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(54) **Device for manipulating an at least substantially plate-shaped object**

(57) The present invention relates to a device for manipulating an at least substantially plate-shaped object (17), comprising a mobile frame (2), a column (3) mounted to the frame, a horizontal arm (4) extending from said column, an elongated, flexible pulling element (14), which is at least passed over a pulley means (12,13) mounted to the arm, and an engaging element (55) for engaging a plate-shaped object, which engaging element is provided on a free end of the flexible pulling element and which comprises two brackets (65,66) for engaging two parts of a circumferential edge of the plate-shaped object. The device further comprises a guide member (54) extending vertically downwards from the horizontal arm, parallel to the column, for guiding cooperation in the longitudinal direction of the guide member with a guide portion of the engaging element, which guide portion of the engaging element is also arranged for rotating the engaging element about the guide member.

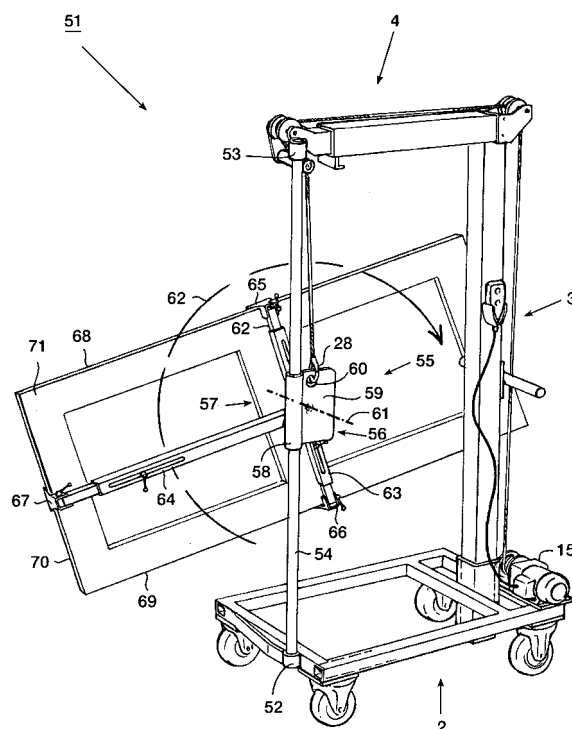


Fig. 4

Description

[0001] The present invention relates to a device for manipulating an at least substantially plate-shaped object, comprising a mobile frame, a column mounted to the frame, a horizontal arm extending from said column, an elongated, flexible pulling element, which is at least passed over a pulley means mounted to the arm, and an engaging element for engaging a plate-shaped object, which engaging element is provided on a free end of the flexible pulling element and which comprises two brackets for engaging two parts of a circumferential edge of the plate-shaped object.

[0002] Quite frequently, plate-shaped objects, for example doors or radiators, need to be manipulated for carrying out certain operations, such as mounting doors. The present application does not exclude the possibility of the present invention being used for manipulating different types of objects having different shapes, such as boxes.

[0003] A device as referred to in the introduction is disclosed in US 4,810,151. Said device comprises a supporting frame, a vertical column mounted on the supporting frame, along which a carriage can move in vertical direction. The carriage is provided with two pivotable gripping arms for gripping a door, whereupon the door can be rotated about a horizontal axis. A drawback of the known device is the limited degree to which manipulation of the door is possible once it is clamped in the gripping arms. The object of the invention is to solve or at least alleviate the above-described problems. This object is accomplished in that the device further comprises a guide member extending vertically downwards from the horizontal arm, parallel to the column, for guiding cooperation in the longitudinal direction of the guide member with a guide portion of the engaging element, which guide portion of the engaging element is also arranged for rotating the engaging element about the guide member.

[0004] Using a device according to the invention, a single person can manipulate plate-shaped objects of substantial weight and substantial dimensions in a sound manner, and that significantly more freely. The elongated, flexible pulling element provides a possibility of manipulating the plate-shaped object in vertical direction along the guide member by hauling in or paying out said pulling element, during which vertical movement the object can also be rotated about the (vertical) axis of the guide member, thus making it possible to position the object optimally.

[0005] Preferably, the two brackets are positioned opposite each other for engaging around two opposite parts of a circumferential edge of the plate-shaped object. This feature enables the engaging element to clamp down a plate-shaped object in an optimum manner.

[0006] Preferably, the engaging element further comprises a base body, relative to which at least one of the brackets can move back and forth in a direction perpendicular to the associated part of the circumferential edge

of the plate-shaped object that is to be engaged. Furthermore preferably, the two brackets are movable in a corresponding manner relative to the base body. Thus, a possibility is provided to engage plate-shaped objects of varying dimensions.

[0007] Alternatively, or in combination therewith, it is preferable if the engaging element comprises a base body, with respect to which at least one of the brackets can pivot back and forth about a pivot axis which extends parallel to the longitudinal direction of the associated part of the circumferential edge of the plate-shaped object that is to be engaged. This reduces the risk of the brackets already coming into contact with the plate-shaped object at an undesirable moment before said brackets engage the plate-shaped object, which might lead to the plate-shaped object being damaged. Within this framework it is preferable if the above-described brackets are both pivotable in a corresponding manner relative to the base body.

[0008] If a base body according to one of the preceding preferred embodiments is used, it is furthermore preferable if the engaging element comprises fixing means for releasably fixing the position and/or orientation of at least one bracket relative to the base body, so that the plate-shaped object can be engaged in a reliable manner.

[0009] According to a very important preferred embodiment, the base body comprises a first base body part and a second base body part, said first base body part being provided on the guide portion and comprising an engaging portion to be engaged by a hook-shaped member attached to the free end of the flexible pulling element, and said second base body part being rotatable jointly with the brackets with respect to said first base body part about an axis of rotation that extends perpendicularly to the plate-shaped object. The rotation of the two base body parts relative to each other makes it possible to change not only the position of the plate-shaped object, by means of a translating manipulation parallel to the (vertical) longitudinal axis of the guide member and rotation about said longitudinal axis, but also the orientation thereof. The present preferred embodiment thus makes it possible to first engage an elongated plate-shaped object in a flat, horizontal orientation thereof and subsequently manipulate said object to a vertical orientation by rotating the two base body parts relative to each other. Since the guide portion is provided on the first base body part, potential movements of the second base body part with the plate-shaped object relative to the first base body part are not restricted by the use of the guide portion.

[0010] The engaging element preferably comprises a number of engaging parts to be engaged at different positions of the engaging element by a hook-shaped member attached to the free end of the flexible pulling element.

[0011] The guide member preferably has a circular cross-section, so that rotation of the guide portion of the engaging element about the guide member can be facilitated in a simple manner.

[0012] A stable construction is obtained in particular if

the guide member extends vertically upwards from the frame.

[0013] Another preferred embodiment of the device according to the invention is characterised in that the engaging element is provided with at least one further bracket for engagement around a part of a circumferential edge of the plate-shaped object that is oriented perpendicular to the two parts of the circumferential edge that are engaged by the two opposite brackets. In this way an adequate support of the plate-shaped objects by the engaging element can take place both when the longitudinal direction of the plate-shaped object is horizontally oriented and when said longitudinal direction is vertically oriented. In particular, but not exclusively, a situation in which the plate-shaped object is a door may be considered in this regard.

[0014] To facilitate the placement of such a door in a door frame upon mounting the door, the brackets, in the engaging position thereof, extend outside the associated parts of the circumferential edge of the plate-shaped object, for example a door, over a distance of 1.5 - 4.0 mm. Thus it can be guaranteed by using the brackets that the circumference of the door will be correctly spaced from the door jambs.

[0015] To render the device according to the invention (more) suitable for transport in a vehicle, the mobile frame preferably comprises a base for effecting a manually detachable, form-locked connection between the frame and the column. The column can thus be disconnected from the mobile frame in a simple manner.

[0016] Within the same framework, the column preferably comprises at least two column members in line with each other, which are connected together in a manually detachable, form-locked manner. The advantage that is thus obtained is not only that transport of the device will be easier, because of the comparatively small dimensions of the parts of which the device is built up, but also that it is also possible to use only one of the column members for specific applications, for example if the mobile frame is simply used as a handtruck, without specific facilities being provided for manipulating the plate-shaped object.

[0017] Preferably, the horizontal arm is connected to the column in a manually detachable, form-locked manner, so that also the horizontal arm can be disconnected from the remaining part of the device in a simple manner.

