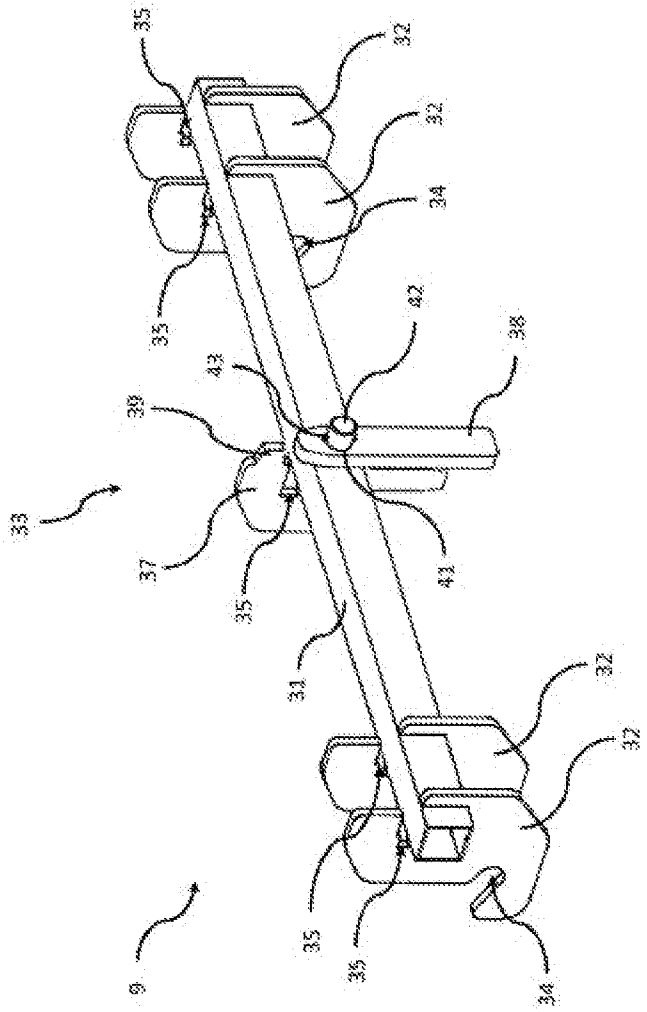

Fig. 3

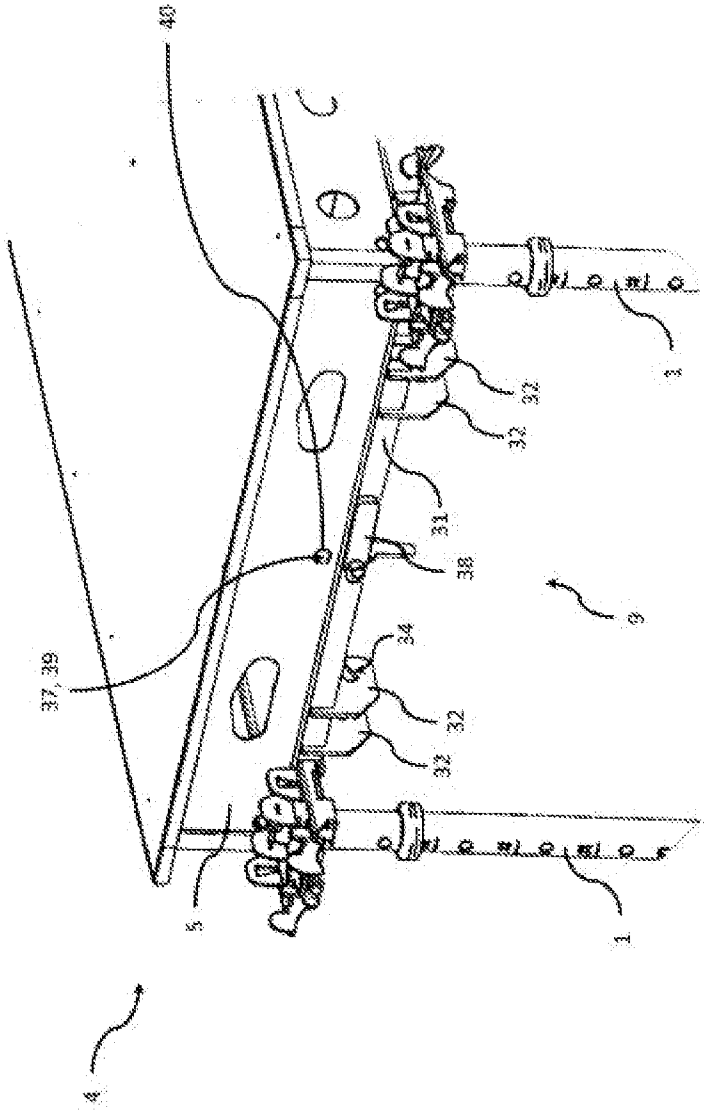

Fig. 4

