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(54) **Scissor lift device**

Scherenhubvorrichtung

Dispositif de levage à ciseaux

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Description

[0001] The present invention concerns a lift device of the shearing platform type, including a bottom frame with long sides and short sides, and an upper frame carried by pairs of shearing arm oriented in parallel and each including an inner shearing arms and an outer shearing arm, where the shearing arms are arranged for folding under the action of an actuator with mainly horizontal orientation.

Description of Prior Art

[0002] Such a lift device is known from WO 00/21478, where both shearing arms by push- and pullrods are connected with the same point on a moment rod on a torsion shaft supended transversely in a bottom frame and driven via a motor-powered actuator with a mainly horizontal field of action.

[0003] The said lift device is well known per se, and its advantage is a small constructional height compared with a relatively large interval between least and greatest lifting height combined with a considerable lifting ability. The drawback of this known lifting device is, however, that the push- and pullrods between the moment rod and the shearing arms make great demands on the accurateness of the circular arc movement of the point where pull- and pushrods meet in order that oppositely directed forces are not to arise during the raising-lowering procedure with the lift device. Furthermore, the presence of the push- and pullrods implies that the possibilities of placing the shearing arms are relatively limited, which sometimes may limit the areas of application for this type of lift, e.g. in connection with wheelchairs.

[0004] Other lift platforms are known from GB patent application 2 267 695, US 3 472 183 and RU patent application 75 17 92. Document WO-A-9 962 813 discloses a lift device according to the preamble of independent claim 1.

[0005] None of the prior art lift devices are distinguished by being simple in structure, very compact and at the same time having a great lifting dynamics.

Description of the Invention

[0006] It is thus the purpose of the invention to indicate a lift device, the structure of which is relatively simple and which allows a certain flexibility with regard to disposition of the lifting system, and which is compact simultaneously with having great lifting dynamics.

[0007] This purpose is achieved with a lift device of the shearing platform type including a bottom frame and an upper frame carried by a first pair of parallel shearing arms and a second pair of parallel shearing arms, where the first pair of shearing arms are connected with the second pair of shearing arms in a rotatable cross joint, so that the shearing arms are arranged for a shearing movement when lifting and lowering the upper frame. Lifting and lowering of the upper frame occurs under the action of an actuator which is connected with only one pair of shearing arms. The connection between the actuator and the shearing arms includes a V-shaped knee joint, where the knee joint includes a actuation arm being in rotatable connection with the actuator, and a lifting arm secured at an angle to the actuation arm and rotatably connected with the first pair of shearing arms via a rod connection. The lift device is furthermore peculiar in that the rod connection between the lifting arm and the shearing arms is rotatably connected to the shearing arms at a position between the cross joint and the lower rotary joint of the shearing arms.

[0008] By the lift device according to the invention is achieved i.a. the advantage that the device for pressing the shearing arms upwards may be constructed in a simple way. As only one pair of shearing arms is pressed, it is not required constructing a device with both pushrods and pullrods that in a critically accurate way are to follow a circular course for the point where push- and pullrods meet. Furthermore, the course for the connection points may be chosen freely, which provides that the length of the V-shaped knee joint with the connecting rod is not a critical dimension either. A further advantage is a relatively great lifting dynamics, i.e. the distance between the lowest position of the upper frame and the highest position is relatively great. This is highly due to the actuation point between the rod connection and the first pair of shearing arms being positioned between the rotary connection for the shearing arms and the lower rotary joint for the first pair of shearing arms.

[0009] The lift device may furthermore be arranged with a first pair of shearing arms disposed between the second pair of shearing arms, so that the first pair of shearing arms becomes an inner pair of shearing arms and the second pair of shearing arms becomes the outer pair of shearing arms. In this case, the V-shaped knee joint may be positioned between these inner shearing arms and connected to a transverse axle connection rotatably suspended in the longs sides in the bottom frame by a rotary connection, the axle connection being connected to two radially projecting lift arms disposed near respective mutually facing sides of the inner shearing arms, where each lifting arm is connected with one of the inner shearing arms via a rod connection.

[0010] Thereby, instead of a long transverse rod connection between the outer ends of the actuation arms, just a short transverse rod connection may be chosen by placing the actuation arms near each side of the actuator piston. This implies that there are not made so great demands on the strength properties of the transverse rod.

