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(54) **SCAFFOLD**

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Description

Field of the invention

[0001] The present invention relates to scaffolding unit intended to form working stages and the support structures required in work for use in connection with repair, installation, and maintenance work on bridges and other structures with a deck, according to the preamble of claim 1.

[0002] In particular, the invention relates to the creation of repair scaffolding for bridges.

Background to the invention

[0003] Publication WO2008132277 discloses one scaffolding arrangement suitable for repair work on a bridge deck. The arrangement consists of a number of scaffolding supports to be installed on the deck of the bridge, which are supported from the bridge by bolting the support to the upper surface of the deck of the bridge and then carrying the support on rotatable support elements on the undersurface of the deck.

[0004] Publication WO2012062968 discloses an attachment element for attaching a scaffolding support to the deck of a bridge. The scaffolding support to be attached is arranged to be carried on two support points to the upper side of the deck of the bridge. At least one of the support points is arranged to take the compressive force of the attachment elements attached to the deck of the bridge and at least one is arranged to take the tensile force. The attachment element is arranged to be detachably attached to the deck of the bridge with at least two attachment means and comprises at least one attachment means for attaching the attachment element to the support point taking the tensile force of the scaffolding support.

[0005] Because scaffolding supports must be able to carry quite a large load of repair tools, repair workers, and possibly casting formwork and similar, the supports easily become quite massive. Thus, lifting means are needed to handle them and heavy vehicles to transport them. In addition, the installation of the supports usually requires several people. All these factors increase the repair costs.

[0006] Another factor slowing repair work and increasing costs is that the vertical adjustment margin of the supports relative to the bridge deck is quite small. In addition, in some cases the lifting of the support level relative to the bridge deck causes it to tilt, which either makes the work difficult or must be compensated for in some way. Due to the large loads, all the adjustment elements and operating devices must be dimensioned to be heavy, which increases the weight and costs of the structure.

[0007] The scaffolding also requires special attachment devices, such as bolts running through the bridge deck and possibly a flat surface in the deck for attachment. The formwork required for repairing and casting the edge of the bridge must be moved with jacks and continuous casting in the longitudinal direction of the bridge or deck is not possible. Work is also hindered by the support required by the scaffolding against the undersurface of the bridge.

[0008] WO 91/03603 A1 discloses a scaffolding unit according to the preamble of claim 1.

[0009] The present invention is intended to create a solution, in which the position of the support level formed by the scaffolding can be easily altered in the height direction.

[0010] The invention is also intended to create a solution, in which adjustment of the height direction does not alter the lateral positioning.

[0011] Further, the invention's embodiments are intended to create scaffolding, which can, when desired, be transported in parts and assembled at the point of use.

[0012] Further, the invention's embodiments are intended to create scaffolding, the structure of which is simple and easily manufactured.

[0013] The invention's embodiments are also intended to permit the adjustment within wide limits of the location of the scaffolding's work stages, formwork, and other structures at least in the height direction of the bridge deck, preferably also in the transverse direction relative to the longitudinal direction of the deck level.

[0014] The invention's embodiments are also intended to permit adjustment of the scaffolding's height-direction position relative to the deck of the bridge or other level at least partly from the top of the deck of the bridge or similar, most preferably from the side of the attachment frame of the scaffolding opposite to the edge of the deck.

[0015] The invention is based on a scaffolding unit according to claim 1.

[0016] According to one embodiment of the invention, the scaffolding can be dismantled into parts and assembled at the point of use.

[0017] According to one embodiment of the invention, one scaffolding unit comprises only one operating device for altering the vertical position of the set of carrier arms.

[0018] Several advantages are gained with the aid of the invention.

[0019] The structure of the scaffolding unit according to the invention is light, but can nevertheless be dimensioned to carry a large load, which is required for carrying the devices and materials to be used in bridge repair work. The scaffolding unit can be easily dismantled into parts for transportation and assembled at the point of use. Heavy lifting devices are not needed to move the parts and installation of the scaffolding can be done even by one workman. One of the most important advantages of a preferred embodiment of the invention is that the location of the carrier level formed with the aid of the scaffolding, relative to the undersurface of the bridge, can be easily altered within a large adjustment range without the angle of the carrier level or the distance from the edge of the deck essentially changing.

[0020] Preferably, the components of the scaffolding

are plate and beam structures, so that it is cheap to manufacture. Preferably, the assembly of the scaffolding unit requires only pivot pins to be set in place, so that installation work is easy and special tools are not required.

[0021] In figure 5, the invention is described in greater detail.

[0022] The embodiments of figures 1-4 do not form part of the invention.

Figure 1 shows a side view of a scaffolding unit.

Figure 2 is an exploded view of the scaffolding unit of Figure 1.