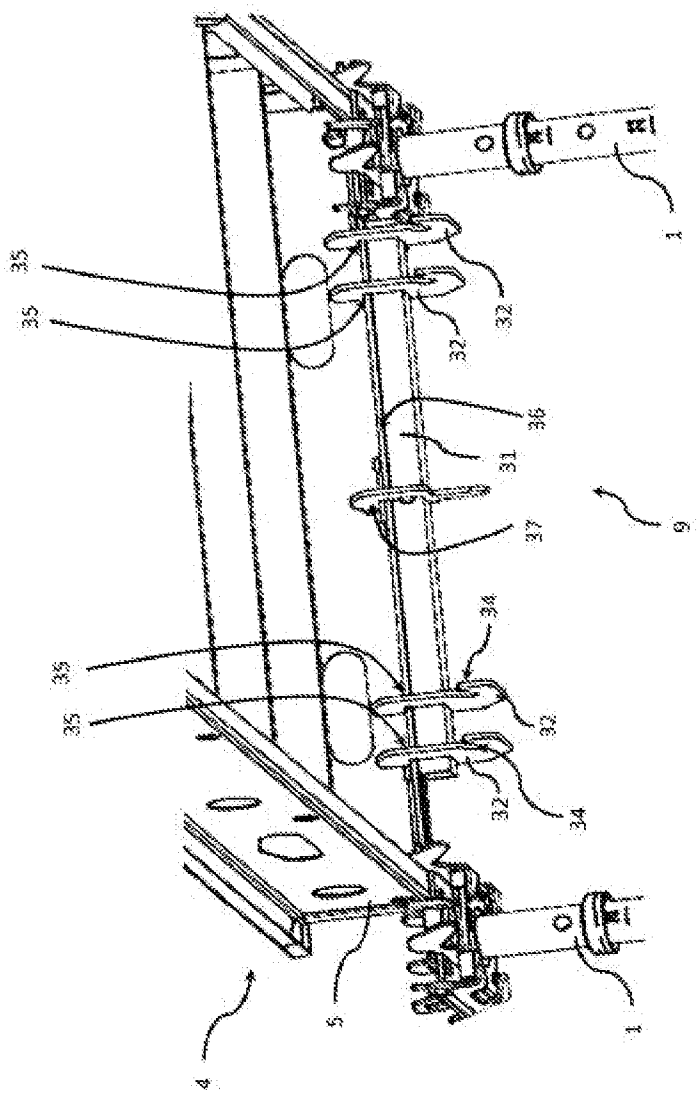

Fig. 5

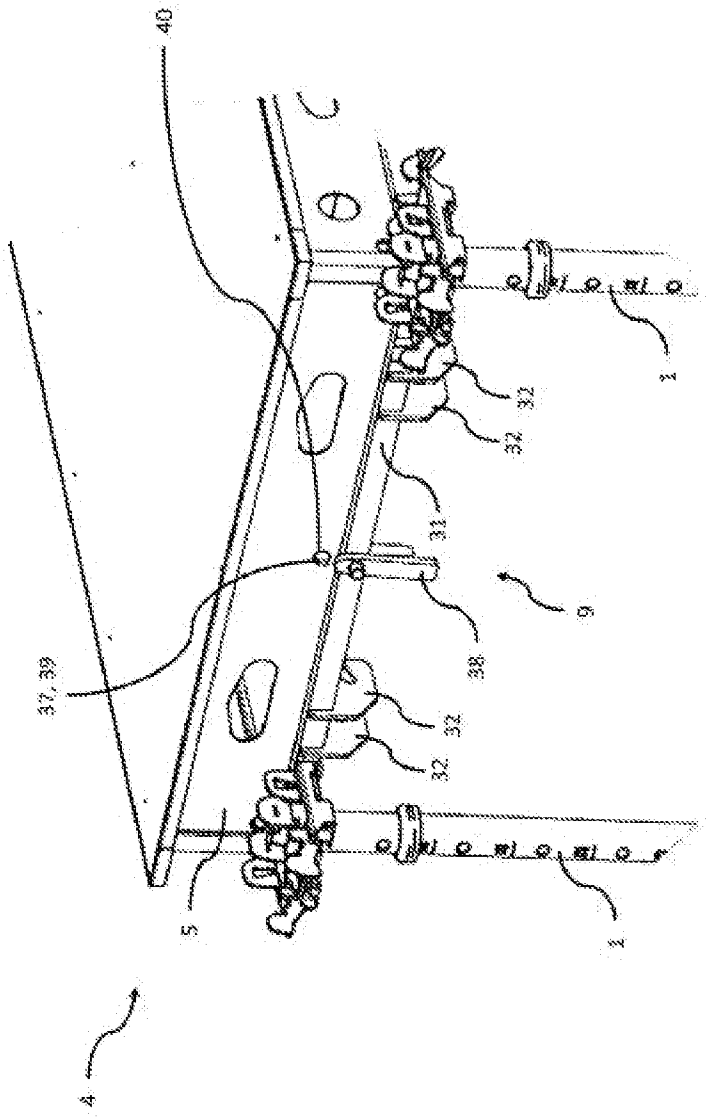

Fig. 6

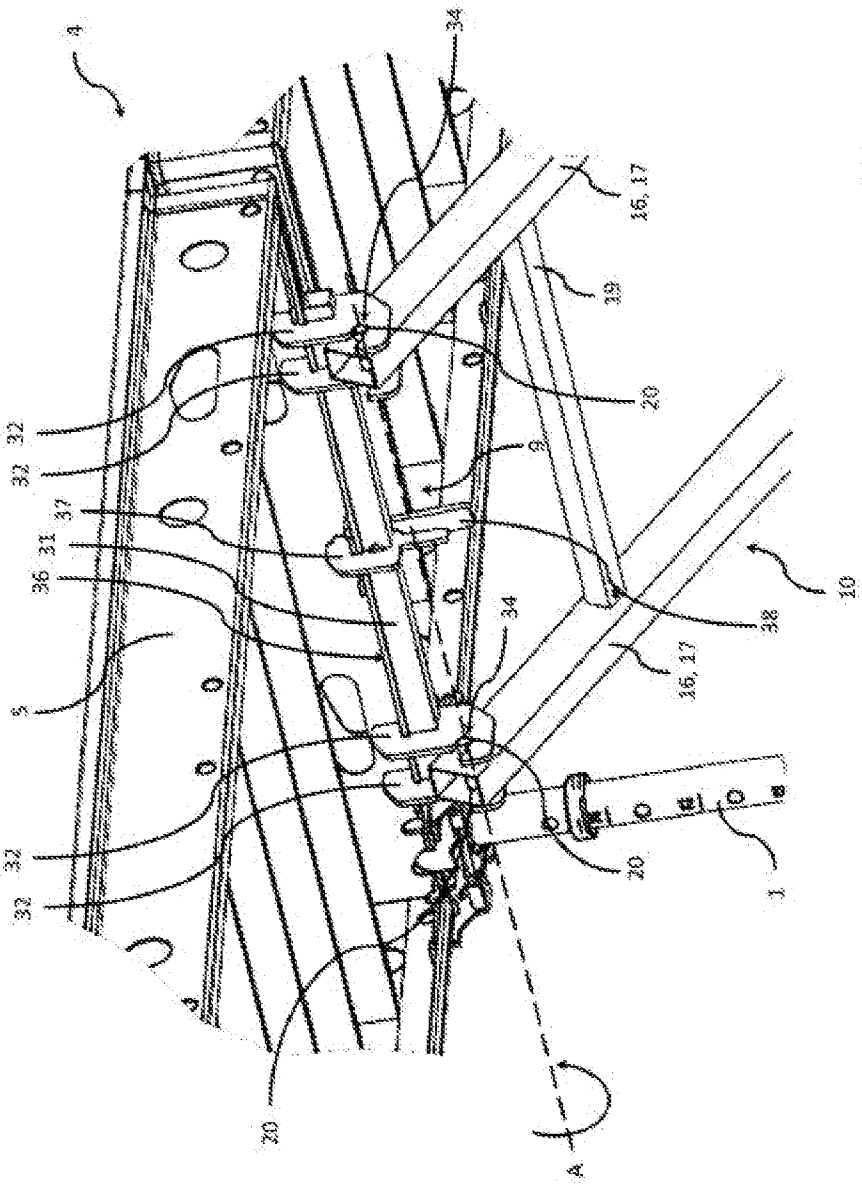