[0011] Furthermore, disposition of the lifting device of the shearing lift within the area between the inner shearing arms is enabled, as a connection between the lifting arm and the outer shearing arm is not necessary, which implies that the lift can be constructed very compact, and the minimum height of the lift may be reduced compared with known lifts. This may be achieved in particular if the

actuator is provided at a height over the lower edge of the bottom frame, which is just possible since it may be disposed at a position between the inner shearing arms.

[0012] With the intention of attaining a suitably great moment/force on the lifting arms for raising the shearing arms, the radial extension from the axis of rotation of the actuation arms be greater than the radial extension of the lift arms, and hereby is achieved an increase of the moment action coming from the actuator.

[0013] With the purpose of achieving optimal distribution of the force exerted on the lifting arms in connection with raising the shearing lift, for which the greatest force is required at the initiation of the raising of the lift, the actuation arms projecting radially from the axis of rotation for the rotary connection may have a angular displacement relative to the radially projecting lifting arms, where the angle is an acute angle, where the angular displacement may vary in dependence of the desired distribution of the force desired to be exerted by the lifting arms. An angle between the actuation arm and the lifting arms is advantageously between 30 and 60 degrees, preferably between 40 and 50 degrees.

[0014] A preferred use of a lifting device according to the invention is for wheelchairs. The invention is, however, quite general and may also advantageously be applied in other fields.

Short Description of the Drawing

[0015] The invention is explained in more detail in the following with reference to the drawing, wherein:

Figs. 1A - 1E	are side views of a lift device according to the invention during raising the lift from a lowest initial position (Fig. 1A) to a fully raised position (Fig. 1E);
Fig. 2	is a lateral sectional view of the lift device shown in Fig. 1;
Fig. 3	is a top view of the lift device shown in Fig. 1;
Fig. 4	shows a perspective view of the lift device.

Detailed Description of the Invention

[0016] Figs. 1A to 1E shows side views of an embodiment of a lift device 2 according to the invention, where the lift device in Fig. 1A is in its low initial position (completely collapsed) to a position where the lift device is fully raised. Fig. 4 shows the device in perspective view.

[0017] The lift device 2 includes a bottom frame 4 with long sides 6 and short sides 8 and an upper frame 10, also with long sides 6' and short sides 8', most clearly appearing from Fig. 2. As it appears from Fig. 1, the upper frame 10 is carried by shearing arms running in parallel, including inner shearing arms 14 and outer shearing arms 16, the shearing arms 14, 16 being mutually connected by a rotary connection 15. The long sides 6, 6' in the bottom frame 4 and the upper frame 8, 8' are constituted by edgeways disposed U-sections.

[0018] At their respective ends, the inner shearing arms 14 are rotationally connected with the bottom frame 4 at a connection 40 and are pivotably-slidingly suspended in the upper frame 10 at the connection 42, respectively, where the connection 42 is sliding in the edgeways positioned U-sections in the upper frame 10 by raising and lowering the lift device, as it appears from Figs. 1A-1E.

[0019] At their respective ends, the outer shearing arms 16 are pivotably connected with the upper frame 10 by a rotary joint 44 and pivotably-slidingly suspended in the bottom frame 4 by the joint 46, where the joint 46 is sliding in the edgeways disposed U-section in the bottom frame 4 when raising and lowering the lift device, as it appears from Figs. 1A-1E.

[0020] Raising and lowering the upper frame 10 occurs mainly by a horizontally oriented actuator (only shown on Fig. 1b), the first end of which is secured to the bottom frame 4 by a rotary connection 48, and the other end of which is connected by a rotary connection 50 to the inner shearing arms 14 via V-shaped knee joint connection 22 that is secured to the bottom frame 4 by a rotary connection 24. The V-shaped knee joint connection 22 includes a projecting actuation arm 26 projecting radially from the rotary connection 22, at the free end of the arm 26 the actuator 18 is connected at the rotary connection 50. The V-shaped knee joint connection also includes a lifting arm 30 that via a rod connection 32 between rotary connection 52, 54 is connected with the free end of the lifting arm 30 and the inner shearing arm 14, respectively, and only this, implying that the shearing arms 14, 16 on the lift device 2 may be collapsed so much that the initial height for the lift device according to the invention corresponds to the total width of the bottom frame 4 and the upper frame 10, respectively, as shown in Fig. 1A.