Figure 3 shows the scaffolding unit of Figures 1 and 2 in a first adjustment position.

Figure 4 shows the scaffolding unit of Figures 1 and 2 in a second adjustment position.

Figure 5 shows an embodiment of the invention.

[0023] In the following, the downward direction is the direction from on top of the deck structure pointing towards its upper surface and the direction pointing upwards is the direction opposite to that.

[0024] In the embodiment of Figure 1, the scaffolding unit consists of a set of carrier arms 2 for forming work levels and for carrying the work machines and formwork required in the work and connecting the set of arms of the attachment frame 1 to the upper surface of the bridge or other deck structure 15 and for adjusting the attitude and location of the scaffolding. The set of arms 2 comprises a vertical arm 4, at the lower end of which is a transverse carrier beam 5, which forms a T-shaped structure at the end of the vertical arm. A second branch of the T is installed to point towards the bridge deck 15, so that the opposite branch points away from the deck. Walkways for the workers and the installations required for the work machines and formwork on the deck side of the bridge can be set on these branches.

[0025] At the opposite end of the vertical arm 4 there is a pivoted parallelogram formed by two beams, the upper beam 11 of which is a straight box-section beam and is attached at its end to the end of the vertical arm 4 at the pivot point 16 and extends from it in the direction of the attachment unit. Under the upper beam 11 is situated a lower parallel beam 3. In this case, the lower beam 3 is a triangular beam or one that is otherwise reinforced at the location of the jack, which, when triangular, comprises a straight lower beam and a triangle formed on top of the lower beam, which consists of two sloping beams and a vertical support connecting the point of the triangle and the lower beam. The advantage of this beam construction is lightness and a good load-bearing capacity.

[0026] The upper and lower beams 3, 11 are attached to the attachment frame 1 by means of pivot pins 6 to pivot point 12 and 17 located at a distance from each other vertically, in such a way that the upper beam 11 is attached to pivot point 12 in the upper part of the attachment frame 1 and the lower beam 3 to pivot point 17 beneath it in the lower part of the attachment frame 1. In this example, the pivot points 12 and 17 of the attachment frame are on the same vertical straight line, but by altering the locations of the pivot points the paths of motion of the set of arms can, if necessary, be altered. At the opposite end, the upper and lower beam 3, 11 are attached by pivot pins 6 to lugs 13 in the end of the vertical arm 4, in which are also formed on top of each other on the same straight line in the vertical direction the pivot points 16, 18 to the upper beam 11 and the lower beam 3. Thus, the pivot points 12, 16, 17, and 18 form, together with the upper and lower beams 3, 11 a pivoted parallelogram, with the aid of which the vertical arm 4 and the transverse carrier beam 5 at its lower end can be moved vertically. The transverse carrier beam 5 is attached by pivot pins 6 to lugs 14 at the lower end of the vertical arm 14. In this attachment method, the transverse carrier beam 5 is locked to the horizontal attitude and the pin attachment is intended to create an easily assembled joint.

[0027] The attachment frame 1 can comprise attachment plates, which form a stand arrangement, which preferably includes attachment bolts that can be adjusted vertically, to attach the scaffolding to the bridge deck. The attachment bolts can be fitted into holes drilled in the bridge deck and secured with a chemical binding agent, thus making the attachment strong and reliable.

[0028] With the aid of the pivoted parallelogram, the vertical arm 4 and the transverse carrier beam 5 attached to it can be raised and lowered. In this embodiment, the operating device is a jack 9, which is installed on top of the attachment frame 1 between the attachment frame 1 and the pivoted parallelogram's triangularly shaped lower beam 3. The jack 9 is located at the vertical support under the point of the beam triangle, so that a strong working point is obtained for the jack 9. The jack 9 can be a simple screw jack, a hydraulic jack, or some similar lifting device. Because continuous adjustment of the vertical position is not needed, the jack can be a simple and strong device.

[0029] In Figure 3, the scaffolding is in the upper position and in Figure 4 in the lower position. As can be seen from the figures, even in the extreme positions the vertical arm 4 of the scaffolding remains precisely vertical and the carrier beam 5 horizontal. In addition, it can be seen that the margin of movement of the height adjustment is quite large. This is an extremely important advantage compared to previously known solutions, because in these the adjustment margins have been quite limited and the adjustments difficult to make.

