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(54) **Print substrate transport assembly**

Druckträgertransportanlage

Ensemble de transport de substrat d'impression

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Description

Field of the Invention

[0001] The present invention relates to a print substrate transport assembly. The present invention further relates to a printing system comprising the print substrate transport assembly of the present invention.

Background of the Invention

[0002] In a known wide format inkjet printing system a print substrate transport assembly is provided, the print substrate transport assembly comprising a feed roller and a platen, which comprises a print surface to support a print substrate. The feed roller comprises an axle being arranged to transport said print substrate in a transport direction over the print surface. An inkjet print head is arranged facing said print surface for printing an inkjet image on the print substrate in a printing area. The axle of the feed roller extends in a lateral direction (y), the lateral direction being perpendicular to the transport direction (x). The feed roller may be arranged upstream of the print surface in the transport direction (x) adjacent to the platen.

In case a printing system is constructed having a larger width in the lateral direction (y), both the feed roller and the platen may have a tendency to bend in a gravity direction. Said bending may be caused by sagging of a middle portion of respectively the feed roller and the platen in response to the gravity forces acting in the gravity direction. Moreover, a manufacturing accuracy of both the feed roller and the platen may decrease due to a larger width needed for the printing system.

[0003] Several measures can be conceived of in order to suppress the bending of the feed roller and the print surface. For example a construction comprising a feed roller support for supporting the feed roller and a platen support, which is independently arranged adjacent to the feed roller support, for supporting the platen. However said construction having two supports arranged adjacent to each other is rather bulky.

In an example, US2008/0143032 discloses a wide/ super wide printer comprising a printer head box that reciprocates across a wide/ super wide printing table that is supported by a fixed support, and a feed roller and a guiding roller that are moveably coupled to the fixed support for switching between a roll to roll printer mode and a discontinuous sheet printer mode.

[0004] In another example a known solution for this problem is using a single support which extends over the width of the printing system in the lateral direction. Said support may have a number of adjustable suspension structures distributed along the width of the
printing system, each adjustable suspension structure being connected to one of the respective feed roller and platen at a corresponding support position. Each adjustable suspension structure is adapted for adjustably positioning the respective feed roller and platen. However said support is not infinitely stiff and may deform in case any of the suspension structures is adjusted. For example, if the position of the feed roller is adjusted, the support structure may deform. As a result the position accuracy of the platen and the print surface is disturbed.

[0005] It is accordingly an object of the present invention to provide a print substrate transport assembly, which is constructed in a compact manner and wherein the bending of the print surface and the feed roller is may be suppressed independently with respect to each other.

Summary of the Invention

[0006] The present invention pertains to a print substrate transport assembly for transporting a print substrate in a printing apparatus, comprising a feed roller for transporting the print substrate, a platen for supporting said print substrate, a feed roller support for supporting said feed roller and a platen support for supporting said platen; wherein the platen comprises a print surface to support the print substrate; wherein the feed roller comprises an axle which is arranged for transporting the print substrate in a transport direction along the print surface; wherein the feed roller support extends in a first support direction, which is directed along the axle of the feed roller, the feed roller support being adapted for adjustably positioning the feed roller in a first adjusting direction, which first adjusting direction is substantially perpendicular to the print surface; wherein the platen support extends in a second support direction, the platen support being adapted for adjustably positioning said platen in a second adjusting direction, which second adjusting direction is substantially perpendicular to the print surface; wherein the print substrate transport assembly comprises an inner support which is at least partly enclosed by an outer support, wherein said inner support is one selected from the feed roller support and the platen support and wherein said outer support is an other selected from the feed roller support and the platen support; and wherein said outer support defines an enclosed volume, wherein a suspension structure of the inner support, which connects the inner support to the corresponding feed roller or platen, extends outside of the enclosed volume.

[0007] In the present invention one of the feed roller support and the platen support is partly or completely enclosed by the other one of the feed roller support and the platen support. As defined herein one of the feed roller support and the platen support is an inner support and said other one of the feed roller support and the platen support is an outer support. The inner support comprises a suspension structure to connect the inner support to the corresponding feed roller or platen. The suspension structure extends outside of the enclosed volume, which is defined by the outer support.

This arrangement enhances a compact print substrate transport assembly, wherein the bending (e.g. due to sagging) of the print surface and the feed roller may be

suppressed independently with respect to each other. The feed roller support may be used to adjust the position of the feed roller and the platen support may be used to adjust the position of the print surface independently with respect to each other, i.e. without disturbing the support of the other element.

[0008] The outer support may partially enclose the inner support. For example the outer support may be a beam having a U type cross sectional shape, wherein said beam is arranged to partially enclose the inner support within said enclosed volume defined by said beam. In an embodiment the suspension structure is mounted on the inner support at a mounting position outside of the enclosed volume defined by the outer support, such as a beam having U type cross sectional shape.