[0018] With a view to extending the device according to the invention, whether or not provided with the facilities required for manipulating a plate-shaped object, such as the horizontal arm and (a part of) the column, the frame is preferably provided with connecting means for connecting an extension element for extending the device to the frame. In this way it is possible, for example, to increase a load-bearing area formed by a part of the frame.

[0019] The connecting means preferably comprise at least one opening on the side remote from the column for receiving the extension element.

[0020] Said at least one opening is preferably formed by two open ends of parallel tubular members forming part of the frame. The presence of such parallel tubular members is thus optimally utilised.

5 **[0021]** To lift objects, in particular heavy objects, while at the same time supporting said objects, the extension element preferably comprises two parallel, interconnected guide members, as well as a support member, whether or not instead of the engaging element, for supporting an object, which support member comprises an engaging portion to be engaged by a hook-shaped member attached to the free end of the flexible pulling element.

10 **[0022]** In general it can be stated that the device is preferably provided with a winch for a winding up the flexible pulling element, whilst the device is furthermore preferably provided with a motor for driving said winch.

15 **[0023]** Preferably, the guide portion of the engaging element is provided with wheels for guiding cooperation with the guide member. In particular when relatively heavy objects are to be manipulated, a low-friction guidance is ensured in this manner.

20 **[0024]** The present invention will now be explained in more detail by means of a description of a preferred embodiment of a device according to the invention with reference to the following figures:

Figure 1 is a perspective view of a hoisting device; Figures 2a and 2b show the piece of plate material lifted by the hoisting device of figure 1 in a vertical orientation and in a horizontal orientation, respectively;

Figures 3a and 3b show two alternative embodiments of an engaging element that can be used with the hoisting device of figure 1;

35 Figure 4 is a perspective view of a preferred embodiment of a device according to the invention used as a hoisting device;

Figures 5 and 6 show a part of an engaging element as may be used with a device according to figure 1 or figure 4;

40 Figure 7 shows the device of figure 4 being used in mounting a door;

45 Figure 8 is a perspective view of another preferred embodiment of a device according to the invention used as a hoisting device;

Figure 9 shows a modified version of the device of figure 1, figure 4 or figure 8;

Figures 10a and 10b show another use of the device of figure 1, figure 4 or figure 8;

50 Figure 11 shows an alternative embodiment of the first base body part of figure 4;

Figure 12 shows an alternative embodiment of the fork means of figure 8.

55 **[0025]** The hoisting device 1 shown in figure 1 comprises a frame 2, a vertical column 3 and a horizontal arm 4. The frame 2 comprises a rectangular framework built up of tubular longitudinal girders 5a, 5b and tubular

cross girders 6a, 6b, 6c. Between the cross girders 6b and 6c, the frame 2 is further provided with a vertically oriented tubular base 7, in which the lower end of the tubular column 3 is accommodated. The column 3 to that end has a smaller cross-section at the location of the base 7. The column 3 rests on the upper edges of the base 7.

[0026] Castors 8 are provided at the four corner points of the framework, so that the frame 2 is mobile. To make it easier to move the frame 2 and thus the hoisting device 1, a horizontal manipulating rod 9 is mounted to the column 3, which manipulating rod can be engaged by the operator of the hoisting device 1 for moving the hoisting device 1 to a desired position.

[0027] The arm 4 is of the telescopic type and comprises arm members 10a, 10b, which arm member 10a can slide into and out of the arm member 10b as indicated by the double arrow 11. At one end of the arm 4, the arm member 10b is provided with a downwardly extending tubular connecting piece 12, which is accommodated in the open upper end of the tubular column 3 with a close fit.

[0028] The hoisting device 1 further comprises two pulleys 12, 13 mounted to the ends of the arm 4, over which a hoisting cable 14 is passed. The hoisting cable 14 can be wound and unwound by means of an electric motor 15, which is mounted to the frame 2 at the location of the cross girder 6c and which also functions as a counterweight. The electric motor 15 is controlled by means of a remote control device 49.

[0029] The hoisting device 1 further comprises an engaging element 16, which is shown in more detail in figures 2a and 2b and which is intended to engage a plate-shaped object 17, such as a door or a radiator. The engaging element 16 comprises a first telescopic, tubular arm member 18 and a second telescopic, tubular arm member 19, which second arm member 19 can telescope into and out of the first arm member 18. The position of the first arm member 18 and the second arm member 19 relative to each other can be fixed by tightening the fixing bolt 20. Brackets 21, 22 are mounted to the free ends of the first arm member 18 and the second arm member 19, respectively, which brackets engage the object 17 around two opposite longitudinal edges 23, 24 of the object 17. The engaging element 16 further comprises a flanged retaining strip 25, whose ends are connected to the side of the first arm member 18 remote from the object 17. The first arm member 18 and the retaining strip 25 jointly define a slotted passage 26. A ring 27 is provided around the retaining strip 25, which ring can move along the retaining strip 25 along the length of the slotted passage 26. Mounted to the free end of the cable 14 is a hook member 28, which is capable of engaging the ring 27.

[0030] Once the object 17 has been engaged by the engaging element 16 and the hook member 28 engages the ring 27, the object 17 can be lifted by suitably driving the electric motor 15. The object 17 can be easily transported by subsequently moving the hoisting device 1. In

figures 1 and 2a the object 17 has a vertical orientation, in which the ring 27 is located in the U-shaped bend in the retaining strip 25. Figure 2b shows an alternative situation, in which the object 17 has a horizontal orientation. In that situation, the ring 27 has been moved along the retaining strip 25 to a position centrally between the brackets 21 and 22. To fix the position of the ring 27 relative to the retaining strip 25 temporarily, the retaining strip 25 is optionally provided at suitable positions with stop edges 29 facing towards the first arm member 18. Although only two such stop edges 29 are shown in figures 1-2b, a different number of stop edges may be provided, of course.

[0031] Figures 3a and 3b show two alternative engaging elements 30, 31, by means of which it is also possible to effect a vertical orientation as well as a horizontal orientation of an object 17 upon manipulation thereof. Insofar as parts forming part of the engaging elements 30, 31 are comparable to parts forming part of the engaging element 16, identical numerals will be used to indicate said parts and a further description of said parts will not be given.

[0032] Instead of being provided with a retaining strip 25 with a ring 27, the engaging element 30 shown in figures 3a is provided with a simple, straight longitudinal strip 33 provided with a hole 34 to be engaged by the hook member 28 upon manipulation of objects in the vertical orientation thereof, and with holes 35a, 35b to be engaged by the hook member 28 upon manipulation of an object 17 in the horizontal orientation of said object 17.

[0033] In the engaging element 31 shown in figure 3b, the longitudinal strip 33 has been substituted for the elongated ring 35 near the bracket 22, which ring is to be engaged the hook member 28 by upon manipulation of an object in the vertical orientation thereof, and for the corrugated rod 36. The corrugated shape of said rod 36 defines several positions where the hook member 28 can engage for manipulating an object 17 in the horizontal orientation thereof.

[0034] Figure 4 shows a hoisting device 51 which is quite similar to the hoisting device 1. Like parts are indicated by the same numerals and will not be discussed in more detail hereinafter. At the front side of the cross girder 6a, the frame 2 is provided with a retaining sleeve 52 having a closed bottom. Near the pulley 12, the arm 4 is provided with a retaining sleeve 53. In the situation shown in figure 4, the telescopic arm 4 is in its fully retracted position, so that the central axes of the retaining sleeve 52 and the retaining sleeve 53 are in line with each other. The hoisting device 51 further comprises a round sliding rod 54, whose ends are positioned within the retaining sleeve 52 and the retaining sleeve 53. The sliding rod 54 extends vertically, parallel to the column 3.

[0035] The hoisting device 51 further comprises an engaging element 55 having a first base body part 56 and a second base body part 57. The first base body part 56 comprises a tubular guide member 58, whose internal diameter corresponds to the external diameter of the slid-

ing rod 54, as well as a connecting plate 59, which is tangentially connected to the guide member 58 and which is provided with a hole 60 to be engaged by the hook member 28. The first base body part 56, and thus the engaging element 55, can be moved up and down as a whole along the sliding rod 54 by suitably driving the electric motor 15. In addition to that, the first base body part 56 can rotate about the central axis of the sliding rod 54.