[0030] The scaffolding of Figure 5 differs slightly from that described above. First of all, the scaffolding's lower beam 3 is unified, not necessarily straight, and continues to the opposite side of the pivot point between the attachment frame 1 and the lower beam 3 relative to the vertical

arm 4. The lower beam 3 thus forms a lever extending to both sides of the lower pivot point 17 of the attachment frame 1. A hydraulic jack 21 and a screw jack 22 is fitted to the end of this lever, also on the opposite side of the pivot point between the attachment frame 1 and the lower beam 3, relative to the vertical arm 4. The shafts of the jacks 21, 22 are supported on the stand 20 of the attachment frame 1. Both jacks can be used independently to adjust the position of the vertical arm 4 and the carrier beam 5 with the arm of the lever formed by the lower beam 3, but the adjustment is preferably made with the aid of the hydraulic jack while the position of the scaffolding is locked with the screw jack 22. Here, the terms hydraulic jack and screw jack refer to any hydraulic or screw-operated operating device whatever, by changing the length of which compression, or tractive force, or locking in position are achieved. The adjustment of position and locking can be done with only a screw jack if desired, but a hydraulic jack can be used as an aid in adjusting the height, or in parallel with the screw jack. Other operating devices or power tools are not required here. The adjustment can be made easily and safely on the opposite side of the attachment frame to the bridge deck. The lever can also be formed in a corresponding manner in the upper beam 11 or in both beams 3, 11. It is then possible to optionally fit either of the jacks to the upper beam and the other to the lower beam or both in connection with either the lower beam or upper beam.

[0031] The scaffolding unit (attachment frame 1) is preferably attached to the deck of the bridge or other structure with the aid of screwed bolts 23 from the stand 20. Attachment to the deck takes place by gluing or casting the bolts into blind holes made in the deck. The attachment is made from two stands 20 at a distance from each other and with the aid of the screwed bolts the scaffolding can be raised from the deck, so that a gap 24 forms between the scaffolding and the deck. The deck surface can then be worked on and the surface cast with the scaffolding attached. There can be a spirit level or spirit levels ready in the attachment frame to facilitate the adjustment of its position.

[0032] In this embodiment, the positioning of the scaffolding unit in the height direction relative to the deck of the bridge or other structure takes place by altering, in addition to the pivoted parallelogram, the locations of the attachment points (pivot points) 16 and 18 between the vertical arm 4 and the pivoted parallelogram 12, 16, 17, 18. In the vertical arm 4 there are attachment holes 25 on top of each other, which have a predefined distance between them. At the ends of the upper and lower beams 11, 3 there are lugs 26, which are arranged on both sides of the vertical arm and in which there are also attachment holes 27 on top of each other, which have a predefined distance between them. The distances between the vertical arm's attachment holes 25 are greater than the distances between the lugs' 26 attachment holes 27. In this way, a large adjustment margin is obtained with the aid of the vertical arm's 4 attachment holes 25 and a smaller adjustment margin with the aid of the lugs' 26 attachment holes 27. When this manner of adjustment is combined with the adjustment taking place with the aid of the pivoted parallelogram, the position of the scaffolding unit can be set precisely as desired within quite large limits. This permits, among other things, easy and accurate placing of the bridge's edge casting 19.

[0033] The adjustment of the position of the carrier beam 5 relative to the edge of the bridge deck or other structure can be carried out with a corresponding hole distribution.

[0034] Figure 5 shows a dense hole distribution in the carrier beam 5 and four holes in the attachment lugs of the vertical arm. This hole distribution is also flexible and the number and distribution of the holes can be altered to create an adequate adjustment precision. Though a dense hole distribution can also be made in the long load-bearing components such as the vertical arm or the carrier beam, in these it is preferable to use a larger hole distribution, to minimize the number of holes and preserve strength.

[0035] In the invention, a pivoted parallelogram is used, but the lengths of the sides and the location of the pivots can be altered as required, making it a pivoted rectangle.

[0036] The features of the embodiment described above can easily be combined and the corresponding components replaced with each other in order to create a structure more suitable for its purpose, within the scope defined by the claims.

[0037] In the scaffolding, there can be integrated working stages and these can include rails or attachments for formwork, tools such as abrasive water jets, or handrails. The scaffolding can be attached to a rail in the bridge deck, so that it can be moved as work progresses parallel to the deck. In the attachment components there can be toolboxes for the safe storage of tools and other materials and lifting hooks or similar can be installed in the scaffolding so that it can be moved as an entire system.

[0038] The scaffolding unit according to the invention can be transported to the work site ready assembled or dismantled into its principal components. Assembly of the scaffolding unit takes place simply by installing the pivot pins 6 in place and locking them with cotters. Thus in principle, the assembly of the scaffolding unit requires no tools at all. The scaffolding unit is easily dismantled into relatively light parts and can be moved to a new location after use. Because several scaffolding units are required for a bridge deck or similar work site, significant advantages are achieved with the aid of easy.assembly, disassembly, and transportation. In place of pivot pins and cotters it is possible, of course, to use other corresponding attachment elements such as bolts and nuts.