[0021] It appears from Figs. 1A-1E how the upper frame 10 of the lift device 2 is raised from the initial position to fully raised position by displacing the actuator 18.

[0022] The actuator 18 displaces the rotary joint 50, whereby the actuation arm 26 and the lifting arm 30 secured thereto are displaced, thus displacing the rod connection 32 rotationally connected to the lifting arm 30 and thereby the inner shearing arms 14 in upwards direction. Via the rotary connection 15 between the inner and outer shearing arms 14, 16 forces are transmitted causing displacement, e.g. by means of rollers in the frame, of the rotatably/slidingly suspended ends 43, 46 in the U-section of the inner shearing arms 14 and the outer shearing arms 16, respectively.

[0023] By the lift device according to the invention is achieved i.a. the advantage that the device for pressing the shearing arms 14, 16 upwards may be constructed in a simple way. As only one pair of shearing arms 14 are pressed, there is not to be constructed a device with both pushrods and pullrods which are to follow a circular path in a critically accurate way for the point where push-

and pullrods meet. Furthermore, the path for the connecting points 50, 52 can be chosen freely to a great extent, providing that the length of the V-shaped knee joint 22 with the connecting rod 32 are not critical dimensions either.

[0024] Furthermore, the disposition of the lift device 22, 24, 26 of the shearing lift within the area between the inner shearing arms 14 is enabled since a connection between the lifting arm 30 and the outer shearing arm 16 is not necessary, implying that the lift may be constructed very compact, and the minimum height of the lift may be reduced compared with prior art lifts. In the shown embodiment, the minimum height of the lift device is thus determined by the height of one shearing arm, which, as shown on Fig. 3, equals the total height of the two frames 4, 10, when they are resting upon each other. The disposition of the shearing arms 14, 16 relative to the long sides 6 on the bottom frame 4 and the upper frame 10 may thus also be chosen more freely, since in the construction there is only a single rod connection 32 between the lifting arm 30 of the knee joint 22 and the inner shearing arms 14.

[0025] A further advantage is relatively great lifting dynamics, i.e. the distance between the lowest position of the upper frame 10 and the highest position is relatively great. This is highly due to the actuation point 54 between the rod connection 32 and the inner lifting arm 14 being positioned between the rotary connection 15 for the shearing arms 14, 16 and the rotary joint 40 for the inner shearing arms 14.

[0026] With the invention, several advantageous aspects for lift devices have thus been provided for, namely great lifting dynamics simultaneously with a very compact construction which furthermore allows a greater freedom with regard to the disposition of the shearing arms 14, 16. Contributing to the outermost compact construction is the fact that the actuator 18 is disposed between the inner shearing arms 14 and above the bottom level of the bottom frame 4.

Claims

1. Lift device (2) of the shearing platform type, including a bottom frame (4) and an upper frame (10) carried by a first pair of parallel shearing arms (14) and a second pair of parallel shearing arms (16), where the first pair of shearing arms (14) are connected with the second pair of shearing arms (16) in a rotatable cross joint (15), so that the shearing arms (14, 16) are arranged for a shearing movement when lifting and lowering the upper frame where lift and lowering of the upper frame occurs under the action of an actuator (18) which is connected with a pair of shearing arms (14), where the connection between the actuator (18) and the shearing arms (14) includes a V-shaped knee joint (22), where the knee joint (22) includes an actuation arm (26) being in rotatable connection with the actuator (18), and a lifting arm (30) secured at an angle to the actuation arm (26) and rotatably connected with the first pair of shearing arms (14) via a rod connection (32)wherein the rod connection (32) between the lifting arm (30) and the shearing arms (14) is rotatably connected to the shearing arms (14) at a position between the cross joint (15) and the lower rotary joint (40) of the shearing arms (14), **characterised in that** the actuator (18) is connected with only one pair of shearing arms (14).

