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(54) HOLDING TOOL FOR HOLDING A PANEL

(57) A holding tool (10) for holding a panel has a main plate (12), a first side plate (14), a second side plate (16) and a corner plate (18). The first side plate (12) is connected to main plate (10) such that the first side plate (12) can move parallel to the plane of the main plate (10) in a first direction. The second side plate (16) is connected to the main plate (10) such that the second side plate (16) can move parallel to the plane of the main plate (10) in a second direction which is perpendicular to the first direction. The corner plate (18) is connected to the first side plate (14) and the second side plate (16) such that the corner plate (18) moves with the first side plate (14) when the first side plate (14) is moved in the first direction and moves with the second side plate (16) when the second side plate (16) is moved in the second direction.

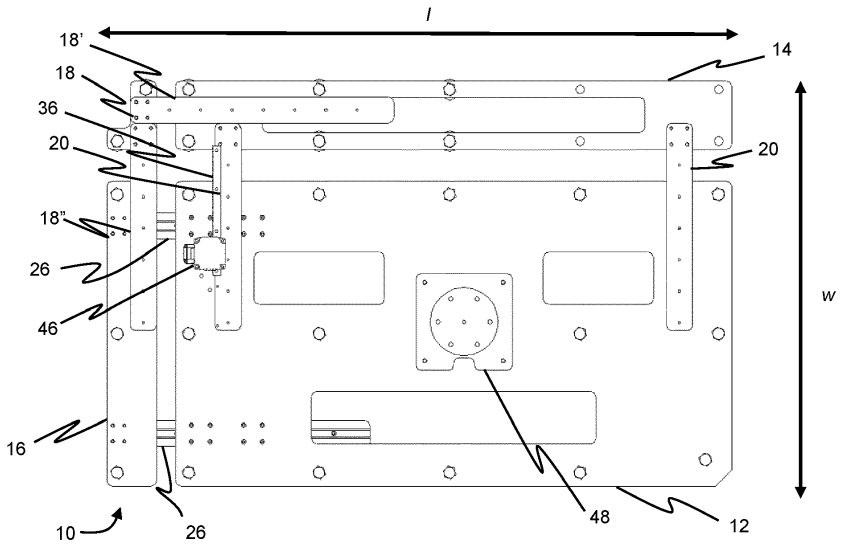

Fig. 1

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Description

Technical Field

[0001] The present disclosure relates to a holding tool for holding a panel.

Background

[0002] There are many situations in which is it necessary to hold or support a panel for some purpose. A particular example is during a manufacturing process, when for example the panel itself is being manufactured or formed. Another example is during an assembly process, when the panel is being assembled with other components. As a particular example, the panel may be a screen of a display device, which is being assembled with other components of the display device, such as a diffuser plate, backlight and main supporting frame.

[0003] It is common in manufacturing and assembly production lines for processes to be automated. This reduces manual labour, which can help protect a work force from having to handle heavy or dangerous parts, and can be fast and accurate, leading to faster and more accurate assembly of parts.

[0004] In manufacturing and assembly production lines, it is common for the same basic equipment to be used to handle and support components, including in particular panels, that are of different sizes. This means that the supporting or holding equipment has to be adjustable in order to accommodate components of different sizes.

[0005] A known holding tool for holding a panel has a central supporting frame which has four adjustable plates that extend (generally diagonally) out from respective corners of the central frame. Each adjustable plate has a suction cup or some other holder which engages with a respective corner of the panel. To accommodate panels of different sizes, an operator has to manually reposition each adjustable plate. This is done by loosening fixing bolts, sliding the adjustable plates in or out as necessary, and then tightening the fixing bolts again. This is a slow process and requires manual input, which exposes human operators to danger around the production line.

Summary

[0006] According to a aspect disclosed herein, there is provided a holding tool for holding a panel, the tool comprising:

a main plate;
a first side plate connected to the main plate;
a second side plate connected to the main plate; and
a corner plate connected to the first side plate and to the second side plate;
the connection between the first side plate and the main plate being constructed and arranged such that the first side plate can move parallel to the plane of the main plate in a first direction;
the connection between the second side plate and the main plate being constructed and arranged such that the second side plate can move parallel to the plane of the main plate in a second direction which is perpendicular to the first direction; and
the connection between the corner plate and the first side plate and the connection between the corner plate and the second side plate being constructed and arranged such that the corner plate moves with the first side plate when the first side plate is moved in the first direction and such that the corner plate moves with the second side plate when the second side plate is moved in the second direction.

[0007] In an example, the connection between the first side plate and the main plate is provided by at least one linear guide which controls movement of the first side plate relative to the main plate.

[0008] In an example, the connection between the second side plate and the main plate is provided by at least one linear guide which controls movement of the second side plate relative to the main plate.

[0009] In an example, the connections between the corner plate and the first side plate and between the corner plate and the second side plate are provided by respective linear guides which control movement of the corner plate.