[0039] It is obvious that the various parts of the example described above can be replaced with functional and structural equivalents within the scope defined by the Claims.

Claims

1. Scaffolding unit to be attached to a bridge or similar deck structure, which comprises

   - a set of arms (2) for carrying the working levels and support structures needed in work, and
   - an attachment frame (1) for attaching the set of arms to the upper surface of the deck structure,

   wherein the set of arms (2) is connected to the attachment frame (1) by means of a pivoted parallelogram (12, 16, 17, and 18), wherein the pivoted parallelogram comprises an upper beam (11)and a lower beam (3) and upper pivot points (12, 16) and lower pivot points (17, 18) for connecting the beams (3, 11) to the attachment frame (1) and the set of arms (2), **characterized in that** the lower beam (3) and/or the upper beam extends to the opposite side of the lower pivot point (17) / upper pivot point (12) of the attachment frame (1) from the set of arms (2) to form a lever, and at least one operating device selected from the group comprising a hydraulic jack (21) and screw jack (22) is arranged at the end of the lever formed by the lower beam (3) or the upper beam (11) to adjust the vertical position of the set of arms (2).

2. Scaffolding unit according to Claim 1, **characterized in that** the pivot points (12, 17) of the attachment frame (1) are on a straight line parallel to the pivot points (16, 18) of the set of arms (2), according to the definition of a pivoted parallelogram, and the straight lines are preferably vertical.

3. Scaffolding unit according to any of Claims 1 - 2, **characterized in that** the lower beam of the pivoted parallelogram is a triangular beam (3).

4. Scaffolding unit according to any of Claims 1 - 3, **characterized in that** at least the joints between the set of arms (2), the attachment frame (1), and the pivoted parallelogram (3, 6, 11, 12) are implemented with detachable attachment elements (6).

5. Scaffolding unit according to Claim 4, **characterized in that** the attachment elements are pivot pins (6).

6. Scaffolding unit according to any of the above Claims, which comprises a vertical arm (4) and carrier beam (5) attached transversely to one end of it **characterized in that** the lower and upper beams (3, 11) are attached to the vertical arm (4) by means of lugs (26), in each of which is one row of holes, in which there is a first distance between the holes (27) and in which vertical arm there is a row of holes, in which there is a different distance between the holes (25) than between the lugs' holes (27).

7. Scaffolding unit according to Claim 6, **characterized in that** the distances between the holes (25) in the vertical arm (4) are greater than the distances between the holes (27 in the lugs (26).

8. Scaffolding unit according to any of the above Claims 6 - 7, **characterized in that** the vertical arm (4) and the carrier beam (5) are attached to each other by means of lugs at the end of the vertical arm (4), in each of which lugs there is a row of holes, in which there is a first distance between the holes and in which carrier beam (5) there is a row of holes, in which there is a different distance between the holes than between the lugs' holes.

9. Scaffolding unit according to Claim 8, **characterized in that** the distances between the holes in the carrier beam (5) are greater than the distances between the vertical arm's lugs.

Patentansprüche

1. Gerüsteinheit zum Anbringen an einer Brücke oder ähnlichen Deckstruktur, umfassend

   - einen Satz von Armen (2) zum Tragen der Arbeitsebenen und Stützen von beim Arbeiten benötigten Strukturen, und
   - einen Anbringungsrahmen (1) zum Anbringen des Satzes von Armen an der oberen Oberfläche der Deckstruktur, wobei der Satz von Armen (2) mit dem Anbringungsrahmen (1) mittels eines Drehparallelogramms (12, 16, 17 und 18) verbunden ist, wobei das Drehparallelogramm einen oberen Balken (11) und einen unteren Balken (13) und obere Drehpunkte (12, 16) und untere Drehpunkte (17, 18) zum Verbinden der Balken (3, 11) mit dem Anbringungsrahmen (1) und dem Satz von Armen (2) umfasst, **dadurch gekennzeichnet, dass** der untere Balken (3) und/oder der obere Balken vom Satz von Armen (2) zur gegenüberliegenden Seite des unteren Drehpunkts (17)/oberen Drehpunkts (12) des Anbringungsrahmens (1) verlaufen, um einen Hebel zu bilden, und dass zumindest ein Betriebsgerät, das aus der Gruppe ausgewählt ist, die einen Hydraulikheber (21) und eine Schraubenwinde (22) umfasst, am Ende des Hebels angebracht ist, der durch den unteren Balken (3) oder den oberen Balken (11) gebildet ist, um die vertikale Position des Satzes von Armen (2) anzupassen.