[0036] The second base body part 57 is connected to the first base body part 56, being rotatable about the axis of rotation 61 in the directions indicated by the double arrow 62. Said axis of rotation 61 extends perpendicularly to the object 71 to be manipulated. The second base body part 57 comprises three telescopic-type arms 62, 63, 64, which are provided with brackets 65, 66, 67 at the ends thereof, which brackets engage around two longitudinal edges 68, 69 and the transverse edge 70, respectively, of the plate-shaped object 71, in this case a door.

[0037] Figure 5 shows an end of one of the arms 62, 63, 64 of the second base body part 57. The position of the telescopic arm members 72, 73 relative to each other can be fixed by means of a clamping element 74, which is connected to the telescopic arm member 73 and which is movable along the slotted hole 75 in the arm member 72. The brackets 65, 66, 67 are pivotally connected to the free end of the arm member 73 about the pivot axis 76. The brackets 65, 66, 67 can be fixed in their pivoted position by tightening the handle 98.

[0038] Figure 6 shows an alternative configuration of (the ends of) the arms 62, 63, 64. In this embodiment, a rack-and-pinion mechanism is used, which comprises a gear 77, which can be rotated by means of a handle 78, and which is connected to the end of the arm member 79 that is located on the side of a bracket 65, 66, 67. Arm member 80 is provided with a tooth portion 81 meshing with the gear 77. Turning the handle 78 will result in the arm member 80 sliding into or out of the arm member 79. The arm members 79 and 80 can be locked in their relative position by means of the fixing pin 82. The brackets 65, 66, 67 can be fixed in their pivoted positions by means of a wing nut 83.

[0039] Figure 7 shows the manner in which the hoisting device 51 is used for mounting a door 71 in a door frame 83. The thickness d (see figure 5) of the brackets has been selected so that it is ensured that the circumferential edges of the door 71 will be spaced a desired distance from the circumferential edges of the frame 83. In practice a thickness d ranging from 2-3 mm has been found to be quite satisfactory.

[0040] The hoisting device 101 is to a significant degree similar to the hoisting device 51. Like parts are indicated by the same numerals. In comparison with the hoisting device 51, the engaging element 55 has been substituted for fork means 102 comprising forks 103 capable of supporting an object 104. The fork means 104 can be moved up and down along a sliding rod 54 by

means of an electric motor 15, in a manner that corresponds to the way in which the first base body part 56 of the hoisting device 51 can be moved along the sliding rod 54. In addition to sliding movement, the fork means 102 is also capable of rotating movement about the central axis of the sliding rod 54, as indicated by the arrow 105, similarly to the way in which the engaging element 55 of the hoisting device 51 is rotatable about the central axis of the sliding rod 54.

[0041] Figure 9 shows a hoisting device 110 provided with an extension element 111. The extension element 111 comprises two tubular vertical guides 112, which are connected at their bottom ends via a connecting plate 113 and which are connected at their upper ends, below the arm 4, via a bracket 114. Said bracket 114 might optionally be connected to the arm 4 (in a manner not shown). At a point exactly above the connecting plates 113, the guides 112 are provided with horizontally oriented insert tubes 115, which extend within the longitudinal girders 5a, 5b of the frame 2.

[0042] The extension element 111 comprises a fork means 116 provided with forks 117 and guide members 118. Said guide members cooperate with the guides 112 for moving the fork means 116 up and down along the guides 112 by suitably driving the electric motor 15.

[0043] Figures 10a and 10b show an alternative use of the hoisting device 1, 51 or 101, in which various parts of the hoisting device 1, 51 or 101 have been removed. The column 3 is built up of two parts, the lower part 120 of which still forms part of the device shown in figures 10a and 10b. The frame 2 has been extended with an extension element 121, which may in fact be regarded as an extension of the framework, which increases the load-bearing area defined by the framework, so that the hoisting device 101 will be more suitable for use as a handtruck as shown in figure 10b for transporting objects 122. The extension element 121 comprises longitudinal girders 123, 124 and a cross girder 125. The free ends of the longitudinal girders extend through the open ends of the longitudinal girders 5a, 5b.

[0044] The open ends of the longitudinal girders 5a, 5b can also be utilised for other types of extension elements, for example as shown in figure 1, in which the extension element comprises a conveyor roller 131 which on the one hand increases the load-bearing area defined by the framework and which on the other hand makes it easier to place objects on the support surface.

[0045] Figure 11 shows a first base body part 56' as an alternative embodiment of the first base body part 56 as shown in figure 4 and described in the foregoing. Instead of a sliding contact between the tubular guide member 58 and the sliding rod 54, a rolling contact is realised by means of wheels 560, which likewise provides a satisfactory, low-friction guidance. The wheels 560 have a concave rolling surface with a radius of curvature that substantially corresponds to the radius of the sliding rod 54. Upon vertical translation of the first base body part 56' along the sliding rod 54, the wheels 560 will roll over

the surface of the sliding rod 54, whilst the wheels 560 will slide over the surface of the sliding rod 54 upon rotation of the base body part 56' about the sliding rod 54.

[0046] Figure 12 shows an engaging element configured as fork means 102' as an alternative embodiment of the fork means 102 shown in figure 8 and described in the foregoing. The guidance of the fork means 102' by means of wheels 1020 along the sliding rod 54 has been realised in a similar manner as with the first base body part 56' of figure 1. Both in the case of the construction shown in figure 11 and in the case of the construction shown in figure 12, the point of engagement of the hook member 28 relative to the point of engagement of the load of the object to be manipulated has been selected so that the wheels 560, 1020 are to a limited degree urged against the sliding rod 54 in horizontal direction in use.

Claims

1. A device for manipulating an at least substantially plate-shaped object, comprising a mobile frame, a column mounted to the frame, a horizontal arm extending from said column, an elongated, flexible pulling element, which is at least passed over a pulley means mounted to the arm, and an engaging element for engaging a plate-shaped object, which engaging element is provided on a free end of the flexible pulling element and which comprises two brackets for engaging two parts of a circumferential edge of the plate-shaped object, **characterised in that** the device further comprises a guide member extending vertically downwards from the horizontal arm, parallel to the column, for guiding cooperation in the longitudinal direction of the guide member with a guide portion of the engaging element, which guide portion of the engaging element is also arranged for rotating the engaging element about the guide member.
2. A device according to claim 1, **characterised in that** the two brackets are positioned opposite each other for engaging around two opposite parts of a circumferential edge of the plate-shaped object.
3. A device according to claim 1 or 2, **characterised in that** the engaging element further comprises a base body, relative to which at least one of the brackets can move back and forth in a direction perpendicular to the associated part of the circumferential edge of the plate-shaped object that is to be engaged.
4. A device according to claim 2 or 3, **characterised in that** the engaging element comprises a base body, with respect to which at least one of the brackets can pivot back and forth about a pivot axis which extends parallel to the longitudinal direction of the associated part of the circumferential edge of the plate-shaped object that is to be engaged.
5. A device according to claim 3, or 4, **characterised in that** the engaging element comprises fixing means for releasably fixing the position and/or orientation of at least one bracket relative to the base body.
6. A device according to claim 3, 4 or 5, **characterised in that** the base body comprises a first base body part and a second base body part, said first base body part being provided on the guide portion and comprising an engaging portion to be engaged by a hook-shaped member attached to the free end of the flexible pulling element, and said second base body part being rotatable jointly with the brackets with respect to said first base body part about an axis of rotation that extends perpendicularly to the plate-shaped object.
7. A device according to any one of the preceding claims, **characterised in that** the engaging element comprises a number of engaging parts to be engaged at different positions of the engaging element by a hook-shaped member attached to the free end of the flexible pulling element.
8. A device according to any one of the preceding claims, **characterised in that** the guide member has a circular cross-section.
9. A device according to any one of the preceding claims, **characterised in that** the guide member extends vertically upwards from the frame.
10. A device according to any one of the preceding claims, **characterised in that** the engaging element is provided with at least one further bracket for engagement around a part of a circumferential edge of the plate-shaped object that is oriented perpendicular to the two parts of the circumferential edge that are engaged by the two opposite brackets.
11. A device according to any one of the preceding claims, **characterised in that** the brackets, in the engaging position thereof, extend outside the associated parts of the circumferential edge of the plate-shaped object over a distance of 1.5 - 4.0 mm.
12. A device according to any one of the preceding claims, **characterised in that** connecting means are provided for connecting an extension element to the frame.
13. A device according to claim 12, **characterised in that** the frame has at least one opening on the side remote from the column for receiving an extension

element with which the device can be extended.