Fig. 7

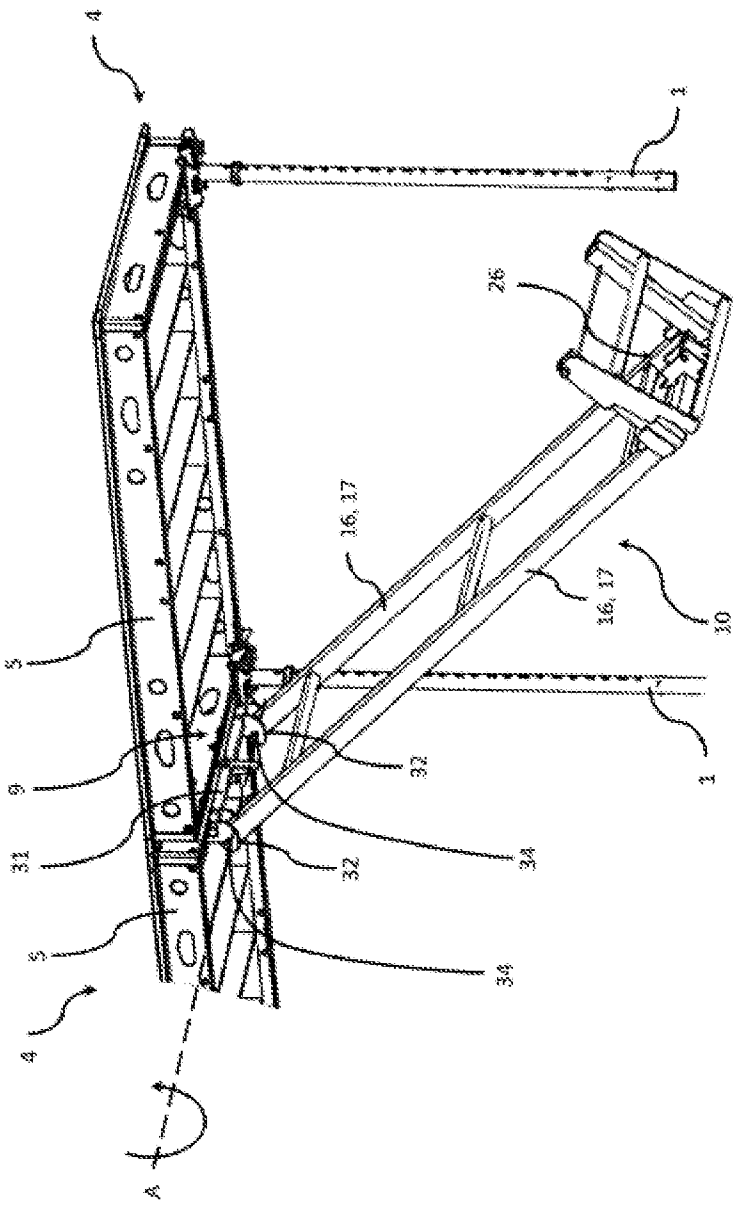

Fig. 8

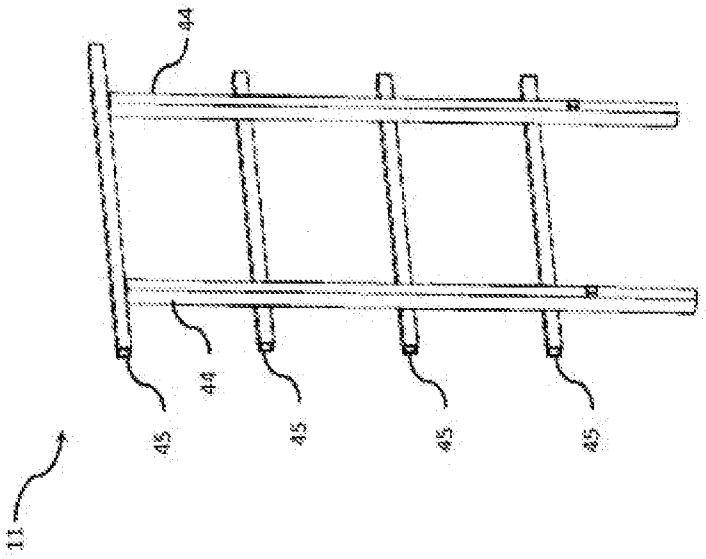