2. Gerüsteinheit nach Anspruch 1, **dadurch gekennzeichnet, dass** die Drehpunkte (12, 17) des Anbringungsrahmens (1) auf einer geraden Linie parallel zu den Drehpunkten (16, 18) des Satzes von Armen

(2) liegen, gemäß der Definition eines Drehparallelogramms, und die geraden Linien vorzugsweise vertikal sind.

3. Gerüsteinheit nach einem der Ansprüche 1 bis 2, **dadurch gekennzeichnet, dass** der untere Balken des Drehparallelogramms ein dreieckiger Balken (3) ist.

4. Gerüsteinheit nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** zumindest die Gelenke zwischen dem Satz von Armen (2), dem Anbringungsrahmen (1) und dem Drehparallelogramm (3, 6, 11, 12) mit abnehmbaren Anbringungselementen (6) implementiert sind.

5. Gerüsteinheit nach Anspruch 4, **dadurch gekennzeichnet, dass** die Anbringungselemente Drehzapfen (6) sind.

6. Gerüsteinheit nach einem der vorhergehenden Ansprüche, umfassend einen vertikalen Arm (4) und Trägerbalken (5), der schräg verlaufend an einem Ende davon angebracht ist, **dadurch gekennzeichnet, dass** der untere und obere Balken (3, 11) am vertikalen Arms (4) mittels Ansätzen (26) angebracht sind, wobei in jedem derselben eine Reihe von Löchern vorhanden ist, wobei ein erster Abstand zwischen den Löchern (27) vorliegt, und wobei im vertikalen Arm eine Reihe von Löchern vorhanden ist, wobei ein anderer Abstand zwischen den Löchern (25) als zwischen den Löchern (27) der Ansätze vorliegt.

7. Gerüsteinheit nach Anspruch 6, **dadurch gekennzeichnet, dass** die Abstände zwischen den Löchern (25) im vertikalen Arm (4) größer als die Abstände zwischen den Löchern (27) in den Ansätzen (26) sind.

8. Gerüsteinheit nach einem der Ansprüche 6 bis 7, **dadurch gekennzeichnet, dass** der vertikale Arm (4) und der Trägerbalken (5) mittels Ansätzen am Ende des vertikalen Arms (4) aneinander angebracht sind, wobei in jedem der Ansätze eine Reihe von Löchern vorhanden ist, wobei ein erster Abstand zwischen den Löchern vorliegt, und wobei im Trägerbalken (5) eine Reihe von Löchern vorhanden ist, wobei ein anderer Abstand zwischen den Löchern als zwischen den Löchern der Ansätze vorliegt.

9. Gerüsteinheit nach Anspruch 8, **dadurch gekennzeichnet, dass** die Abstände zwischen den Löchern im Trägerbalken (5) größer als die Abstände zwischen den Ansätzen des vertikalen Arms sind.

Revendications

1. Échafaudage destiné à être fixé sur un pont ou une structure de pont similaire, qui comprend

   - un jeu de bras (2) pour supporter les niveaux de travail et les structures de support nécessaires pour le travail, et
   - un châssis de fixation (1) pour fixer le jeu de bras à la surface supérieure de la structure de pont,

   dans lequel le jeu de bras (2) est connecté au châssis de fixation (1) au moyen d'un parallélogramme pivoté (12, 16, 17, et 18), dans lequel le parallélogramme pivoté comprend une poutre supérieure (11) et une poutre inférieure (3) et des points de pivot supérieurs (12, 16) et des points de pivot inférieurs (17, 18) pour connecter les poutres (3, 11) au châssis de fixation (1) et au jeu de bras (2), **caractérisé en ce que** la poutre inférieure (3) et/ou la poutre supérieure s'étend(ent) jusqu'au côté opposé du point de pivot inférieur (17) / point de pivot supérieur (12) du châssis de fixation (1) à partir du jeu de bras (2) pour former un levier, et au moins un dispositif fonctionnel sélectionné parmi le groupe comprenant un vérin hydraulique (21) et un vérin à vis (22) est agencé à l'extrémité du levier formé par la poutre inférieure (3) ou la poutre supérieure (11) pour ajuster la position verticale du jeu de bras (2).

2. Échafaudage selon à la revendication 1, **caractérisé en ce que** les points de pivot (12, 17) du châssis de fixation (1) sont sur une ligne droite parallèle aux points de pivot (16, 18) du jeu de bras (2) selon la définition d'un parallélogramme pivoté, et les lignes droites sont de préférence verticales.

3. Échafaudage selon l'une quelconque des revendications 1 - 2, **caractérisé en ce que** la poutre inférieure du parallélogramme pivoté est une poutre triangulaire (3) .