14. A device according to claim 12 or 13, **characterised in that** the extension element comprises two parallel, interconnected guide members, as well as a support member, whether or not instead of the engaging element, for supporting an object, which support member comprises an engaging portion to be engaged by a hook-shaped member attached to the free end of the flexible pulling element. 5 10
15. A device according to any one of the preceding claims, **characterised in that** the device is provided with a winch for a winding up the flexible pulling element. 15
16. A device according to any one of the preceding claims, **characterised in that** the guide portion of the engaging element is provided with wheels for guiding cooperation with the guide member. 20

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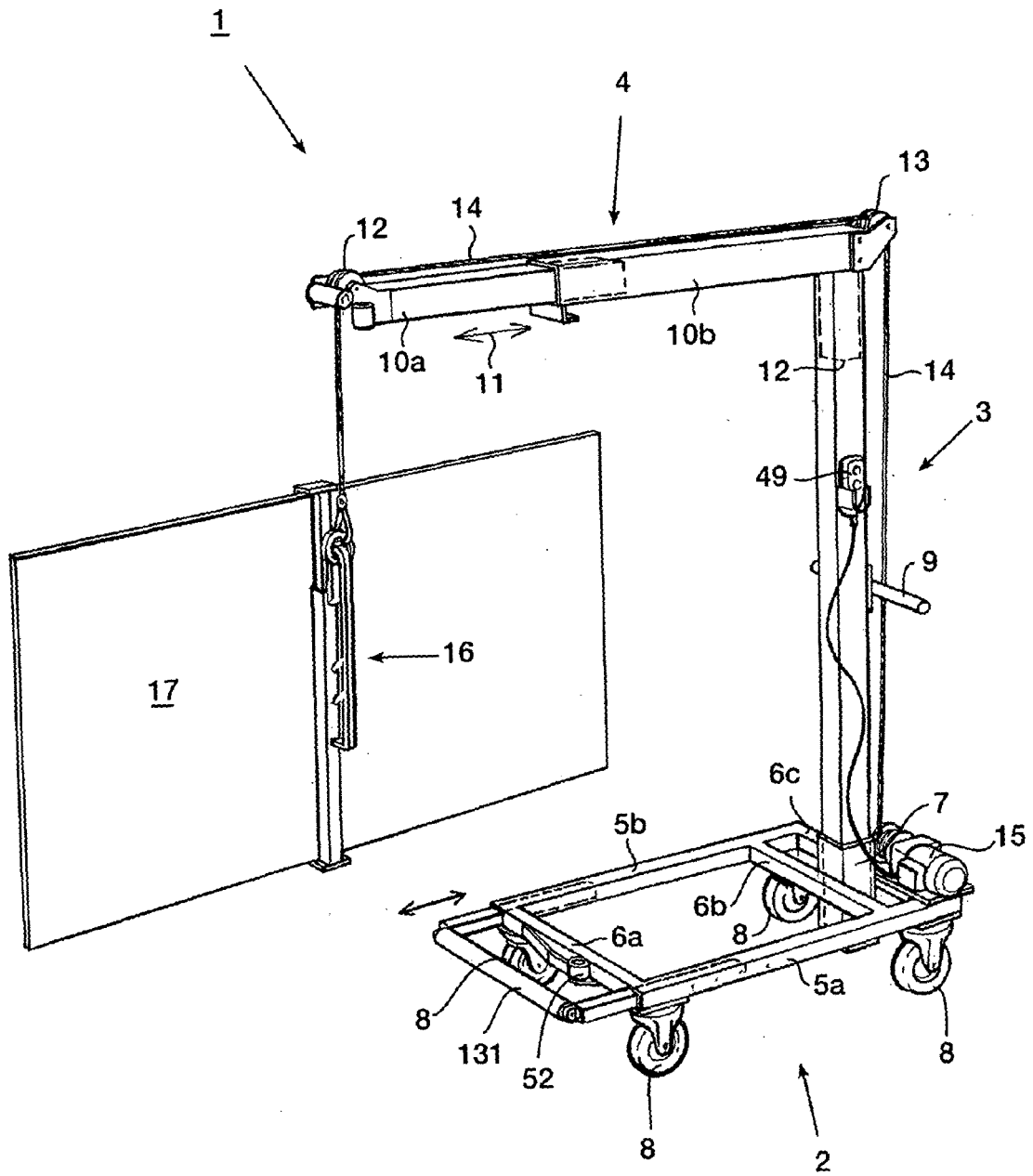
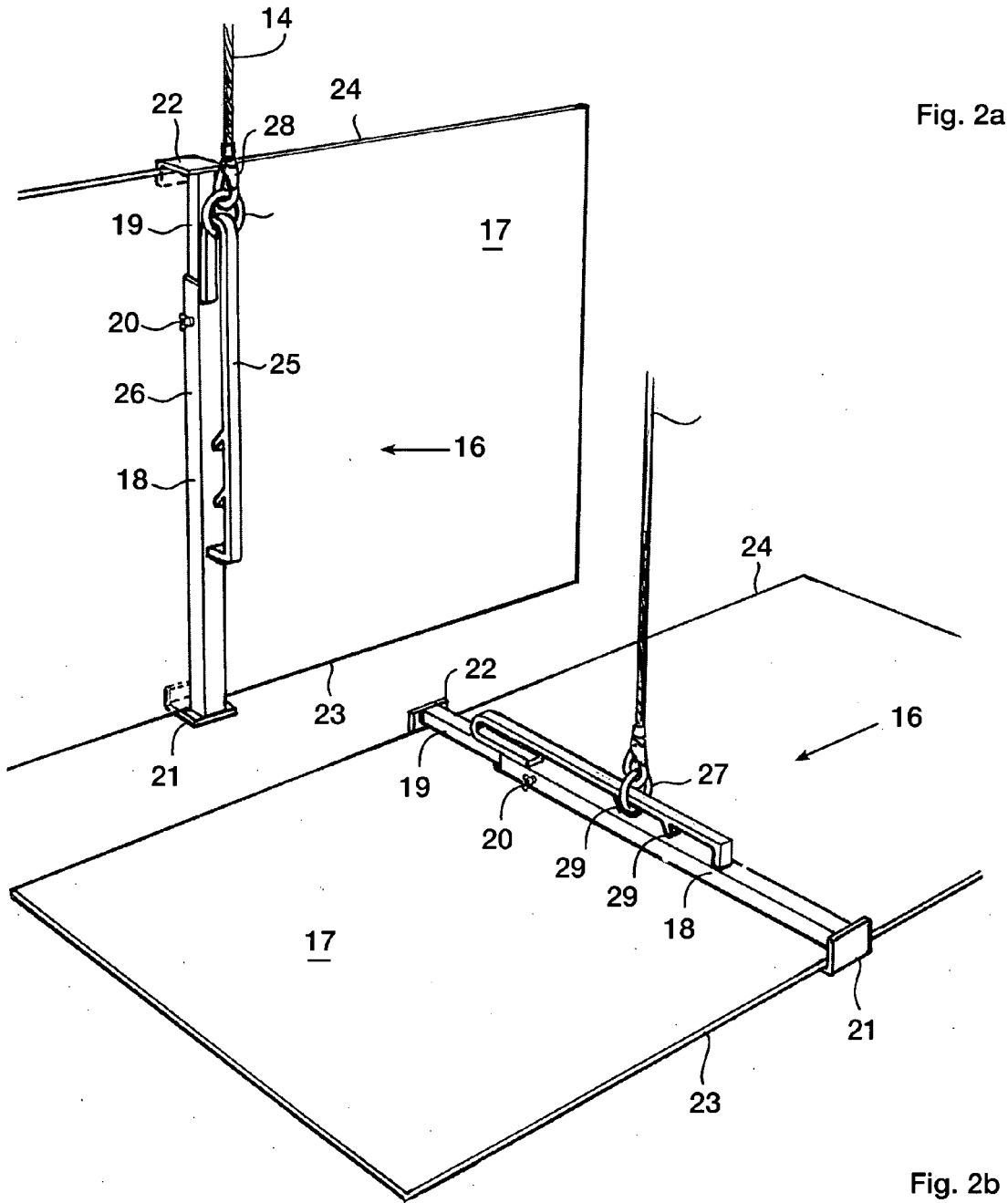