Fig. 9

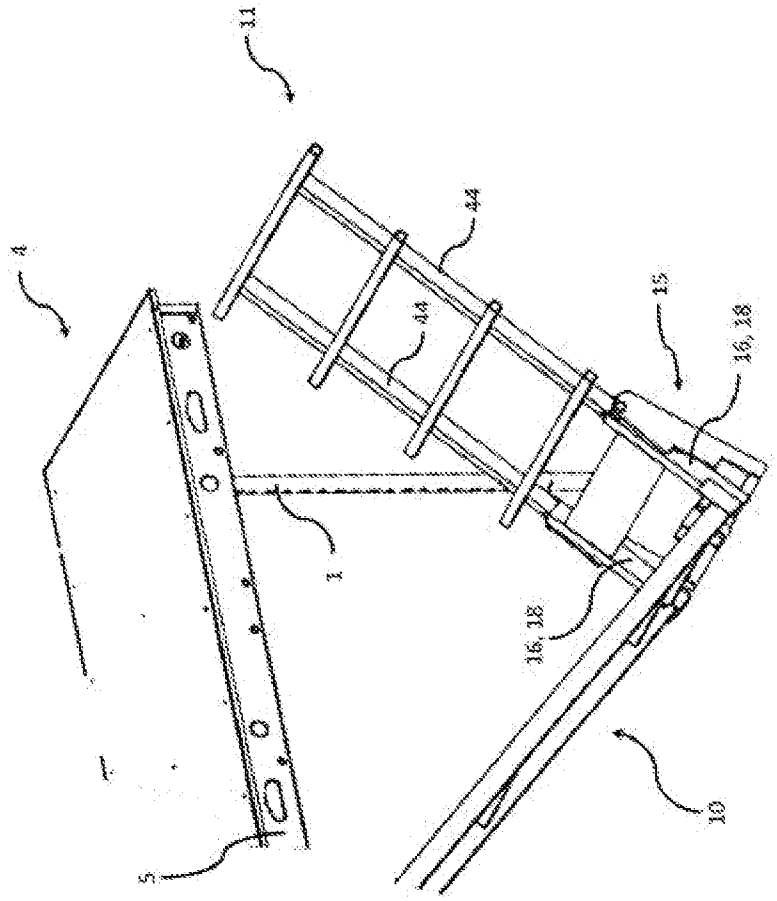

Fig. 10

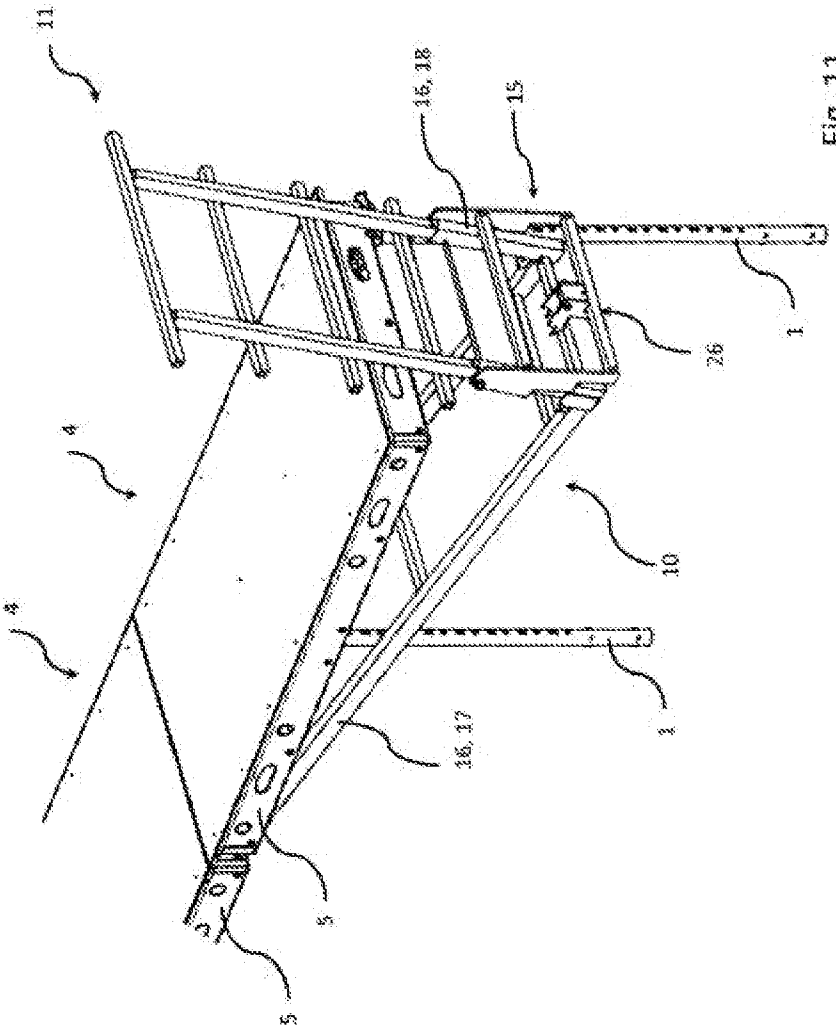

Fig. 11