[0010] In an example, the holding tool comprises a first rack and pinion arrangement for driving movement of the first side plate and a second rack and pinion arrangement for driving movement of the second side plate.

[0011] In an example, the holding tool comprises a rotatable drive shaft which is rotatable to drive movement of the first side plate and second drive plate, wherein the rack of the first rack and pinion arrangement is fixed to the first side plate and the pinion of the first rack and pinion arrangement is fixed to the rotatable drive shaft, and wherein the rack of the second rack and pinion arrangement is fixed to the second side plate and the pinion of the second rack and pinion arrangement is fixed to the rotatable drive shaft, such that rotation of the rotatable drive shaft drives simultaneous movement of the first side plate and second side plate.

[0012] In an example, the gear ratio of the first pinion and the second pinion corresponds to the aspect ratio of the panel which in use is held by the holding tool.

[0013] In an example, the holding tool comprises a motor which is arranged to drive rotation of the drive shaft.

[0014] In an example, the holding tool comprises one or more suction holders located on one or more of the main plate, the first side plate, the second side plate and the corner plate for engaging with and holding a panel in use.

[0015] In an example, the holding tool comprises a fixing mount for fixing the holding tool to a robot arm.

Brief Description of the Drawings

[0016] To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Figure 1 shows schematically a view from the front of an example of a holding tool according to the present disclosure;

Figure 2 shows schematically a view from the rear of the holding tool of Figure 1;

Figure 3 shows schematically a view from the side of the holding tool of Figure 1; and.

Figure 4 shows schematically an isometric view of the holding tool of Figure 1

Detailed Description

[0017] As mentioned, a known holding tool for holding a panel during manufacture of the panel or assembly of the panel with other components has a central supporting frame which has four adjustable plates that extend (generally diagonally) out from respective corners of the central frame. Each adjustable plate has a suction cup or some other holder which engages with a respective corner of the panel. To accommodate panels of different sizes, an operator has to manually reposition each adjustable plate. This is done by loosening fixing bolts, sliding the adjustable plates in or out as necessary, and then tightening the fixing bolts again. This is a slow process and requires manual input, which exposes human operators to danger around the production line.

[0018] In an example described herein, this is addressed by providing a holding tool for holding a panel, the tool having a main plate, a first side plate connected to the main plate, a second side plate connected to the main plate, and a corner plate connected to the first side plate and to the second side plate. The connection between the first side plate and the main plate is such that the first side plate can move parallel to the plane of the main plate in a first direction. The connection between the second side plate and the main plate is such that the second side plate can move parallel to the plane of the main plate in a second direction which is perpendicular to the first direction. The connection between the corner plate and the first side plate and the connection between the corner plate and the second side plate is such that the corner plate moves with the first side plate when the first side plate is moved in the first direction and such that the corner plate moves with the second side plate when the second side plate is moved in the second direction.

[0019] The holding tool can be extended and contracted in the first and second directions as necessary to fit panels of different sizes. The first and second directions are orthogonal and are in use typically parallel to the respective side edges of the panel which is being held by the tool. This means that the lateral extent of the holding tool in the first and second directions can be adjusted to fit the panel which is being held. Further, the corner plate moves with the first side plate and the second side plate as they are respectively moved. Together, this means that the panel can be well supported at all four corners.

[0020] This has particular use when the panel is a relatively large item, which may not be very rigid and thus may be prone to twisting or deformation when it is being handled. This is the case when for example the panel is an LCD cell or other display screen for a display panel, as used in for example a television set or other display device.

[0021] Each of the main plate, first side plate and second side plate may be for example generally rectangular in plan view. The corner plate may be for example generally L-shape in plan view.

[0022] Another problem with the known holding tool discussed above is that suction cups are on the four adjustable plates, which means that the panel is only properly supported at the corners of the panel. Whilst additional suction cups may also be provided on the central supporting frame, these only support an adjacent central part of the panel. If for example the panel is relatively large, this means that the adjustable plates are fully extended. This means at the periphery of the panel, the panel is only supported at the corners and the edges of the panel may not be supported at all. This can cause the edges of the panel to twist and deform, which is increasingly likely for large panels given the greater weight of the large panels.

[0023] In contrast, with the present holding tool, the panel can be supported along at least a large part of the all edges of the panel. This is because the first side plate and the second side plate can be moved to coincide with first and second adjacent edges of the panel, with the other two edges of the panel coinciding with opposed edges of the main plate of the holding tool.

[0024] Referring now to the drawings, a specific example of a holding tool 10 according to the present disclosure will now be described.