2. Lift device (2) according to claim 1, wherein the first, inner pair of shearing arms (14) are disposed between the second, outer pair of shearing arms (16), where the V-shaped knee joint (22) is positioned between these inner shearing arms (14) and connected to a transverse axle connection (34) which is connected to two radially projecting lift arms (30) disposed near respective mutually facing sides of (36) of the inner shearing arms (14), where each lifting arm (30) is connected with one of the inner shearing arms (14) via a rod connection (32).

3. Lift device (2) according to claim 1 or 2, wherein the V-shaped knee joint (22) is rotationally connected to the bottom frame (4) in a rotary connection (24), and wherein the actuation arms (26) radially projecting relative to the rotary axis (38) for the rotary connection (24) projects farther from the said rotary axis (38) than the radially projecting lifting arms (30).

4. Lift device (2) according to any of claims 1 - 3, **characterised in that** the angle between the actuation arms (26) and the lifting arm (30) is an acute angle.

5. Lift device according to any preceding claim, **characterised in that** the angle between the actuation arm (26) and the lifting arm (30) is between 30 and 60 degrees.

6. Lift device according to any preceding claim, **characterised in that** the angle between the actuation arm (26) and the lifting arm (30) is between 40 and 50 degrees.

7. Lift device according to any preceding claim, **characterised in that** the actuator (18) is disposed at a level above the lower edge of the bottom frame (4).

8. Lift device according to any preceding claim, wherein the first pair of shearing arms (14) is connected with the lower frame (4) by stationary rotational connections (40).

9. Lift device according to claim 8, wherein the position of the rotary connection (24) is between the stationary rotational connection (40) and a projection point

on the bottom frame (4), where the projection point on the bottom frame (4) corresponds to the projection on the bottom frame of the rotary connection (15) between the inner and outer shearing arms (14, 16).

10. A wheelchair comprising a lift device according to any preceding claim.

Patentansprüche

1. Hubvorrichtung (2) des Scherenplattform-Typs, mit einem Bodenrahmen (4) und einem oberen Rahmen (10), der von einem ersten Paar paralleler Scherenarme (14) und von einem zweiten Paar paralleler Scherenarme (16) getragen wird, wobei das erste Paar Scherenarme (14) mit dem zweiten Paar Scherenarme (16) an einem drehbaren Kreuzgelenk verbunden ist, so dass die Scherenarme (14, 16) so angeordnet sind, dass sie eine Scherbewegung ausführen, wenn der obere Rahmen angehoben oder abgesenkt wird, wobei das Anheben und Absenken des oberen Rahmens unter der Wirkung eines Aktors (18) erfolgt, der mit einem Paar Scherenarme (14) verbunden ist, wobei die Verbindung zwischen dem Aktor (18) und den Scherenarmen (14) ein V-förmiges Kniegelenk (22) umfasst, wobei das Kniegelenk (22) einen Betätigungsarm (26), der mit dem Aktor (18) drehbar verbunden ist, und einen Hubarm (30), der unter einem Winkel zu dem Betätigungsarm (26) befestigt und mit dem ersten Paar Scherenarme (14) über eine Stabverbindung (32) drehbar verbunden ist, umfasst, wobei die Stabverbindung (32) zwischen dem Hebearm und den Scherenarmen (14) mit den Scherenarmen (14) an einer Position zwischen dem Kreuzgelenk (15) und dem unteren Drehgelenk (40) der Scherenarme (14) drehbar verbunden ist, **dadurch gekennzeichnet, dass** der Aktor (18) nur mit einem Paar Scherenarme (14) verbunden ist.

2. Hubvorrichtung (2) nach Anspruch 1, bei dem das erste, innere Paar Scherenarme (14) zwischen dem zweiten, äußeren Paar Scherenarme (16) angeordnet ist, wobei das V-förmige Kniegelenk (22) zwischen diesen inneren Scherenarmen (14) positioniert und mit einer Querachsenverbindung (34) verbunden ist, die mit zwei radial vorstehenden Hubarmen (30) verbunden ist, die in der Nähe einander zugewandter Seiten (36) der inneren Scherenarme (14) angeordnet sind, wobei jeder Hubarm (30) mit einem der inneren Scherenarme (14) über eine Stabverbindung (32) verbunden ist.