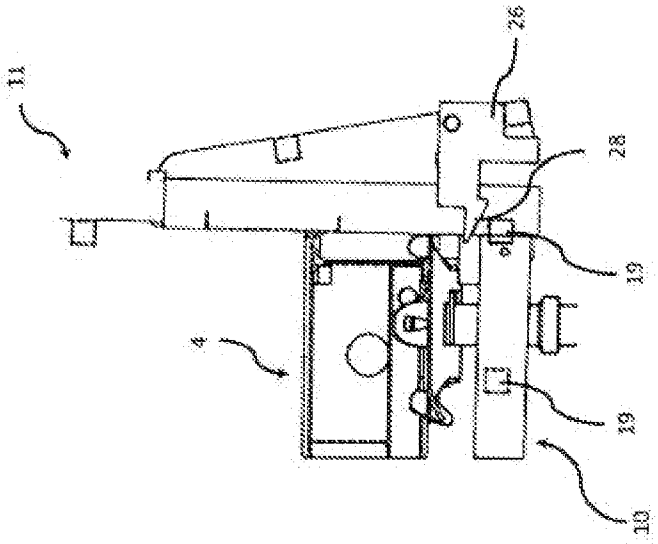

Fig. 13

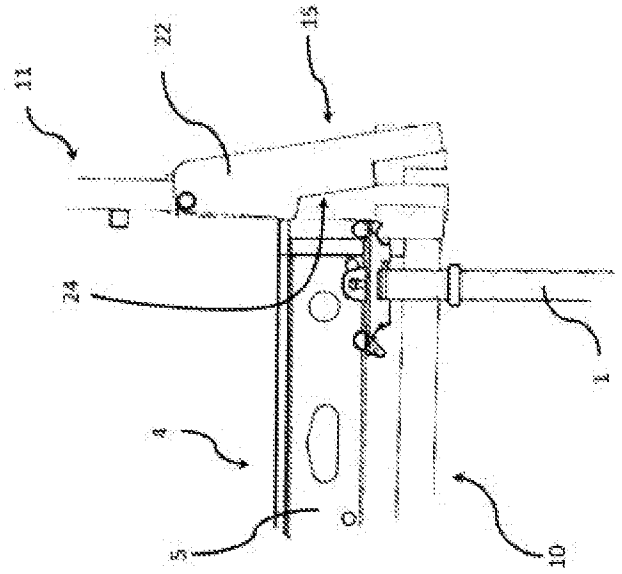

Fig. 12