4. Échafaudage selon l'une quelconque des revendications 1 - 3, **caractérisé en ce qu'**au moins les articulations entre le jeu de bras (2), le châssis de fixation (1) et le parallélogramme pivoté (3, 6, 11, 12) sont mises en oeuvre avec des éléments de fixation (6) séparables.

5. Échafaudage selon à la revendication 4, **caractérisé en ce que** les éléments de fixation sont des tiges de pivotement (6).

6. Échafaudage selon l'une quelconque des revendications précédentes qui comprend un bras vertical (4) et une poutre porteuse (5), fixés de manière transversale à une extrémité de celui-ci, **caractérisé en**

ce que les poutres inférieure et supérieure (3, 11) sont fixées au bras vertical (4) au moyen de taquets (26), dans chacun desquels est présente une rangée d'orifices dans lesquels il y a une première distance entre les orifices (27) et dans lequel bras vertical il y a une rangée d'orifices, dans lesquels il y a une distance différente entre les orifices (25) de celle des orifices des taquets (27).

7. Échafaudage selon à la revendication 6, **caractérisé en ce que** les distances entre les orifices (25) dans le bras vertical (4) sont plus grandes que les distances entre les orifices (27) dans les taquets (26).

8. Échafaudage selon l'une quelconque des revendications 6 - 7, **caractérisé en ce que** le bras vertical (4) et la poutre porteuse (5) sont fixés l'un à l'autre au moyen de taquets à l'extrémité du bras vertical (4), dans chacun desquels taquets est présente une rangée d'orifices dans lesquels il y a une première distance entre les orifices et dans laquelle poutre porteuse (5), il y a une rangée d'orifices dans lesquels il y a une distance différente entre les orifices de celle entre les orifices des taquets.

9. Échafaudage selon à la revendication 8, **caractérisé en ce que** les distances entre les orifices dans la poutre porteuse (5) sont plus grandes que les distances entre les orifices du bras vertical.