In an alternative embodiment an outer support, such as a box beam element, may enclose the inner support, wherein the suspension structure of the inner support is disposed partly within the enclosed volume defined by the outer support. For example the suspensions structure may be mounted on the inner support, such as a box beam element extending in the respective first or second direction, wherein the mounting position is within the enclosed volume defined by the outer support. This embodiment further enhances the compactness of the print substrate transport assembly.

The outer support may comprise at least one opening, which at least one opening defines a space to freely connect the suspension structure of the inner support to the corresponding supported element (i.e. the feed roller or the platen), wherein the suspension structure is arranged extending through said space. The openings provide that the suspension structure connects the inner support to the respective supported element mechanically independently of the outer support.

[0009] Said suspension structure may comprise an adjusting element to position the corresponding feed roller or platen in a respective adjusting direction, wherein the adjusting element is arranged outside the enclosed volume defined by the outer support. The advantage is that the adjusting element is easily accessible to adjust the corresponding feed roller or platen in the respective adjusting direction.

[0010] The feed roller may be arranged upstream of the print surface, and may be arranged downstream of the print surface in the transport direction of the print substrate, wherein upstream and downstream is defined with respect to the transport direction of the print substrate. The feed roller may be arranged to move the print substrate in the transport direction along the print surface at a relatively close distance from said print surface (e.g. at a distance less than 2 mm, preferably less than 1 mm). The feed roller may form a feed pinch together with a backing roller. In an embodiment said feed roller forms a plurality of feed pinches in conjunction with a plurality of backing rollers. Said backing rollers are distributed along the feed roller.

The feed roller support may be adapted for supporting a middle portion of the feed roller with respect to a width of the feed roller in the first support direction. The platen support may be adapted for supporting a middle portion of the print surface relative to a width of the print surface in the second support direction. The platen support may be adapted for diminishing sagging of the print surface over a width of the print surface in the second support direction.

[0011] Each of the feed roller support and the platen support may comprise a beam element, may comprise a cylindrical element, and may comprise any other hollow element suitably shaped to at least partly enclose an inner support. Said beam element or cylindrical element as used herein is an element that is capable of withstanding load in the respective first and second adjusting direction perpendicular to the direction in which said element extends. Said beam element may be a box beam element. Said box beam element may be constituted by four plates, which four plates cooperatively enclose a volume. Said cylindrical element may be constituted by a tube, which tube encloses a volume.

[0012] In an embodiment the second support direction is substantially parallel to the first support direction. In this embodiment the compactness of the print substrate transport assembly is further enhanced.

[0013] In an embodiment, said inner support is expandable in the respective first support direction or second support direction independently of said outer support.

As such the inner support is mechanically decoupled from the outer support in the respective first support direction or second support direction. This provides the advantage that any expansion of the inner support is substantially unhindered and does not induce bending of the inner support. The inner support may be rigidly connected to the outer support at one end, while the other end of the inner support may be freely expandable in the respective first or second support direction. In an embodiment the inner support is freely expandable at both ends independently of the outer support.

[0014] In a particular embodiment, a first end of said one of the feed roller support and the platen support is connected to a first end of said other one of the first support and the platen support by means of a number of leaf springs, wherein each of said number of leaf springs is extending substantially perpendicular to the respective first support direction or second support direction. Said number of leaf springs supports expansion of the said one of the first support and the platen support (i.e. at said first end) independently of said other one of the first support and the platen support.

[0015] In an embodiment, the feed roller support comprises a first suspension structure connected to the feed roller, wherein the first suspension structure comprises a first adjusting element adapted for adjustably positioning the feed roller in the first adjusting direction with respect to the feed roller support.

Said first adjusting element may be controlled for further minimizing a deformation (e.g. sag) of the feed roller in

the first adjusting direction. In a particular embodiment said first suspension structure may be arranged for supporting a middle portion of the feed roller with respect to a lateral direction, said lateral direction being parallel to the axle of the feed roller.

In case said feed roller support is the inner support according to the invention said first suspension structure may be arranged partly within the enclosed volume of the outer support.

[0016] In an embodiment, the platen support comprises a plurality of second suspension structures being connected to the platen, each comprising a second adjusting element, wherein each of the second adjusting elements is adapted for adjustably positioning the print surface in the second adjusting direction with respect to the feed roller support.

In particular each of the second adjusting elements is adapted for adjustably positioning a portion of the print surface in the second adjusting direction. Said second adjusting element may be controlled for minimizing a deformation (e.g. sag) of the print surface in the second adjusting direction. In case said platen support is the inner support according to the invention each of said second suspension structure may be arranged parly within the enclosed volume of the outer support.