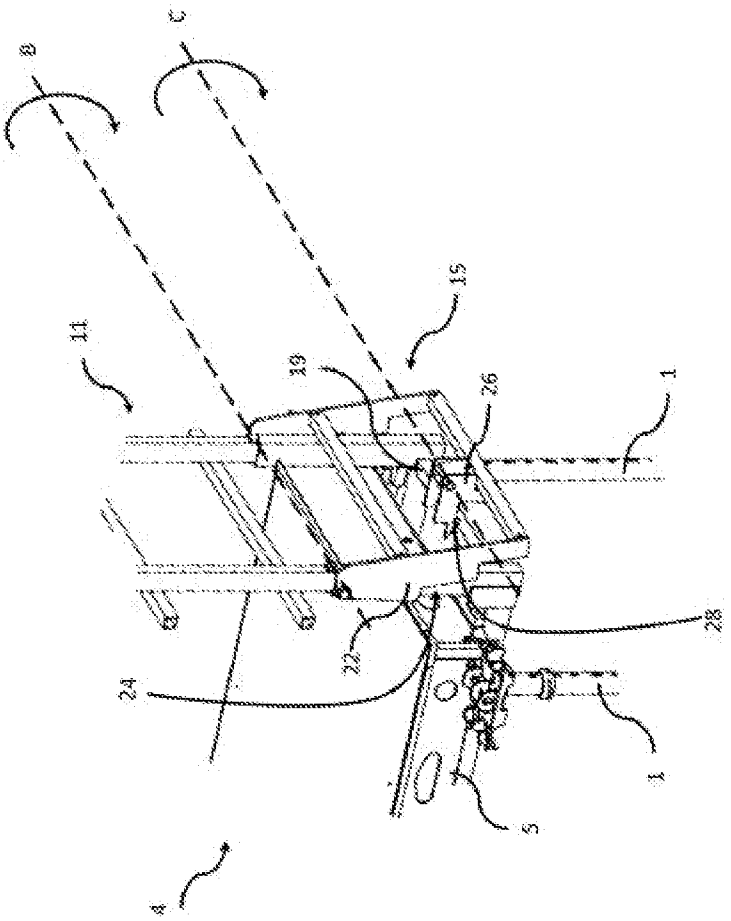

Fig. 14

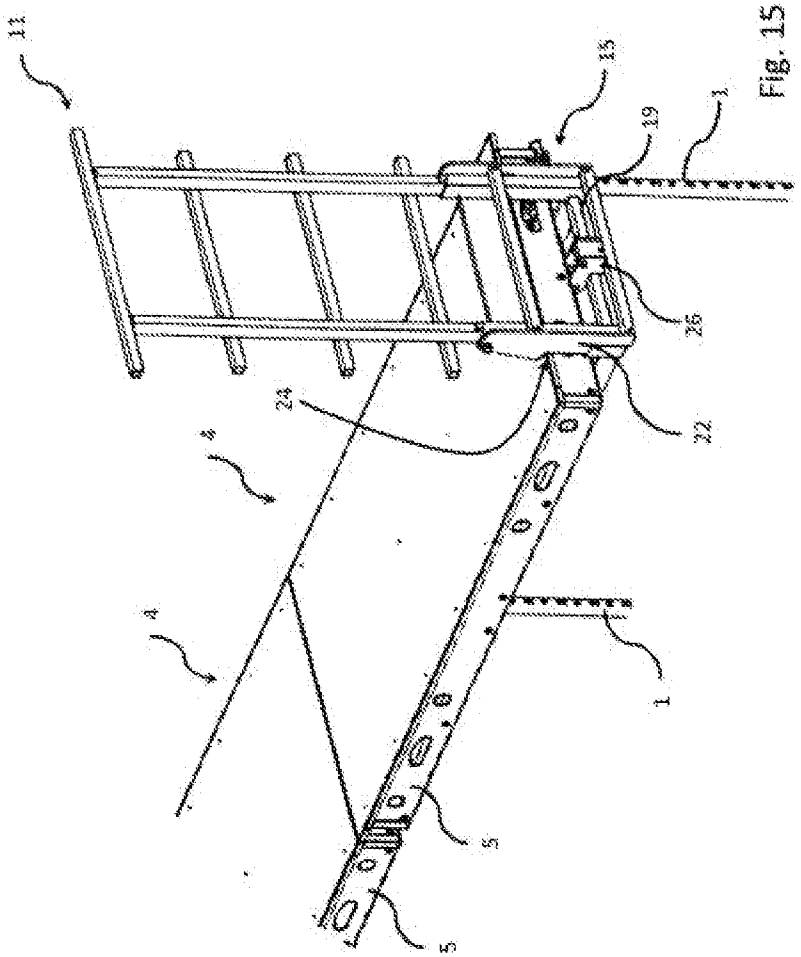

Fig. 15

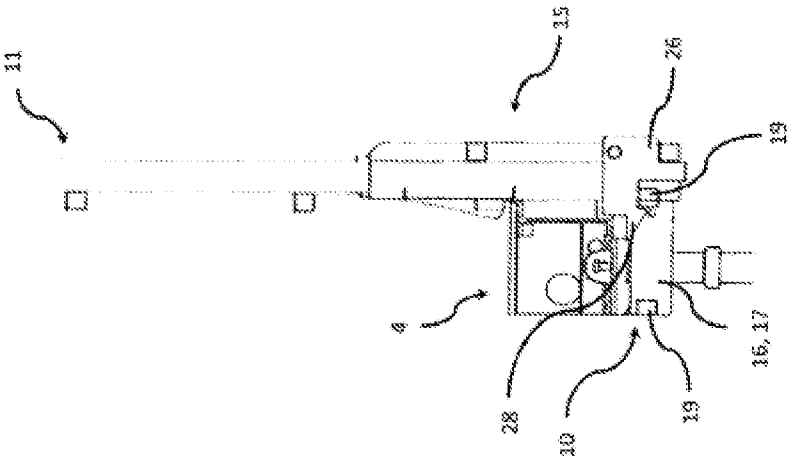