[0025] The holding tool 10 has a main plate 12, a first side plate 14, a second side plate 16 and a corner plate 18. The holding tool 10 of this example is generally rectangular in plan view. As such, in this example, each of the main plate 12, the first side plate 14 and the second side plate 16 is generally rectangular in plan view. The corner plate 18 is generally L-shape in plan view. The first side plate 14 is located to be adjacent and parallel to one long edge of the main plate 12. The first side plate 14 is relatively narrow and elongate, and has a length that is at least approximately the same as the major length of the main plate 12 (i.e. the length of the long edge of the main plate 12). The second side plate 16 is located to be adjacent and parallel to one short edge of the main plate 12. The second side plate 16 has a length

that is at least approximately the same as the minor length of the main plate 12 (i.e. the length of the short edge of the main plate 12). The long and short arms 18', 18" of the L-shape corner plate 18 are somewhat shorter than the long and short edges of the main plate 12 respectively, and may for example have lengths in the range of 1/3 to 1/2 or so of the long and short edges of the main plate 12 respectively.

[0026] The first side plate 14 is connected to the main plate 12 so as to be movable relative to the main plate 12 and parallel to the plane of the main plate 12. The first side plate 14 is movable in a first direction, which in this example is a direction parallel to the short edges of the main plate 12, i.e. perpendicular to the long edge of the main plate 12. In this way, the first side plate 14 can be moved perpendicularly away from and towards the adjacent long edge of the main plate 12, to increase and decrease respectively the width w of the holder 10 as a whole. Similarly, the second side plate 16 is connected to the main plate 12 so as to be movable relative to the main plate 12 and parallel to the plane of the main plate 12. The second side plate 16 is movable in a second direction, which in this example is a direction parallel to the long edges of the main plate 12, i.e. perpendicular to the short edge of the main plate 12. In this way, the second side plate 16 can be moved perpendicularly away from and towards the adjacent short edge of the main plate 12, to increase and decrease respectively the length / of the holder 10 as a whole. Taken together, this means that the length / and the width w of the holder 10 as a whole can be adjusted to fit the panel which is to be held by the holding tool 10 in use.

[0027] In an example, the first side plate 14 is connected to the main plate 12 using at least one linear guide 20. In the example shown, the first side plate 14 is connected to the main plate 12 using two linear guides 20 which are respectively located towards the ends of the first side plate 14 and which run parallel to the short sides of the main plate 12. One end of each guide 20 is fixed to the first side plate 14. The movement of each of the guides 20 relative to the main plate 12 is constrained by a suitable sliding arrangement. As seen most clearly in Figure 3, in the example shown, this sliding arrangement is provided by using an elongate "tongue and groove" type fitting. In particular, the under surface of the guides 20 have recessed elongate projections 22. The projections 22 in use are located within guide blocks 24 which are fixed to the upper surface of the main plate 12 and which have outwardly facing correspondingly shaped open recesses in which the projections 22 are located. Other ways of slidably connecting the first side plate 14 to the main plate 12 are possible, using for example different arrangements of recesses and projections or tongues and grooves, etc.

[0028] Similarly, in an example, the second side plate 16 is connected to the main plate 12 using at least one linear guide 26. In the example shown, the second side plate 16 is connected to the main plate 12 using two linear guides 26 which are respectively located towards the ends of second side plate 16 and which run parallel to the long sides of the main plate 12. One end of each guide 26 is fixed to the second side plate 16. Again, the movement of each of the guides 26 relative to the main plate 12 is constrained by a suitable sliding arrangement. Similarly to the example of the first linear guides 20 discussed above, in an example, the sliding arrangement of the second linear guides 26 is provided by the under surface of the second guides 26 having recessed elongate projections (not visible in the drawings). These projections are located in use within guide blocks 28 which are fixed to the lower surface of the main plate 12 and which have outwardly facing correspondingly shaped open recesses in which the projections of the second linear guides 26 are located. That is, again, the second linear guides 26 are slidably fitted to the second guide blocks 28 using an elongate "tongue and groove" type fitting. Again, other ways of slidably connecting the second side plate 16 to the main plate 12 are possible, using for example different arrangements of recesses and projections or tongues and grooves, etc.

[0029] It is noted that in this example, the first side plate 14, the first guides 20 and the first guide blocks 24 are located on one surface of the main plate 12 and the second side plate 16, the second guides 26 and the second guide blocks 28 are located on the other, opposed surface of the main plate 12, which, as will be explained, faces towards the panel that is being held. However, the arrangement may be reversed, or the first side plate 14, etc. and the second side plate 16, etc. may be located on the same surface of the main plate 12.

[0030] The L-shape corner plate 18 is connected to the first side plate 14 and to the second side plate 16. The connection of the corner plate 18 to the first side plate 14 and to the second side plate 16 is such that the corner plate 18 moves with the first side plate 14 when the first side plate 14 is moved in the first direction and, likewise, such that the corner plate 18 moves with the second side plate 16 when the second side plate 16 is moved in the second direction. This means that if both the first side plate 14 and the second side plate 16 are moved outwards from the main plate 12 to accommodate a larger panel, the corner plate 18 "fills" the gap at the corner between the first side plate 14 and the second side plate 16 which would be present if there were no moving corner plate 18. In turn, this means that there is a portion of the holding tool 10 that is opposed to each corner of the panel, which means that each corner of the panel can be properly engaged and supported by the holding tool 10.