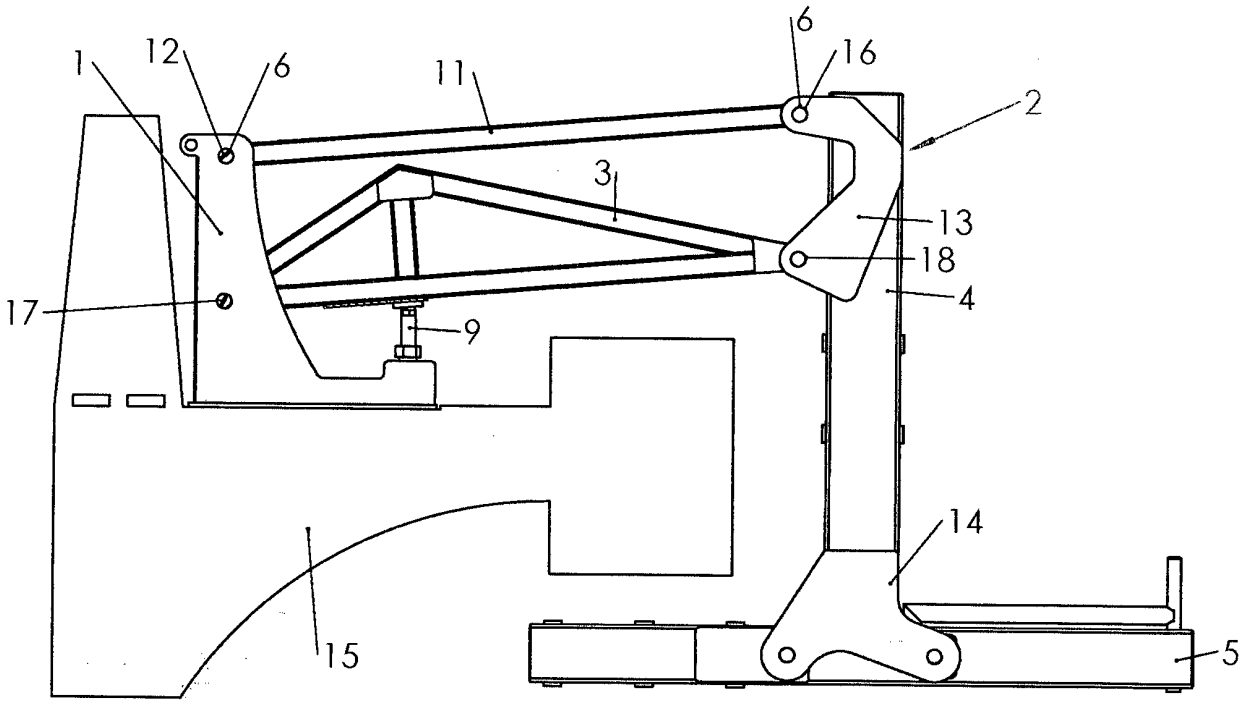

Fig. 1

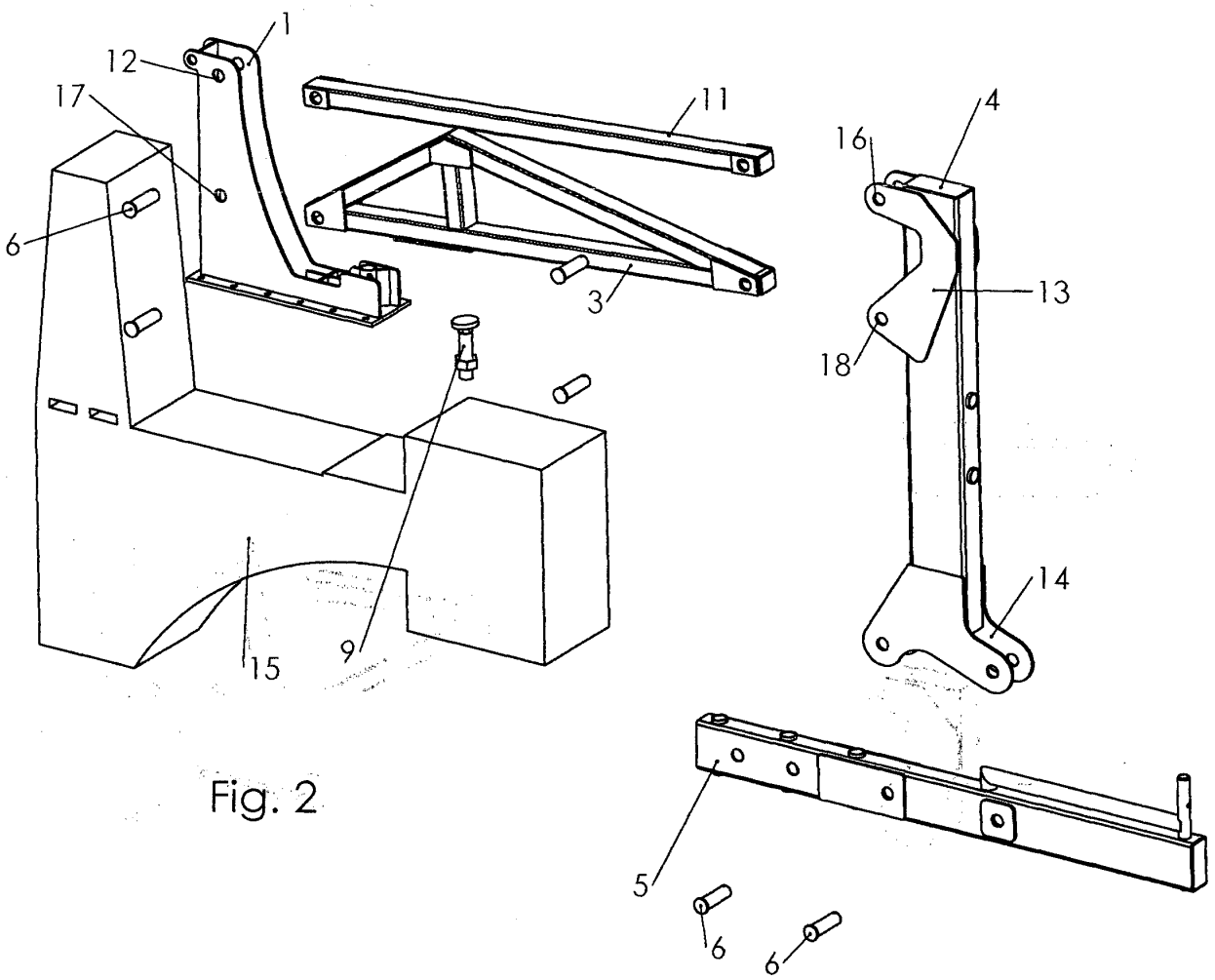

Fig. 2

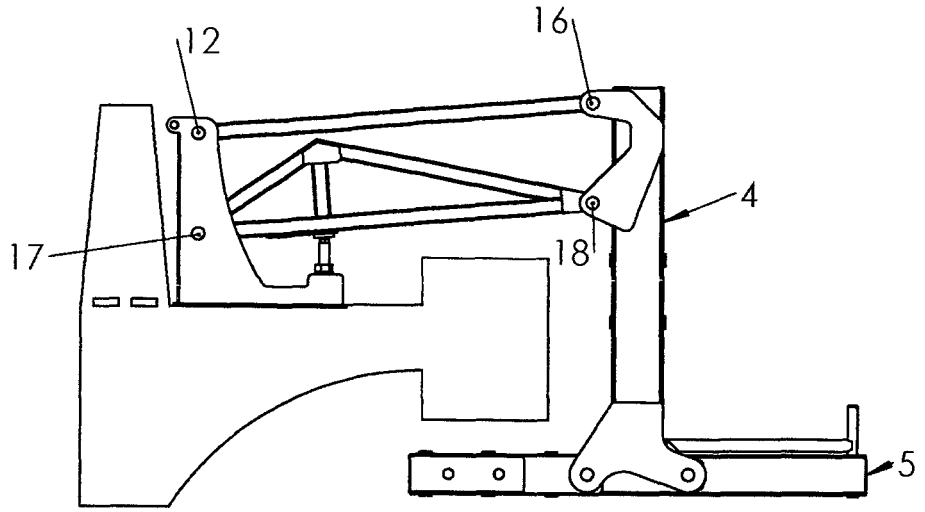

Fig. 3

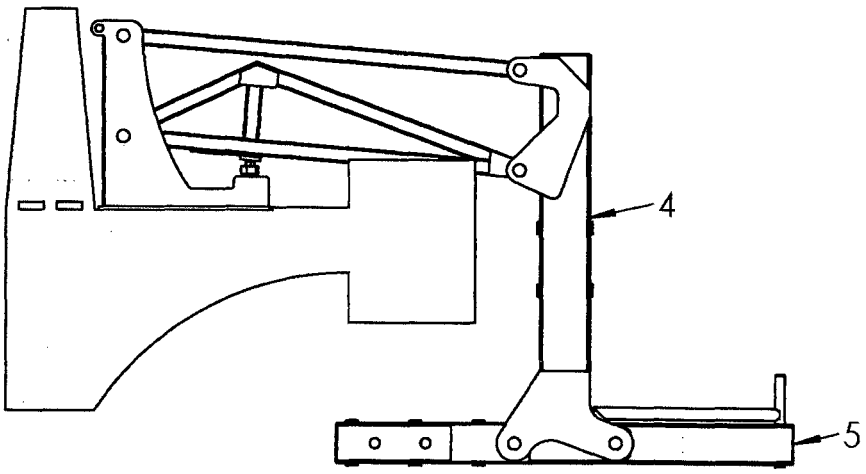