Fig. 17

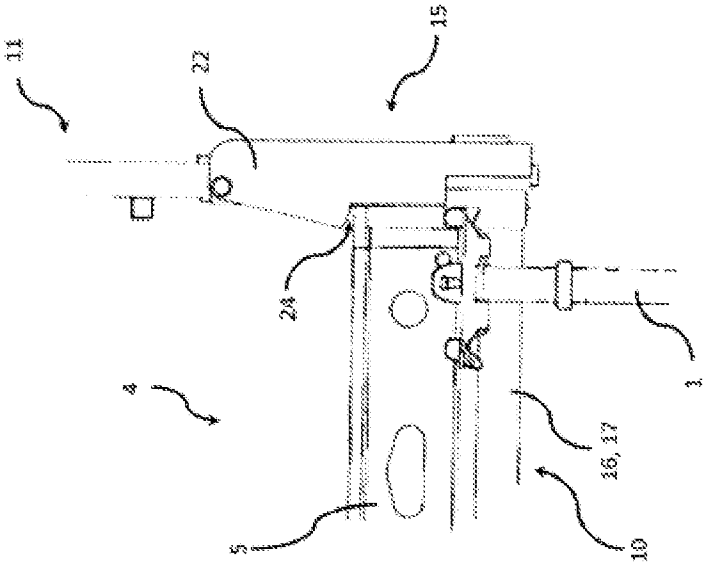

Fig. 16

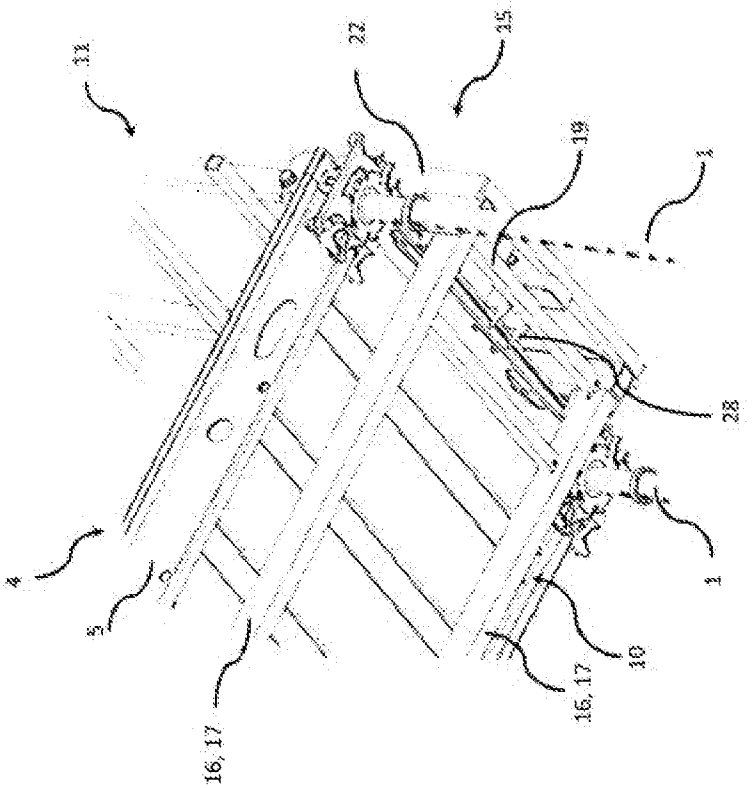