3. Hubvorrichtung (2) nach Anspruch 1 oder 2, bei der das V-förmige Kniegelenk (22) mit dem Bodenrahmen (4) mittels einer Drehverbindung (24) drehbar verbunden ist und bei der die Betätigungsarme (26), die von der Drehachse (38) der Drehverbindung (24) radial vorstehen, weiter von der Drehachse (38) vorstehen als die radial vorstehenden Hubarme (30).

4. Hubvorrichtung (2) nach einem der Ansprüche 1-3, **dadurch gekennzeichnet, dass** der Winkel zwischen den Betätigungsarmen (26) und den Hubarmen (30) ein spitzer Winkel ist.

5. Hubvorrichtung nach einem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** der Winkel zwischen dem Betätigungsarm (26) und dem Hubarm (30) im Bereich von 30 bis 60 Grad liegt.

6. Hubvorrichtung nach einem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** der Winkel zwischen dem Betätigungsarm (26) und dem Hubarm (30) im Bereich von 40 bis 50 Grad liegt.

7. Hubvorrichtung nach einem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** der Aktor (18) auf einer Höhe über der Unterkante des Bodenrahmens (4) angeordnet ist.

8. Hubvorrichtung nach einem vorhergehenden Anspruch, bei der das erste Paar Scherenarme (14) mit dem unteren Rahmen (4) durch stationäre Drehverbindungen (40) verbunden ist.

9. Hubvorrichtung nach Anspruch 8, bei der die Position der Drehverbindung (24) zwischen der stationären Drehverbindung (40) und einem Vorsprungspunkt am Bodenrahmen (4) liegt, wobei der Vorsprungspunkt am Bodenrahmen (4) dem Vorsprung der Drehverbindung (15) zwischen dem inneren und dem äußeren Scherenarm (14, 16) am Bodenrahmen entspricht.

10. Rollstuhl, der eine Hubvorrichtung nach einem vorhergehenden Anspruch enthält.

Revendications

1. Dispositif de levage (2) de type plateforme de cisaillement, comprenant un cadre inférieur (4) et un cadre supérieur (10) supportés par une première paire de bras de cisaillement (14) parallèles et par une deuxième paire de bras de cisaillement (16) parallèles, la première paire de bras de cisaillement (14) étant reliée à la deuxième paire de bras de cisaillement (16) dans un joint horizontal (15) pouvant pivoter, de sorte que les bras de cisaillement (14, 16) sont disposés de manière à pouvoir effectuer un mouvement de cisaillement lors du soulèvement ou de l'abaissement du cadre supérieur, lors du soulèvement ou de l'abaissement du cadre supérieur sous l'action d'un actionneur (18) relié à une paire de bras

de cisaillement (14), la liaison entre l'actionneur (18) et les bras de cisaillement (14) comprenant un joint à rotule (22) en V, le joint à rotule (22) comprenant un bras d'actionnement (26) en liaison pivotante avec l'actionneur (18) et un bras de levage (30) fixé selon un certain angle par rapport aux bras d'actionnement (26) et relié de façon pivotante à la première paire de bras de cisaillement (14) via une liaison par tige (32), dans lequel la liaison par tige (32) entre le bras de levage (30) et les bras de cisaillement (14) est reliée de façon pivotante aux bras de cisaillement (14) dans une position située entre le joint horizontal (15) et le joint rotatif inférieur (40) des bras de cisaillement (14), **caractérisé en ce que** l'actionneur (18) n'est relié qu'à une seule paire de bras de cisaillement (14).

2. Dispositif de levage (2) selon la revendication 1, dans lequel la première paire de bras de cisaillement (14) intérieurs est disposée entre la deuxième paire de bras de cisaillement (16) extérieurs, le joint à rotule (22) en V étant positionné entre les bras de cisaillement (14) intérieurs et relié à une liaison d'essieu transversal (34) reliée à deux bras de levage (30) faisant saillie radialement et disposés à proximité des deux faces mutuellement opposées respectives (36) du bras de cisaillement (14) intérieur, chaque bras de levage (30) étant relié à un des bras de cisaillement (14) intérieurs via une liaison par tige (32).