Fig. 1



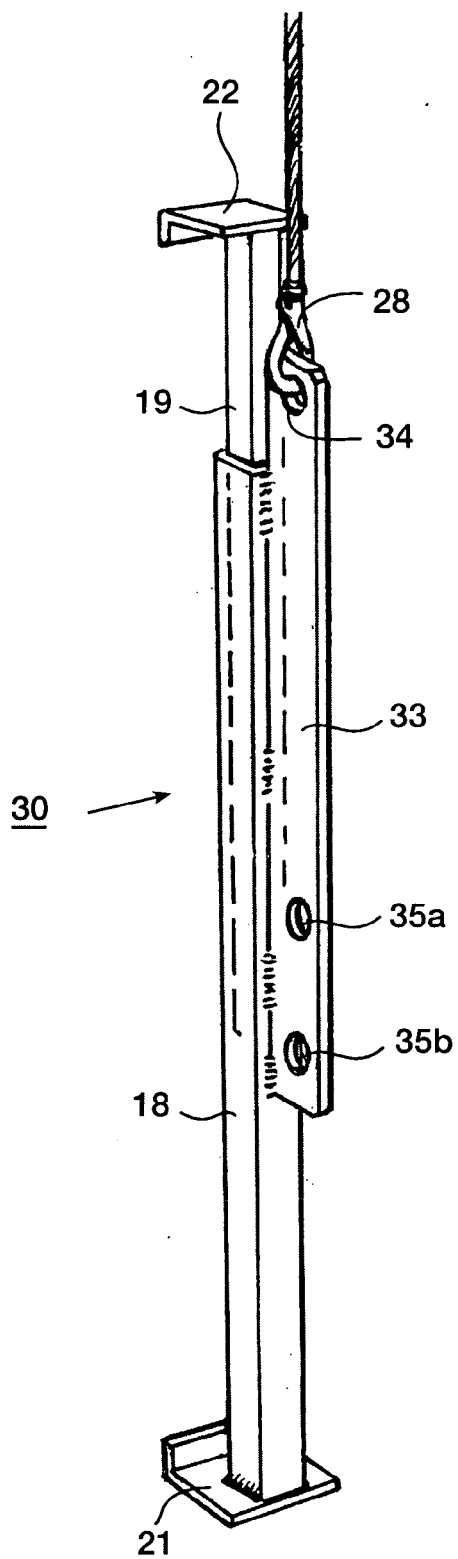


Fig. 3a

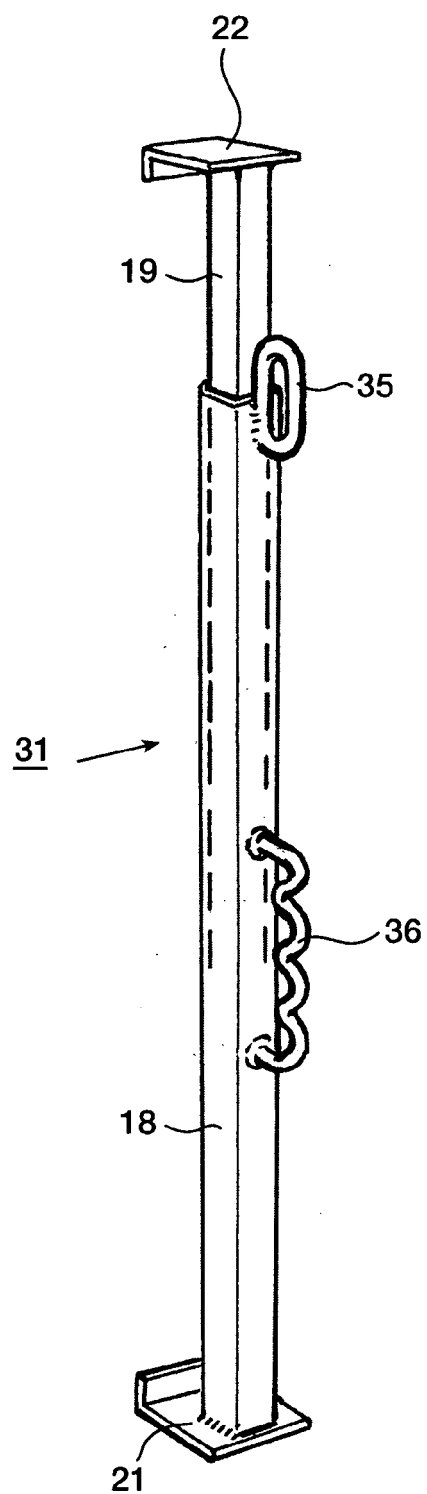


Fig. 3b

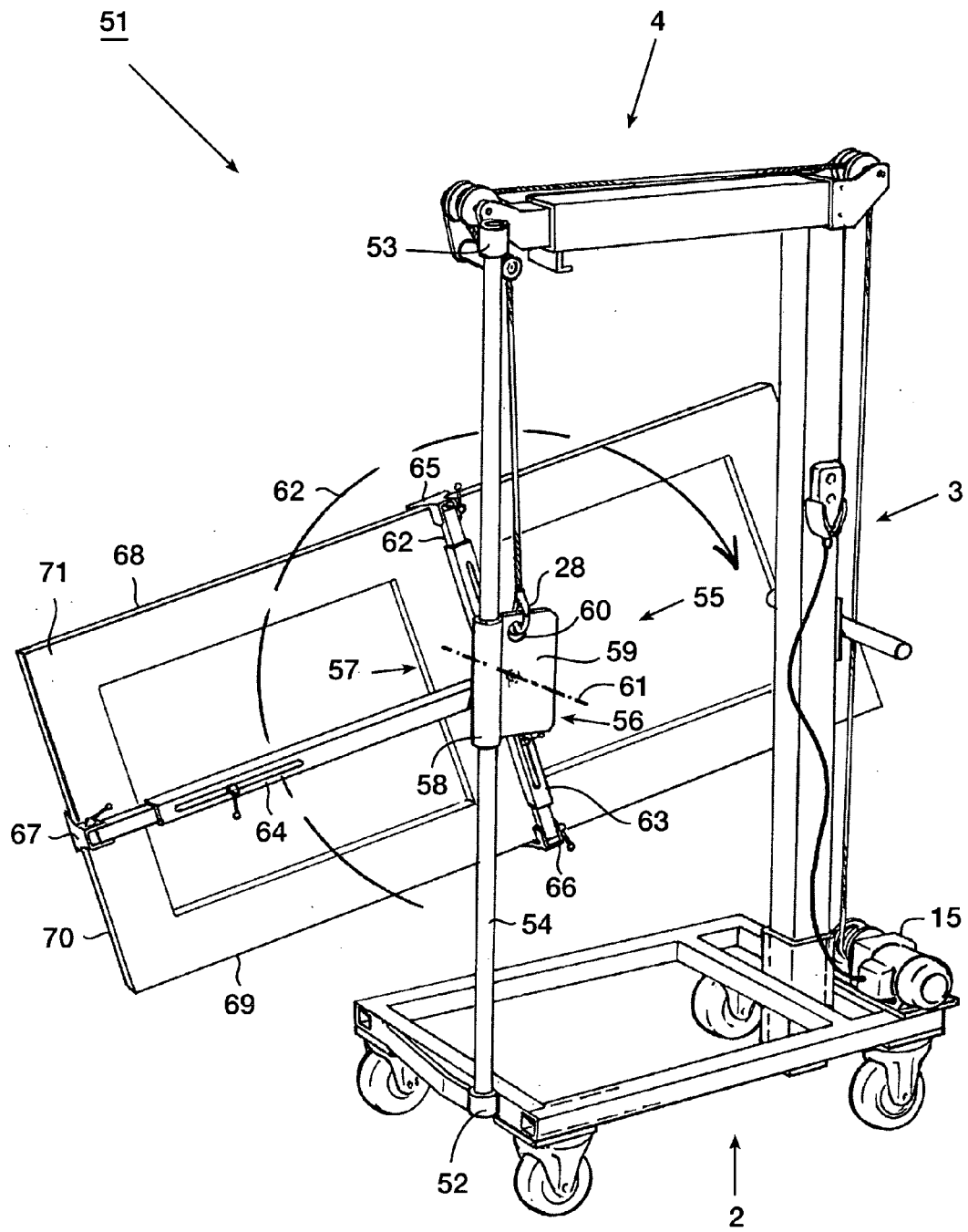


Fig. 4

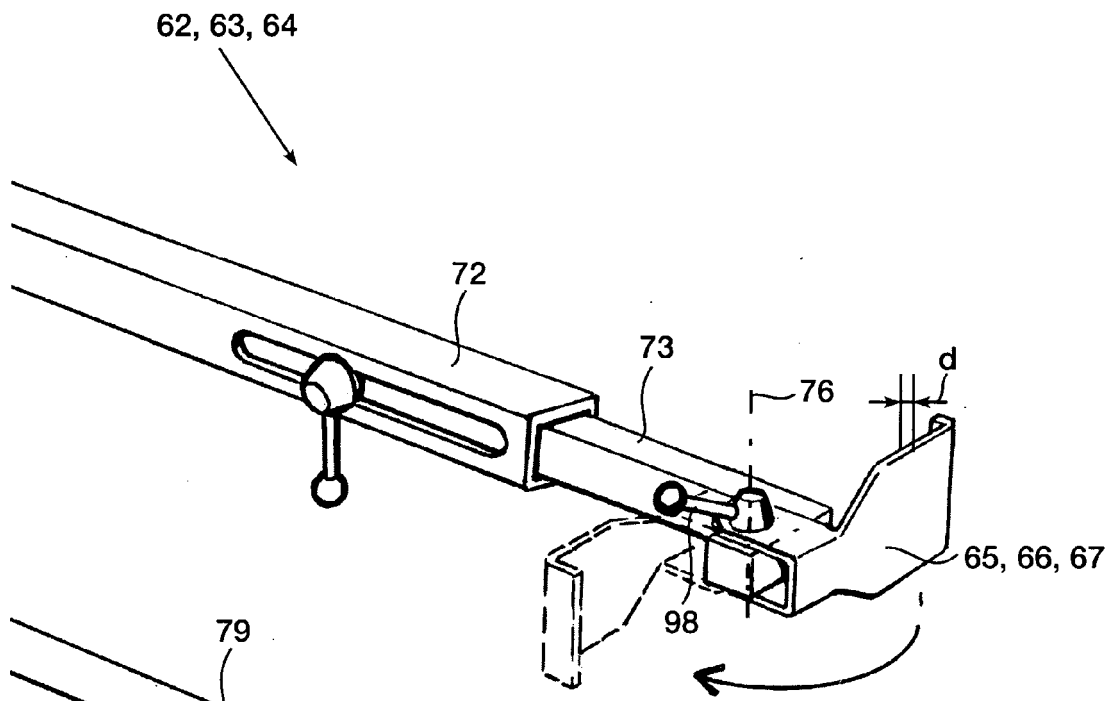


Fig. 5

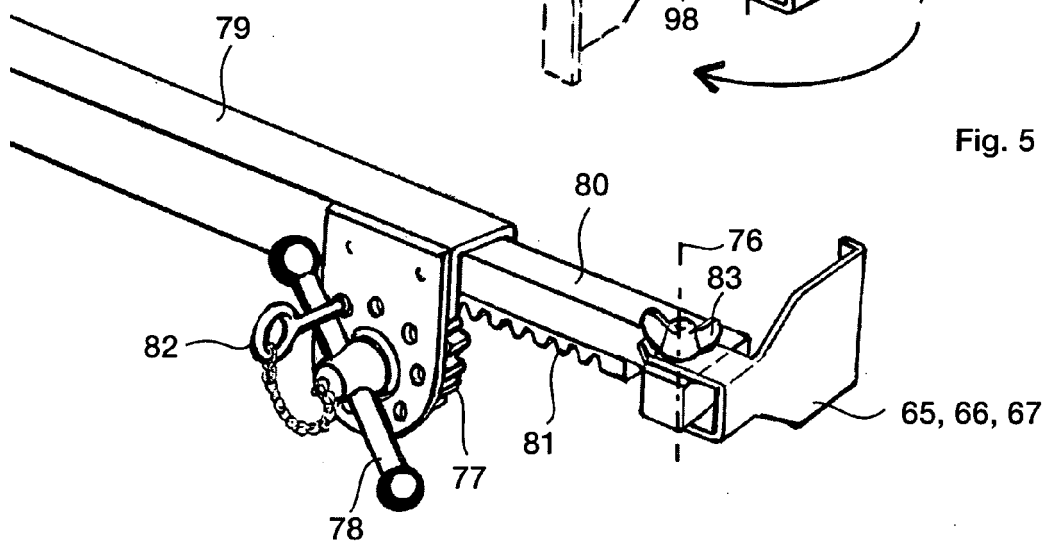


Fig. 6

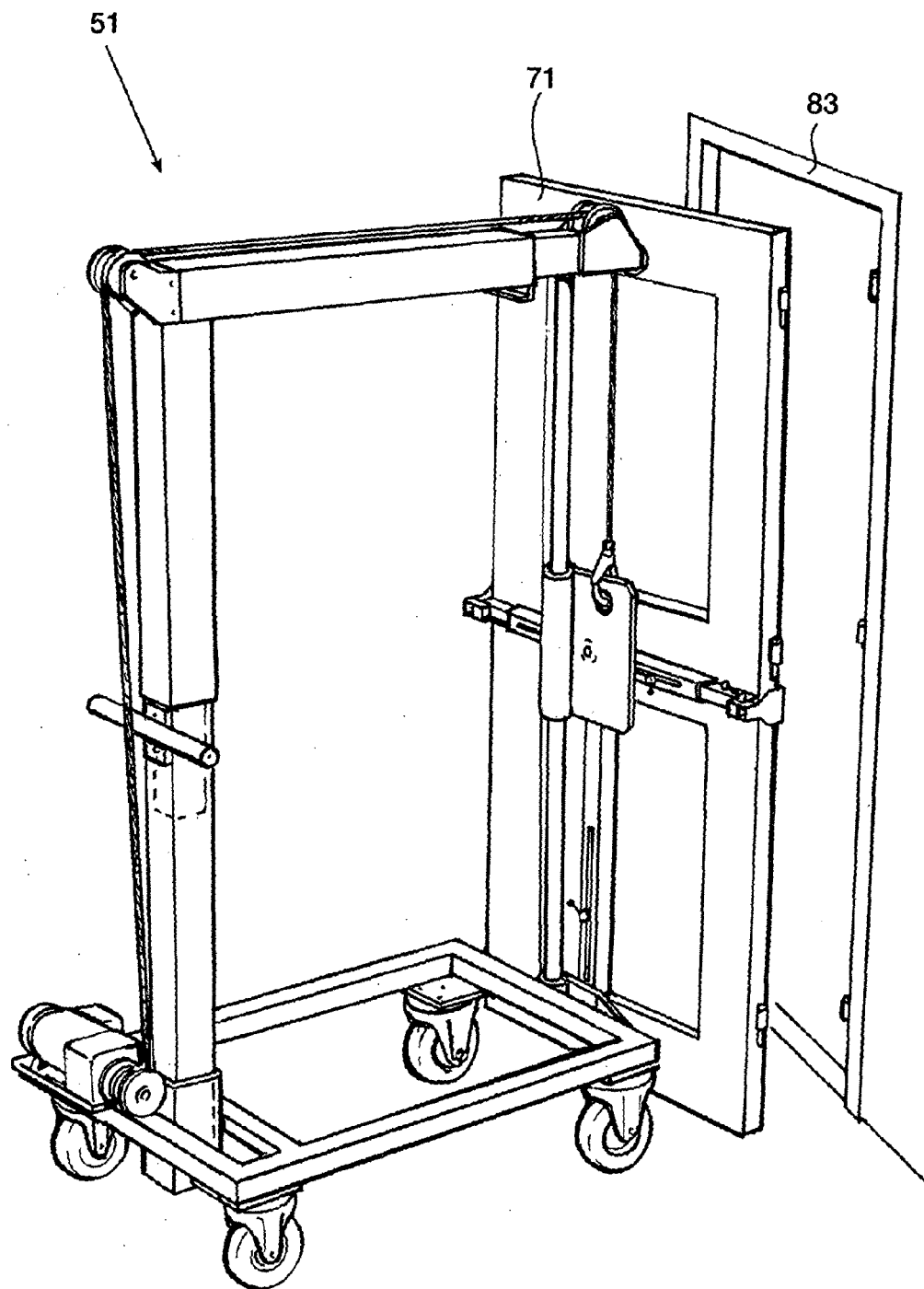


Fig. 7