Fig. 18

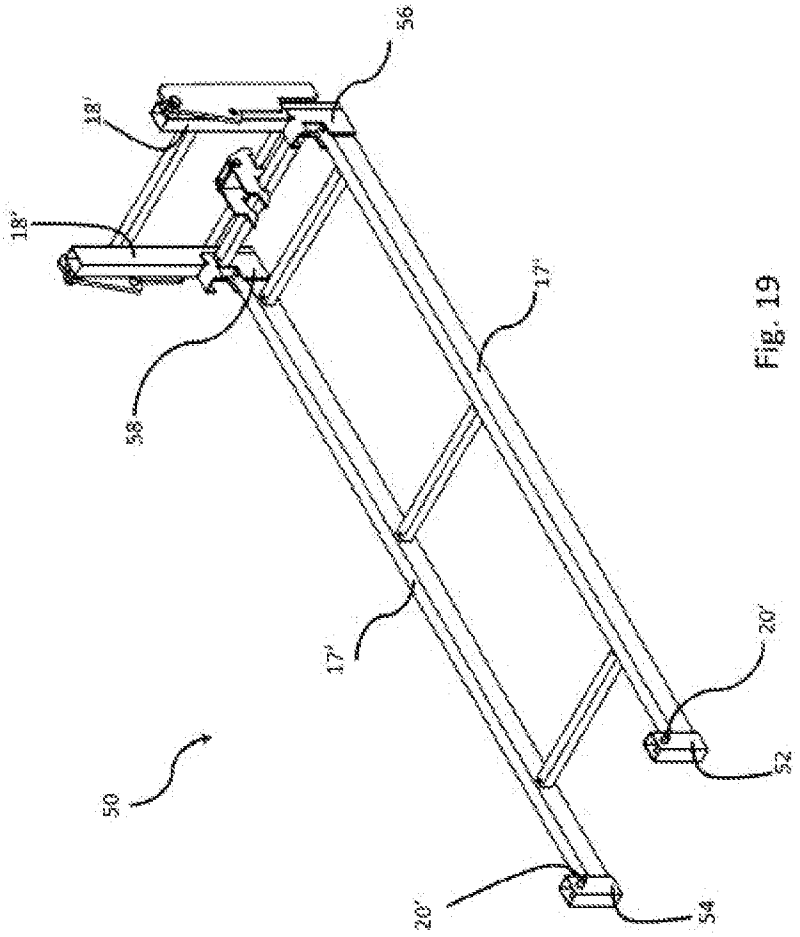

Fig. 19

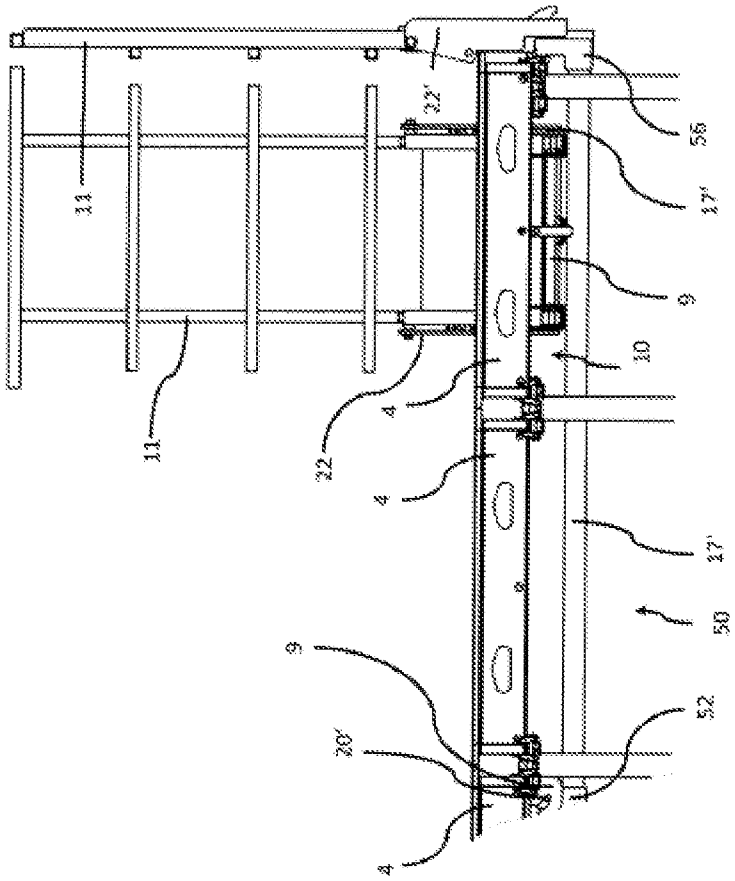

Fig. 20