[0031] In an example, the connection of the L-shape corner plate 18 to the first side plate 14 and to the second side plate 16 is achieved using a linear guide arrangement. In the example shown, and similarly to the linear guides 20, 26 for the first side plate 14 and second side plate 16, this is achieved using elongate tongue and groove type fittings. In particular, and as seen in part in Figure 3, the under surface of each arm 18', 18" of the

L-shape corner plate 18 has recessed elongate projections 30 (one of which can be seen in end view in Figure 3). The projections 30 on each arm 18', 18" in use are located within respective guide blocks 32, which are fixed to the upper surface of the first side plate 14 and second side plate 16 respectively and which have outwardly facing correspondingly shaped open recesses in which the projections 30 are located. Other ways of slidably connecting the corner plate 18 are possible, using for example different arrangements of recesses and projections or tongues and grooves, etc.

[0032] Movement of the first side plate 14 and the second side plate 16 inwards and outwards may be achieved manually, by an operator pushing and pulling the first side plate 14 and the second side plate 16 as necessary. However, especially in a production process in a factory, it is preferred that movement of the first side plate 14 and the second side plate 16 inwards and outwards can be carried out in an automated manner. To enable this, the holding tool 10 has a first rack and pinion arrangement for driving movement of the first side plate 12 and a second rack and pinion arrangement for driving movement of the second side plate 14.

[0033] Specifically, in the example shown, a first rack 36 (i.e. a linear toothed gear) is fitted to one of the guides 20 which are fixed to the first side plate 14. Correspondingly, a first pinion 38 (i.e. a circular toothed gear) is fitted to a rotatable shaft 40 which is mounted in the main plate 12 and which is oriented to project perpendicularly to the plane of the main plate 12. As the rotatable shaft 40 rotates in one direction or the other, the rotating first pinion 38 engages with the first rack 36 to move the first side plate 14 inwards or outwards respectively.

[0034] Likewise, in the example shown, a second rack 42 is fitted to one of the guides 24 which are fixed to the second side plate 16. Correspondingly, a second pinion 44 is fitted to the rotatable shaft 40 which is mounted in the main plate 12. As the rotatable shaft 40 rotates in one direction or the other, the rotating second pinion 44 engages with the second rack 42 to move the second side plate 16 inwards or outwards respectively.

[0035] A motor 46 is provided to drive rotation of the rotatable shaft 40 and therefore to move the first side plate 14 and the second side plate 16 inwards and outwards as necessary so that the holding tool 10 can accommodate panels of different sizes. The motor 46 may be for example an electric motor operating under servo control.

[0036] In this example, the first pinion 38 and the second pinion 44 are both fitted permanently to the rotatable shaft 40 so that both rotate at the same time to drive movement of the first side plate 14 and the second side plate 16 simultaneously. In other arrangements, the first pinion 38 and the second pinion 44 may be arranged so that they can be selectively engaged with and disengaged from the rotatable shaft 40 so that the first side plate 14 and the second side plate 16 can be moved independently. As another option, there may be separate rotatable shafts for the first pinion 38 and the second pinion 44 which can be rotated independently so that the first side plate 14 and the second side plate 16 can be moved independently.

[0037] In one particular application, the holding tool 10 is used to hold a panel which is a screen of a display device, which is being assembled with other components of the display device, such as for example a diffuser plate, backlight and main supporting frame. Display devices are used in many different types of consumer apparatus including for example television screens or monitors, computer displays or monitors, and displays for other computing devices, including smartphones, tablet computers, laptop computers, etc. Display devices are also used in many public environments in so-called "signage", for example, for displaying advertisements or for information or entertainment that is of interest to a larger audience. Such display devices are often large and heavy. In such cases, the holding tool 10 is fitted to an arm of a robot, which may for example be a 6-axis robot which can move and rotate the holding tool 10 as desired to locate the panel correctly. The holding tool 10 has a fixing mount or fixing plate 48 on the main plate 12 which is used to allow the holding tool 10 to be fixed to the robot arm.

[0038] Here it is noted that display screens frequently have a aspect ratio of 16:9. Technically, this means that the ratio of the number of pixels across the long edge of the screen to the number of pixels across the short edge of the screen is 16:9 (e.g. 1920 x 1080 pixels, or 3840 x 2160 pixels, etc.). However, it means in turn that the ratio of the length of the screen to the width (height) of the screen is (at least approximately) 16:9 for many display screens. Notably, this ratio of the length to width is common to many display screens regardless of the absolute size of the display screen.