3. Dispositif de levage (2) selon la revendication 1 ou 2, dans lequel le joint à rotule (22) en V est relié de façon pivotante au cadre inférieur (4) dans une liaison pivotante (24) et dans lequel les bras d'actionnement (26) saillant radialement par rapport à l'axe de rotation (38) de la liaison pivotante (24) font davantage saillie dudit axe de rotation (38) que lesdits bras de levage (30) saillant radialement.

4. Dispositif de levage (2) selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** l'angle entre les bras d'actionnement (26) et les bras de levage (30) est un angle aigu.

5. Dispositif de levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'angle entre le bras d'actionnement (26) et le bras de levage (30) est compris entre 30 et 60 degrés.

6. Dispositif de levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'angle entre le bras d'actionnement (26) et le bras de levage (30) est compris entre 40 et 50 degrés.

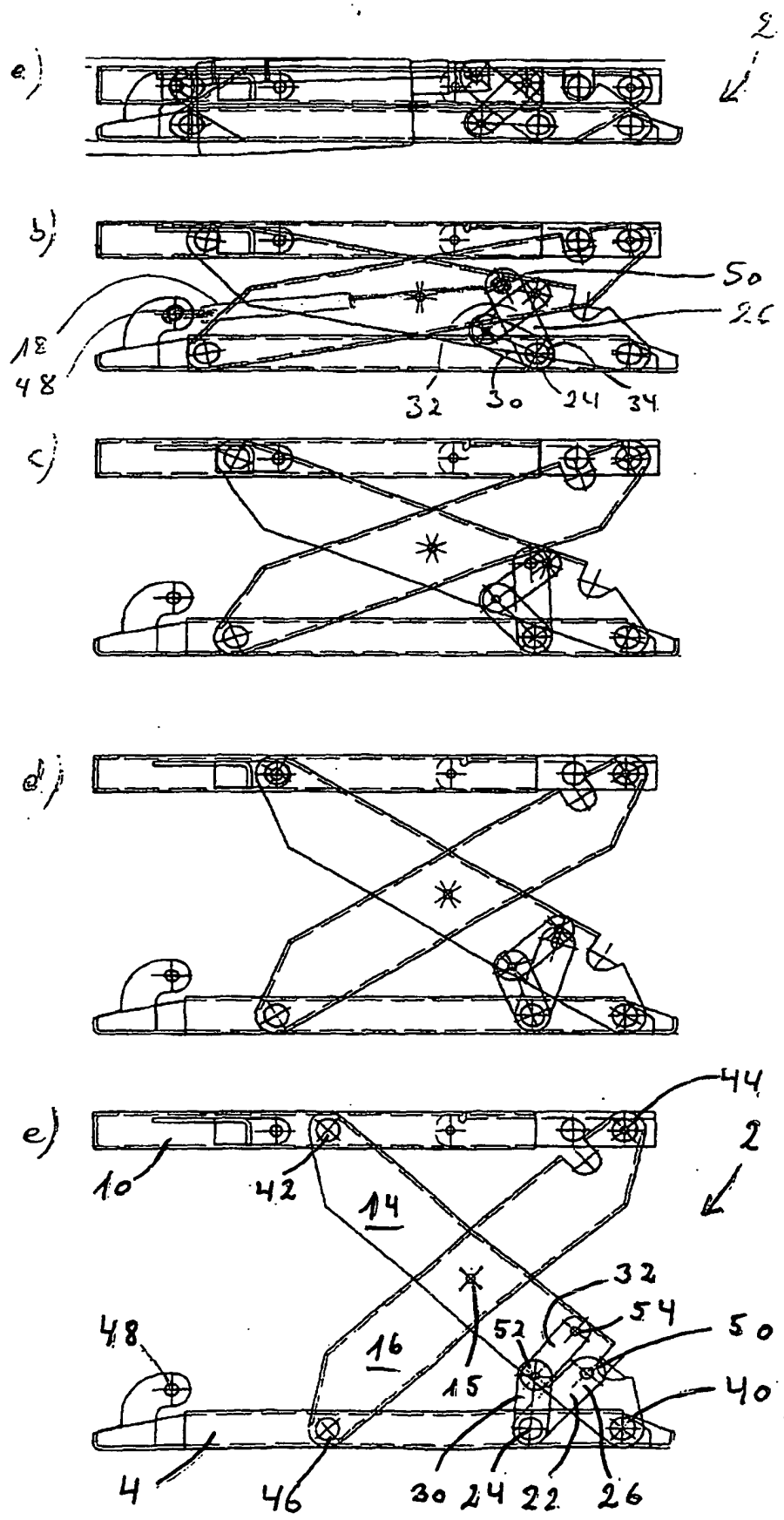
7. Dispositif de levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'actionneur (18) est disposé plus haut que le bord inférieur du cadre inférieur (4).