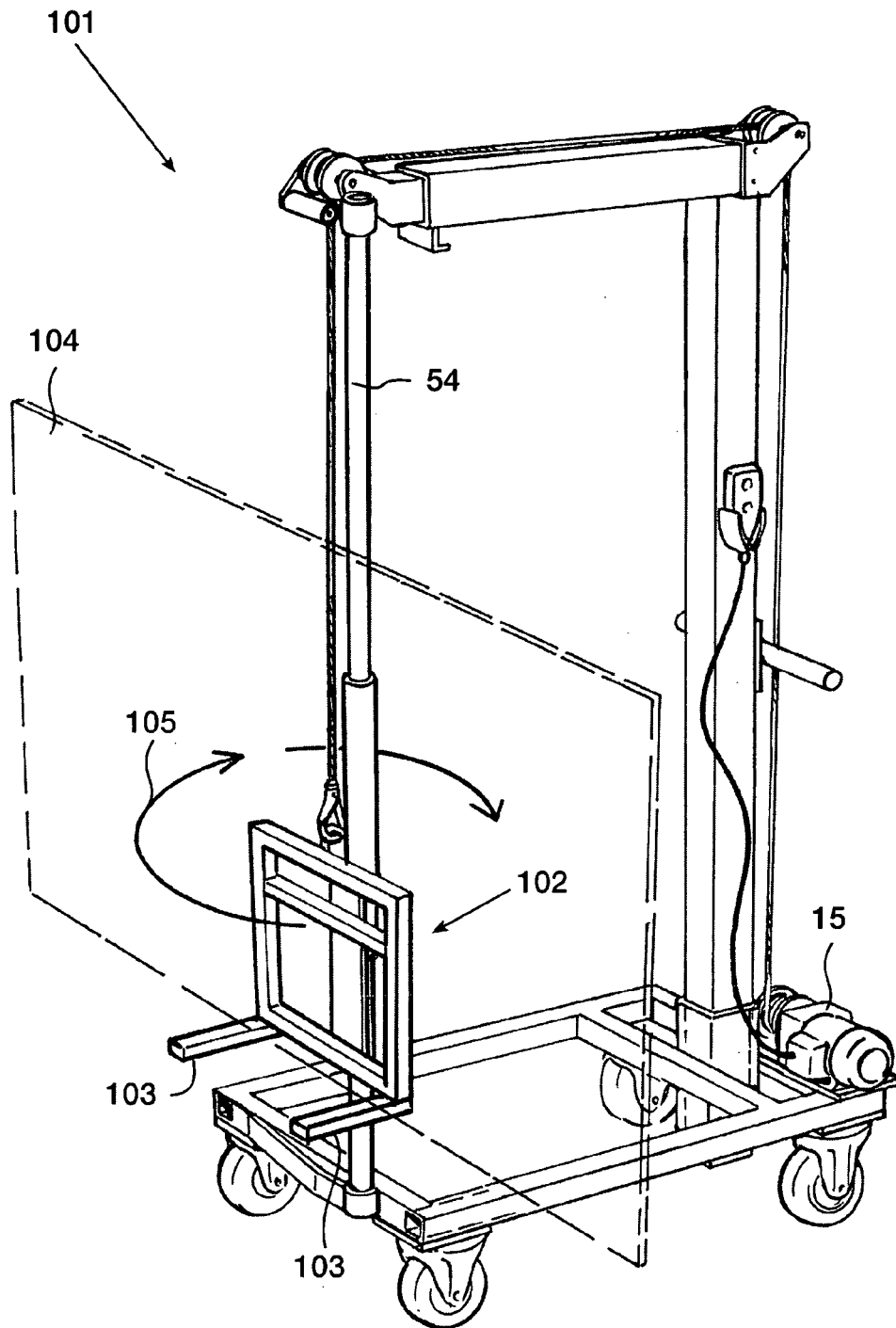


Fig. 8

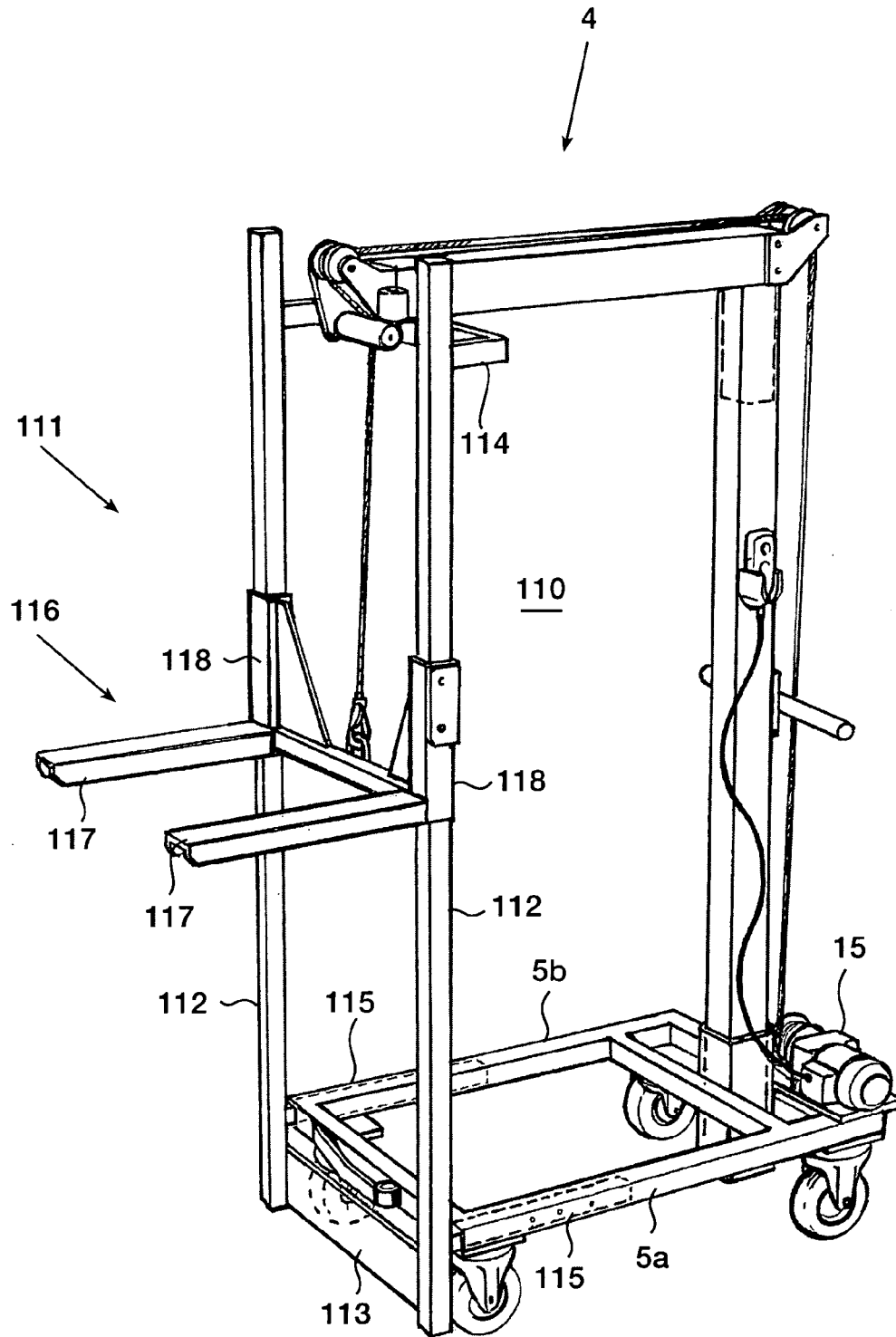


Fig. 9

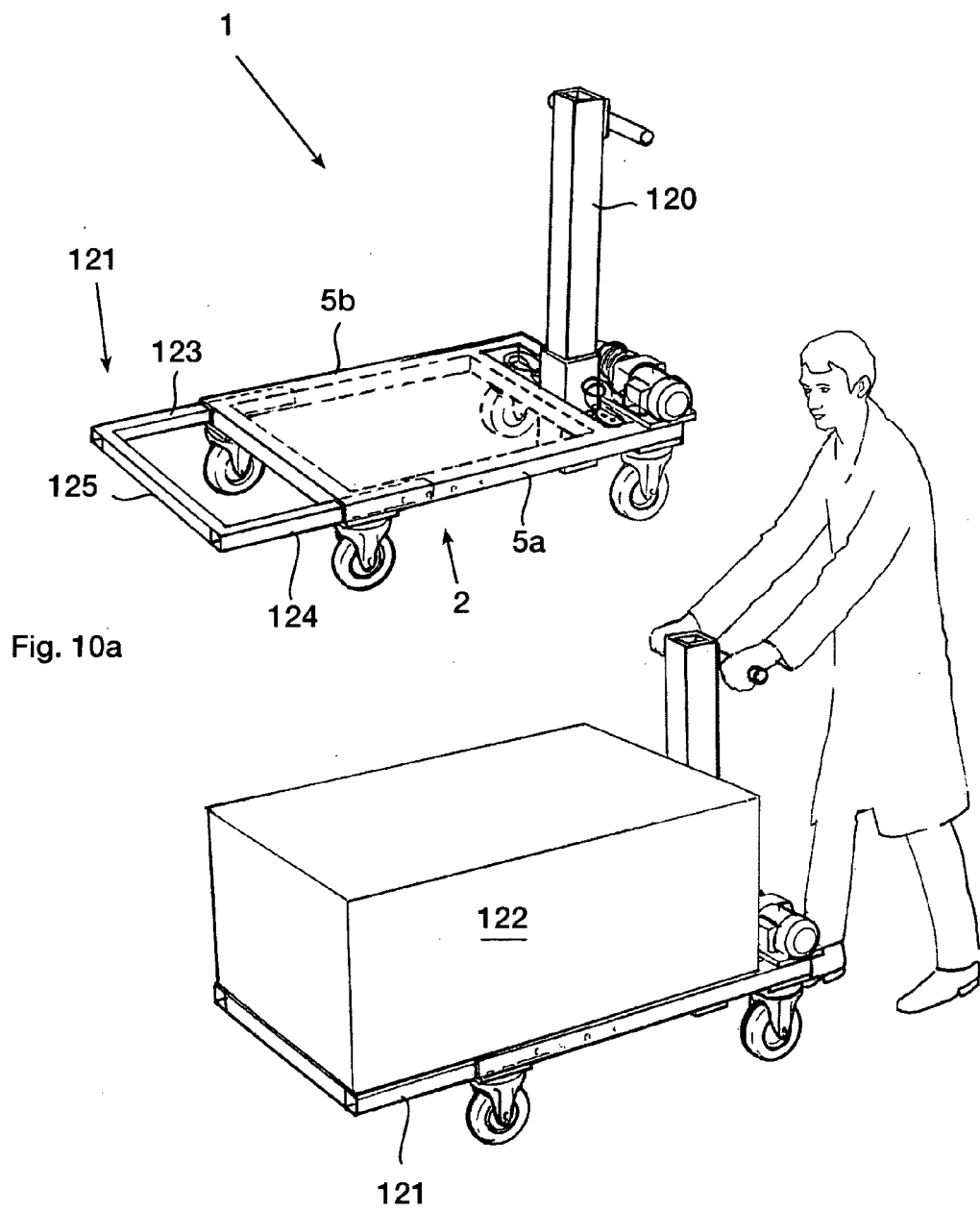


Fig. 10b

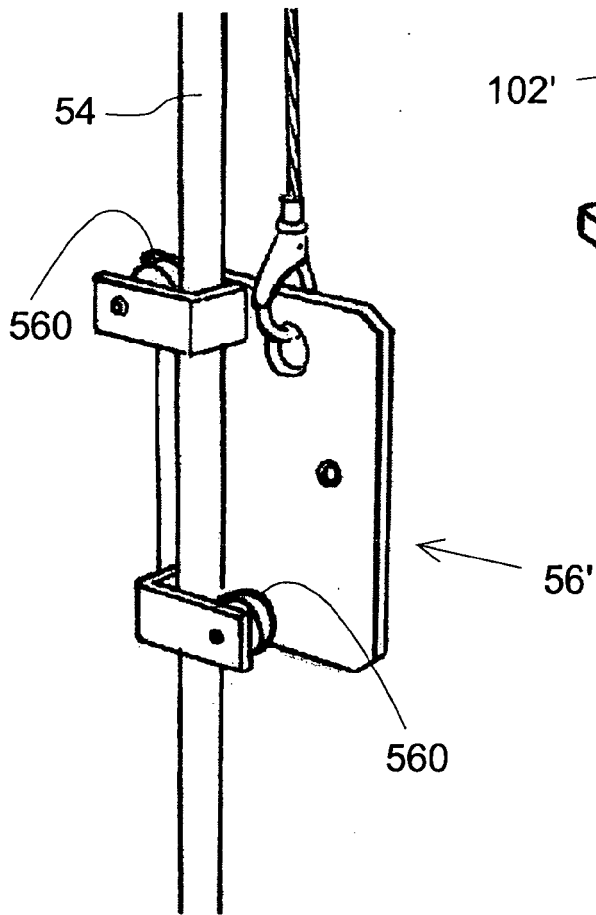


Fig. 11

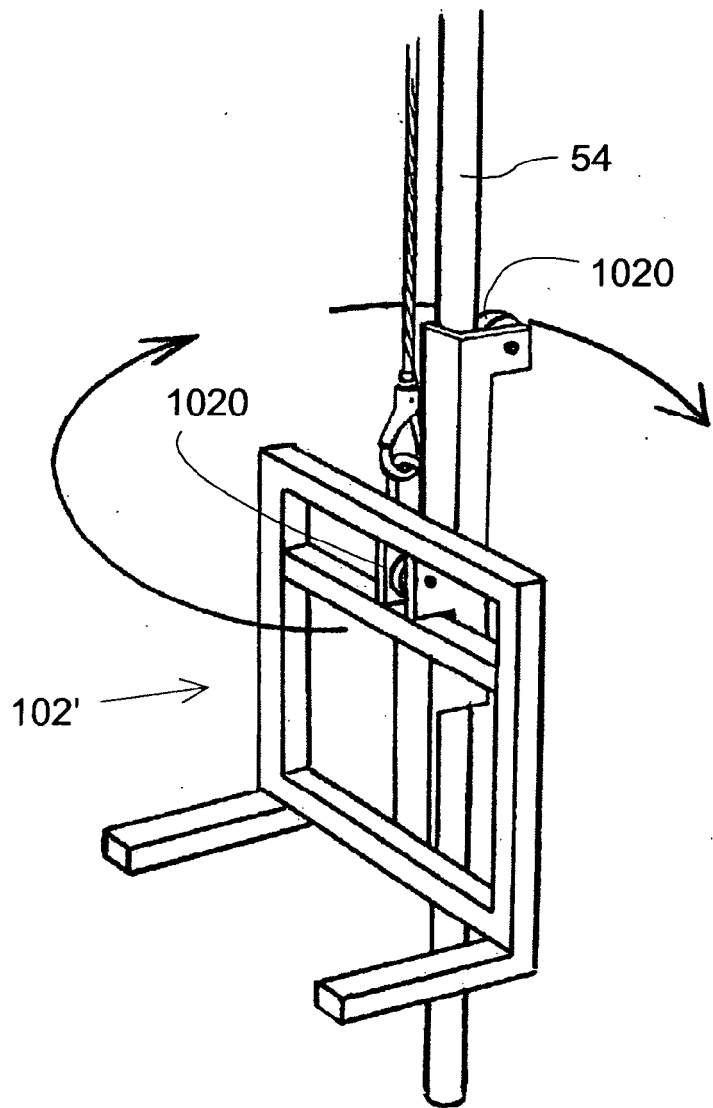


Fig. 12



EUROPEAN SEARCH REPORT

Application Number
EP 08 01 2392

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 714 393 A (BETTS KENNETH H [CA]) 22 December 1987 (1987-12-22) * abstract * * column 2, line 60 - column 4, line 20 * * figures 2,4 *	1,14	INV. B66C23/48 B66F9/18 E04F21/00
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A	US 5 975 826 A (SCHOLDER PERRY L [US]) 2 November 1999 (1999-11-02) * abstract * * column 9, line 16 - column 13, line 50 * * figures 3,4 *	1	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 October 2008	Examiner Sheppard, Bruce
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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