[0039] This is accommodated by the holding tool 10 where the first pinion 38 and the second pinion 44 are both fixed to the same rotatable shaft 40 by making the gear ratio of the second pinion 44 to the first pinion 38 also 16:9. This means that as the rotatable shaft 40 is rotated, the first side plate 14 moves 9 units whilst the second side plate 16 moves 16 units. This is convenient, as the holding tool 10 can be rapidly and easily adjusted to accommodate different display screens or display cells that have different absolute sizes, whilst ensuring that each corner of the display screen or display cell is properly supported.

[0040] To engage the holding tool 10 with a panel, the holding tool 10 is provided with a number of holding devices. The holding devices may be for example suction cups 50, which may be simple rubber or similar pads or which may be connected to an air pump to create a low pressure ("vacuum"). One or more of the suction cups 50 may be mounted to the holding tool 10 via coil springs 52 which help to absorb shock and surface irregularities when the holding tool 10 engages a panel. In an example, suction cups 50 are provided at least at each corner of

the holding tool 10, it being noted that the corners of the holding tool 10 are provided by one corner of the main plate 12, one end of the first side plate 14, one end of the second side plate 16 and the junction of the arms 18', 18" of the corner plate 18 respectively. In this way, each corner of the panel is in contact with a respective suction cup 50. Furthermore, in an example, a number of suction cups 50 are located at intervals along the length of the first side plate 14, the second side plate 16 and towards the two edges of the main plate 12 that are on the opposite sides from the first side plate 14 and the second side plate 16. In this way, each edge of the panel is in contact with plural suction cups 50 along its length. Taken together, once the holding tool 10 has been expanded or contracted to correspond to the size of the panel which is to be held, each corner and each edge of the panel can be properly engaged and supported by the holding tool 10. This avoids any twisting or deformation of the panel during manipulation by the robot or other means.

[0041] In summary, the present holding tool 10 ensures that a panel that is held by the holding tool 10 is properly supported at each corner and each edge. The size of the holding tool 10 can be quickly and easily adjusted to accommodate panels of different sizes, whilst ensuring that the panel is still properly supported. The adjustment of the size of the holding tool 10 can be automated, and can therefore be more accurate and not prone to human error. The holding tool 10 is particularly suited to holding panels, including for example display cells or screens, but can also be used to hold other objects, whether planar or non-planar.

[0042] The examples described herein are to be understood as illustrative examples of embodiments of the invention. Further embodiments and examples are envisaged. Any feature described in relation to any one example or embodiment may be used alone or in combination with other features. In addition, any feature described in relation to any one example or embodiment may also be used in combination with one or more features of any other of the examples or embodiments, or any combination of any other of the examples or embodiments. Furthermore, equivalents and modifications not described herein may also be employed within the scope of the invention, which is defined in the claims.

Claims

1. A holding tool for holding a panel, the tool comprising:

   a main plate;
   a first side plate connected to the main plate;
   a second side plate connected to the main plate; and
   a corner plate connected to the first side plate and to the second side plate;
   the connection between the first side plate and the main plate being constructed and arranged such that the first side plate can move parallel to the plane of the main plate in a first direction;
   the connection between the second side plate and the main plate being constructed and arranged such that the second side plate can move parallel to the plane of the main plate in a second direction which is perpendicular to the first direction; and
   the connection between the corner plate and the first side plate and the connection between the corner plate and the second side plate being constructed and arranged such that the corner plate moves with the first side plate when the first side plate is moved in the first direction and such that the corner plate moves with the second side plate when the second side plate is moved in the second direction.

2. A holding tool according to claim 1, wherein the connection between the first side plate and the main plate is provided by at least one linear guide which controls movement of the first side plate relative to the main plate.

3. A holding tool according to claim 1 or claim 2, wherein the connection between the second side plate and the main plate is provided by at least one linear guide which controls movement of the second side plate relative to the main plate.

4. A holding tool according to any of claims 1 to 3, wherein the connections between the corner plate and the first side plate and between the corner plate and the second side plate are provided by respective linear guides which control movement of the corner plate.

5. A holding tool according to any of claims 1 to 4, comprising a first rack and pinion arrangement for driving movement of the first side plate and a second rack and pinion arrangement for driving movement of the second side plate.

6. A holding tool according to claim 5, comprising a rotatable drive shaft which is rotatable to drive movement of the first side plate and second drive plate, wherein the rack of the first rack and pinion arrangement is fixed to the first side plate and the pinion of the first rack and pinion arrangement is fixed to the rotatable drive shaft, and wherein the rack of the second rack and pinion arrangement is fixed to the second side plate and the pinion of the second rack and pinion arrangement is fixed to the rotatable drive shaft, such that rotation of the rotatable drive shaft drives simultaneous movement of the first side plate and second side plate.

7. A holding tool according to claim 6, wherein the gear

ratio of the first pinion and the second pinion corresponds to the aspect ratio of the panel which in use is held by the holding tool.