8. Dispositif de levage selon l'une quelconque des revendications précédentes, dans lequel la première paire de bras de cisaillement (14) est reliée au cadre inférieur (4) à l'aide de liaisons pivotantes stationnaires (40).

9. Dispositif de levage selon la revendication 8, dans lequel la position de la liaison pivotante (24) est située entre la liaison pivotante stationnaire (40) et un point de projection sur le cadre inférieur (4), le point de projection sur le cadre inférieur (4) correspondant à la projection sur le cadre inférieur de la liaison pivotante (15) située entre les bras de cisaillement (14, 16) intérieur et extérieur.

10. Fauteuil roulant comprenant un dispositif de levage selon l'une quelconque des revendications précédentes.

Fig. 1


a)
2
b)
50
26
18
48
32
30
24
34
c)
d)
e)
44
2
10
42
14
32
54
52
50
48
16
15
40
4
46
30
24
22
26

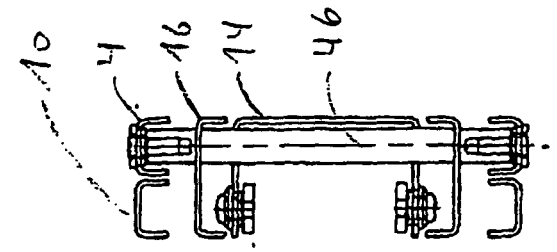


FIG. 3

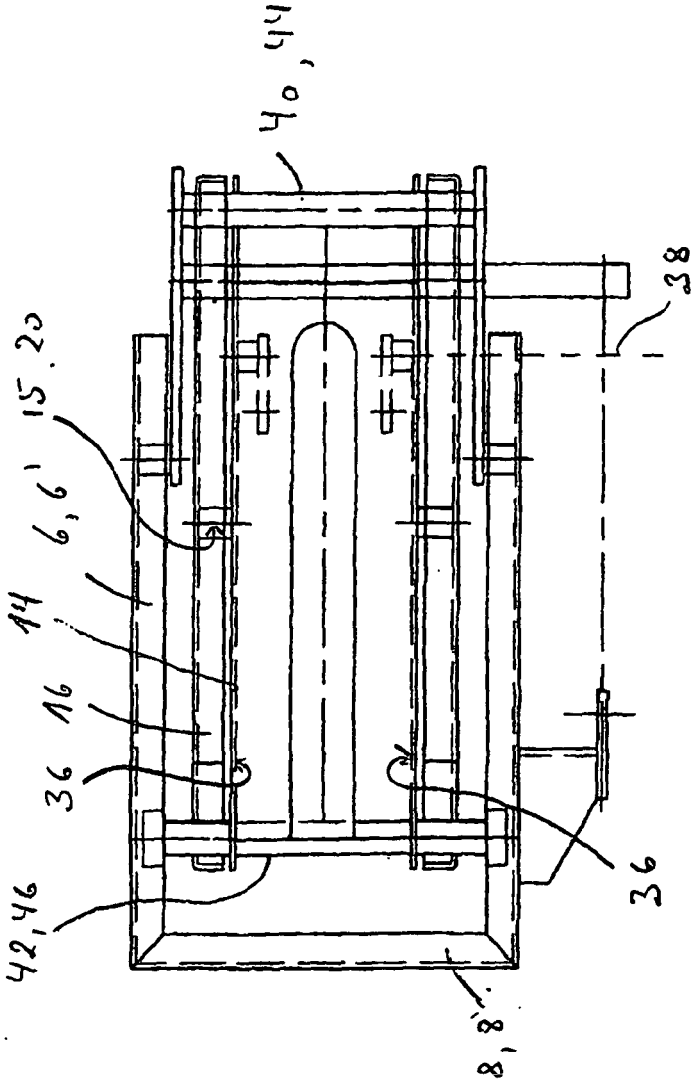


FIG. 2

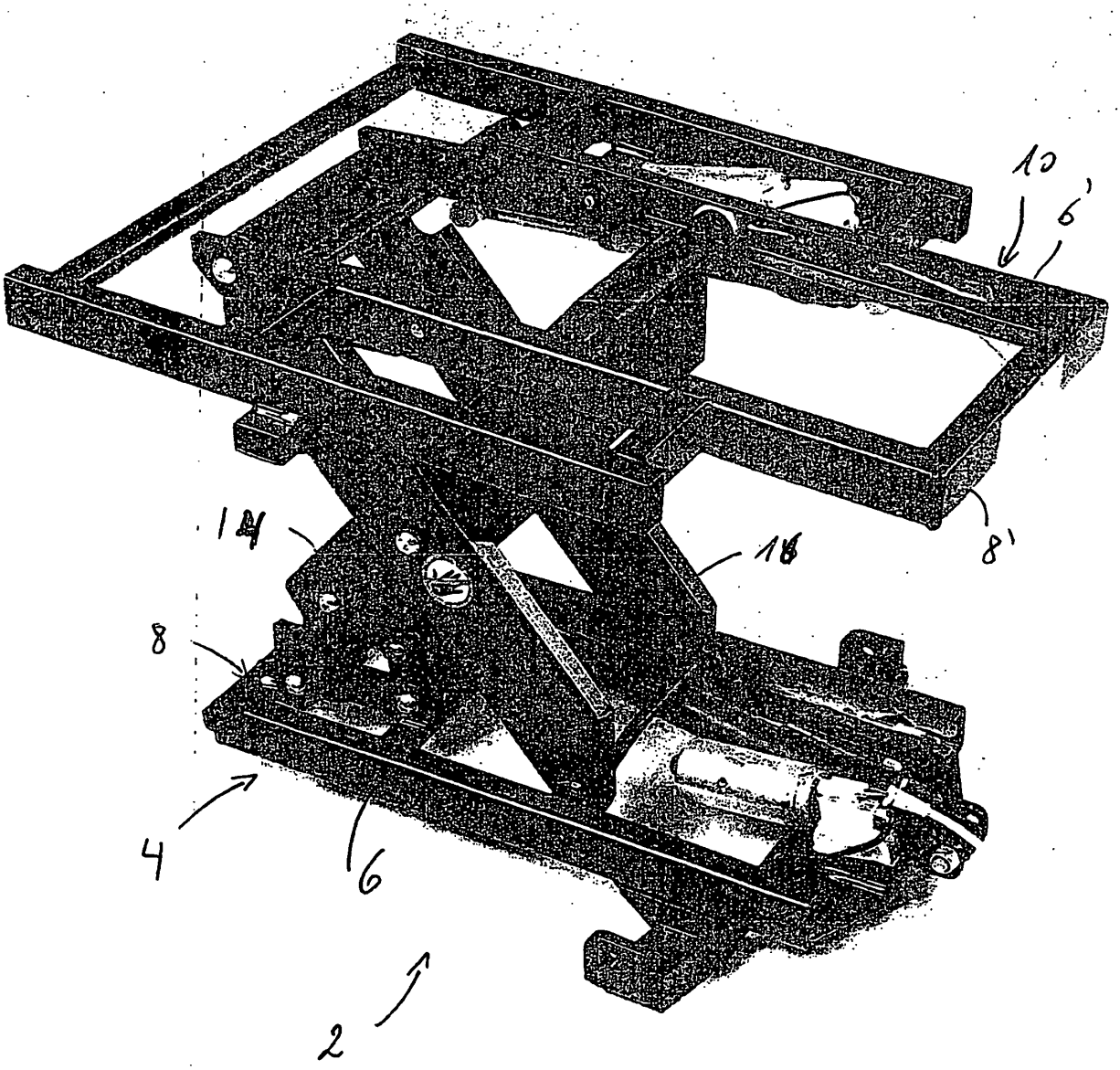


FIG. 4