Fig. 4

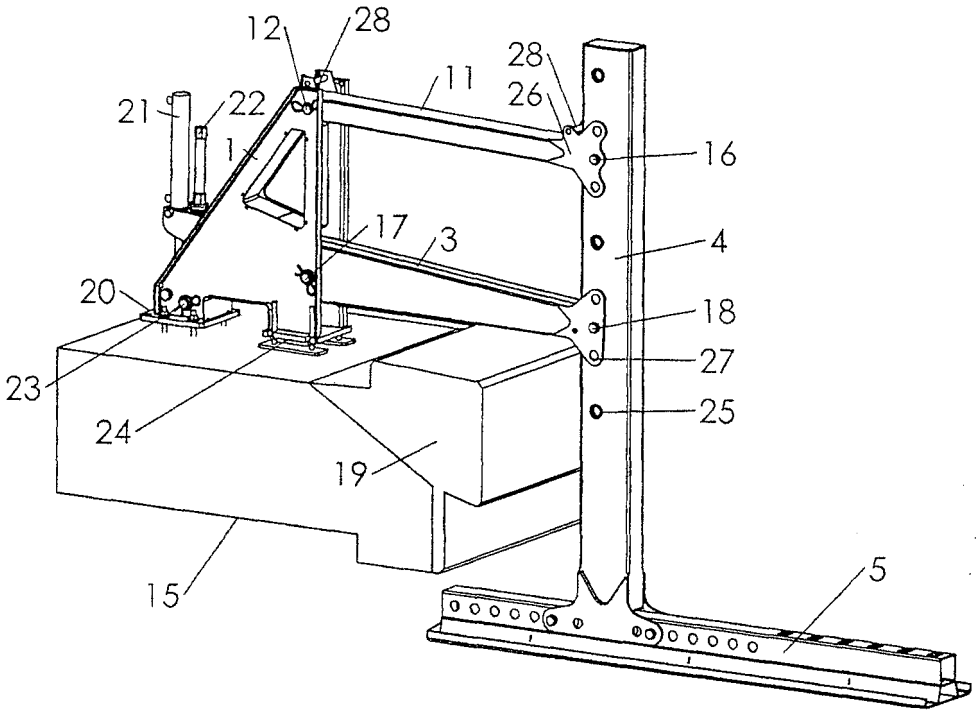

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- WO 2012062968 A **[0004]**
- WO 9103603 A1 **[0008]**