8. A holding tool according to claim 6 or claim 7, comprising a motor which is arranged to drive rotation of the drive shaft.

9. A holding tool according to any of claims 1 to 8, comprising one or more suction holders located on one or more of the main plate, the first side plate, the second side plate and the corner plate for engaging with and holding a panel in use.

10. A holding tool according to any of claims 1 to 9, comprising a fixing mount for fixing the holding tool to a robot arm.

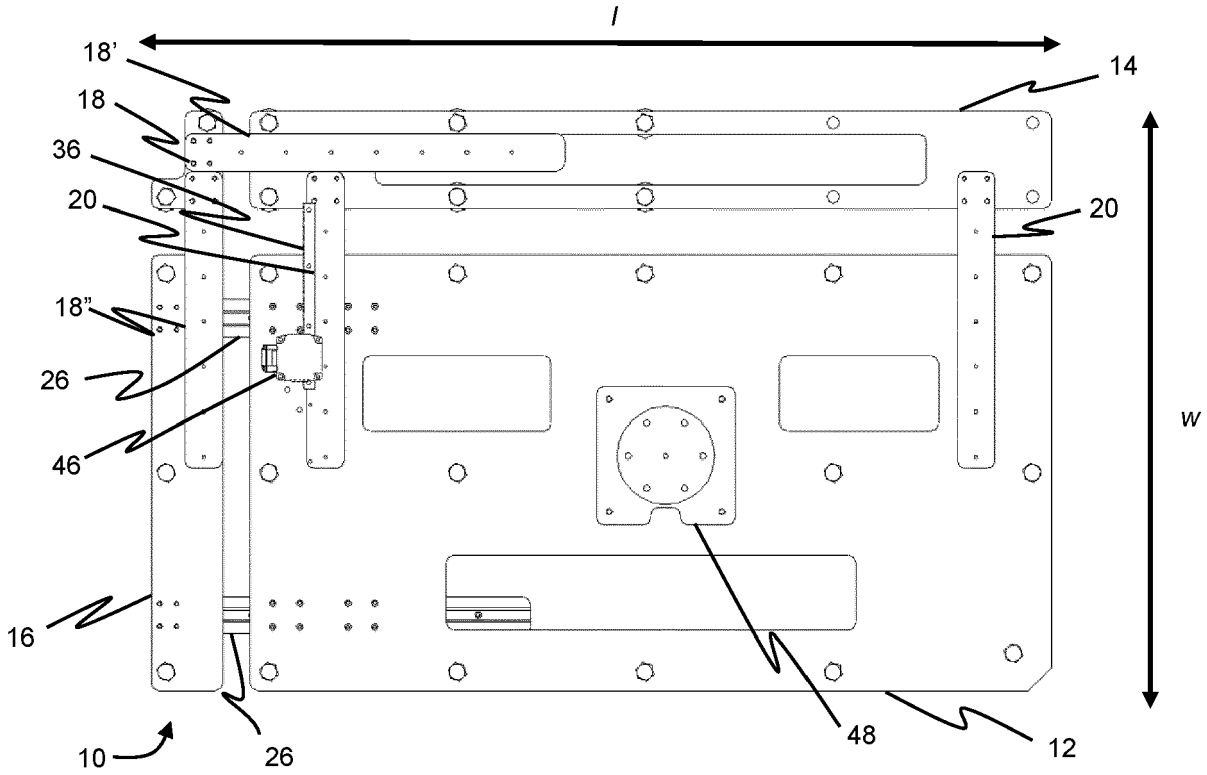
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Fig. 1

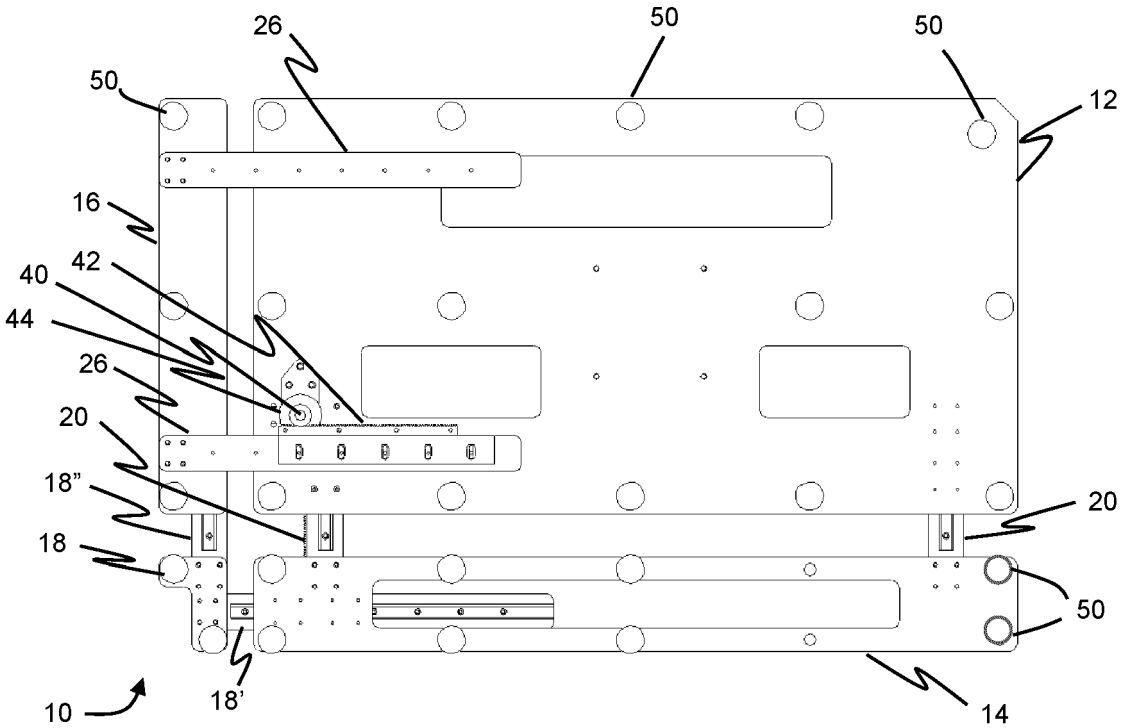
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Fig. 2

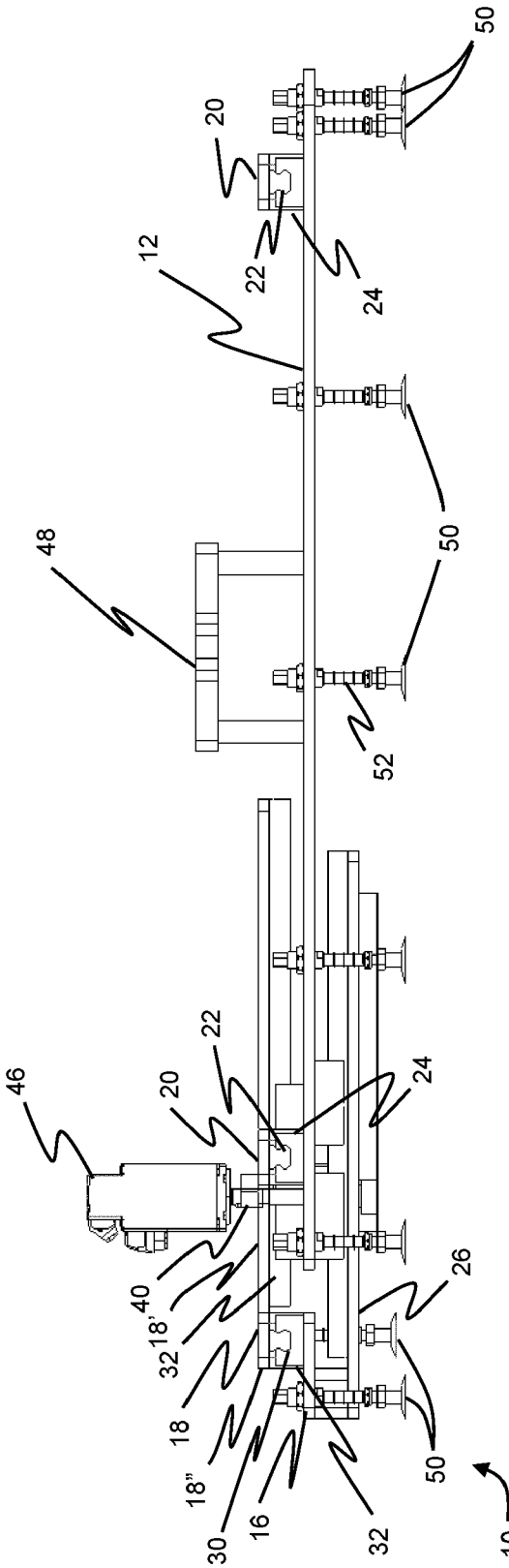

Fig. 3

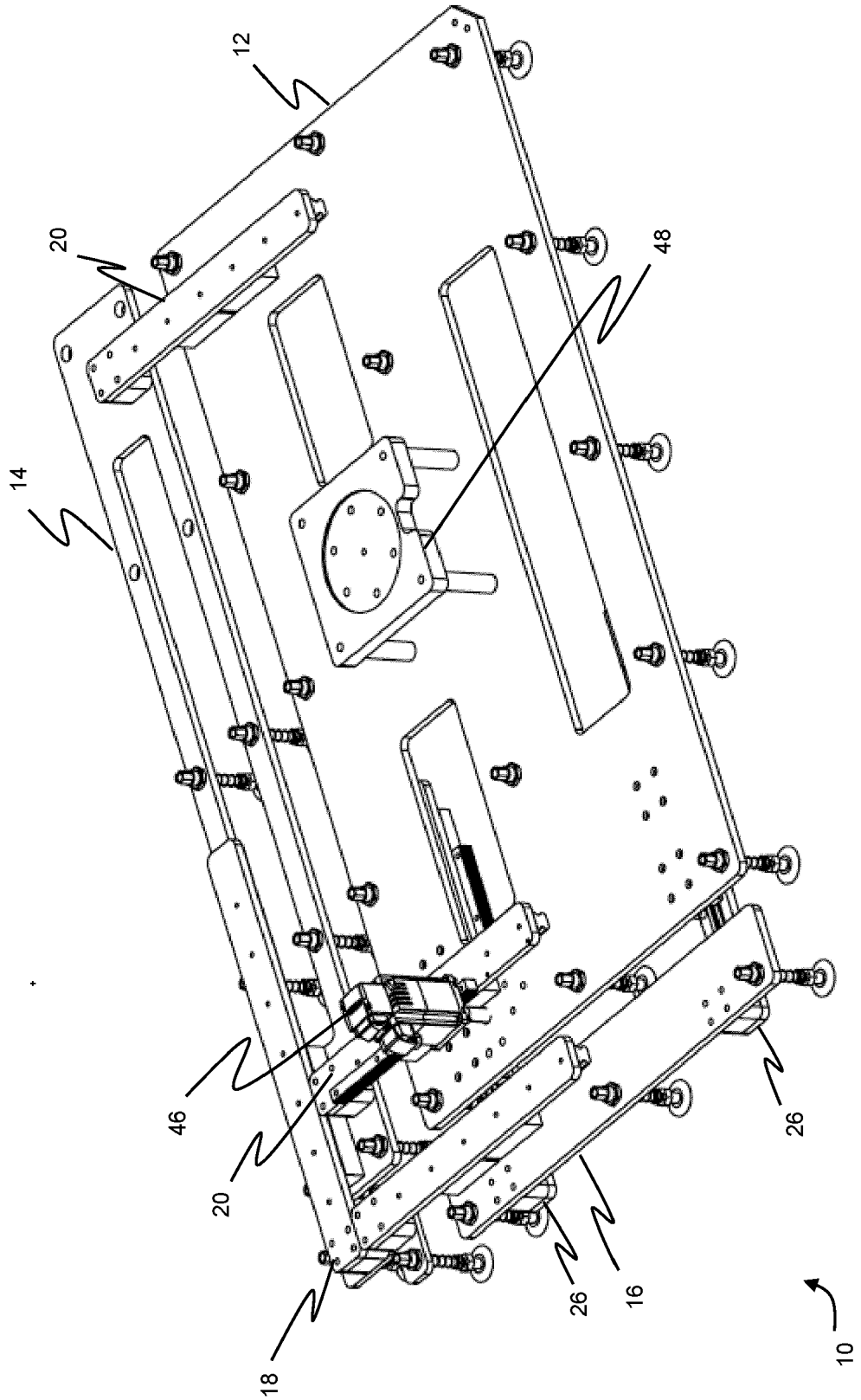

Fig. 4

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 3957

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	CN 106 671 036 A (BOE TECHNOLOGY GROUP CO LTD; BEIJING BOE OPTOELECTRONICS TECH CO LTD) 17 May 2017 (2017-05-17) * abstract * * claims 1-5 * * figures 1a, 1b, 1c * * paragraph [0003] - paragraph [0009] * * paragraph [0014] * * paragraph [0015] * * paragraph [0018] * * paragraph [0019] * * paragraph [0029] - paragraph [0031] * * paragraph [0038] - paragraph [0040] * * paragraph [0043] - paragraph [0057] *	1-10	INV. B25B11/00
A	CN 108 098 636 A (GUANGDONG ZHENGYE TECHNOLOGY CO LTD) 1 June 2018 (2018-06-01) * abstract * * claims 1-5 * * figures 1-5 * * paragraph [0001] - paragraph [0015] * * paragraph [0025] - paragraph [0029] * * paragraph [0039] *	1-10	TECHNICAL FIELDS SEARCHED (IPC) B25B B23Q B26D B25J
A	DE 10 2012 020585 A1 (RS TECHNOLOGY GMBH & CO KG [DE]) 24 April 2014 (2014-04-24) * abstract * * claims 1-3 * * figures 1, 2 * * paragraph [0001] - paragraph [0005] * * paragraph [0014] - paragraph [0023] * * paragraph [0029] - paragraph [0031] * * paragraph [0034] - paragraph [0037] *	1-10	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 June 2022	Heinzelmann, Eric

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 3957

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 June 2022	Heinzelmann, Eric

CATEGORY OF CITED DOCUMENTS

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