[0017] In a further embodiment, at least one of the second suspension structures of the platen support is adapted to adjustably position a first transport end portion of the print surface and wherein at least another one of the second suspension structures of the platen support is adapted to adjustably position a second transport end portion of the print surface, which second transport end portion is arranged opposite to the first transport end portion with respect to the transport direction.

An advantage is that the embodiment enhances an alignment of the print surface to the transport direction of the moving print substrate. Each of the second suspension structures comprises a second adjusting element for adjusting a corresponding portion of the printing surface in the second adjusting direction. Each of the second suspension structures may be mounted on a side frame plate of the platen support, wherein said side frame plate extends substantially perpendicular to the print surface.

[0018] In a further embodiment of the print substrate transport assembly, the platen support comprises a plurality of second suspension structures, wherein said plurality of second suspension structures is distributed along the second support direction. Each of the second suspension structures is configured to adjustably position a portion of said print surface in the second adjusting direction. This embodiment may further enhance alignment of the print surface with the transport direction of the print substrate along the second support direction.

[0019] In an embodiment, the print substrate transport assembly further comprises a transport gap adjusting element, which transport gap adjusting element is mounted to the feed roller and to one of the platen and the feed roller support, the transport gap adjusting element being adapted for adjustably positioning the feed roller in the transport direction with respect to the print surface.

The transport gap adjusting element enhances a smooth and uniform transition of the print substrate from the feed roller to the print surface in the transport direction. Furthermore any vibrations of the feed roller, such as vibrations generated during rotational movements of the feed roller, are not transmitted to the platen by the transport gap adjusting element in a direction perpendicular to the print surface, The advantage is that a position of the print surface perpendicular to the transport direction is not disturbed by vibrations of the feed roller.

In a particular embodiment the transport gap adjusting element is adapted for adjusting a middle portion of the print surface and the feed roller with respect to each other in the transport direction.

[0020] In a particular embodiment, said transport gap adjusting element is part of the first suspension structure, which is mounted to the feed roller support, and is adapted for adjustably positioning the feed roller in the transport direction independently of said first adjusting element adjustably positioning the feed roller in the first adjusting direction.

[0021] In an embodiment, the first suspension structure comprises a cantilever element, which cantilever element extends in a direction substantially perpendicular to the first adjusting direction and is connected to the feed roller near one end of the cantilever element, wherein said first adjusting element is connected to the cantilever element at one end of said first adjusting element in the first adjusting direction.

In this embodiment the cantilever of the first suspension structure bridges a distance between the feed roller support and the feed roller in a direction substantially perpendicular to the first adjusting direction. Said extending direction of the cantilever may be substantially paralel the transport direction of the print substrate. The advantage is that both the feed roller support and the platen support may be arranged below the print surface, while the feed roller support adjustably supports the feed roller. The cantilever element may be connected to the feed roller support at two positions by a connecting element. At least one of the connecting elements comprises a first adjusting element. Alternatively each of the two connecting elements comprises a first adjusting element.

[0022] In a further embodiment, the inner support is said feed roller support and the outer support is said platen support. This embodiment is advantageous for a print substrate transport assembly, wherein the number of first suspension structures is less than the number of second suspension structures. Furthermore this embodiment is especially advantageous for a platen support having a plurality of second suspension structures, wherein each second suspension structure comprises a second adjustment element. Each of the plurality of second adjustment elements being connected to the outer support is easily accessible to adjust the position of each corresponding portion of the print surface in the second adjusting direc-

tion.

[0023] In an embodiment said inner support encloses an open volume. This embodiment provides an advantage that additionally other functional elements may be mounted inside the open volume of said inner support, such as an air pressure source. Said open volume may be a hole, may be a cavity, and may have any other shape which is accessable to accomodate other functional elements. In particular said air pressure source may be mounted in said inner support. This provides a compact design of the print substrate transport assembly, wherein a distance between the air pressure source and the suction holes may be minimized.

[0024] In a particular embodiment, both the feed roller support and the platen support comprise a box beam. This embodiment is advantageous for mounting each of the first suspension structures and second suspension structures to the corresponding first and platen support. Furthermore the inner box beam comprises an open volume.

[0025] In a particular embodiment, the print surface comprises a plurality of suction holes and wherein the print substrate transport assembly further comprises an air pressure source, wherein said air pressure source is mounted onto said inner support and said air pressure source is operatively coupled to the plurality of suction holes for providing an air pressure to the print substrate. In case the feed roller support is the inner support any vibrations generated by the air pressure source are decoupled from the platen as the platen is supported by the platen support.

[0026] In an embodiment, the print substrate transport assembly further comprises a first frame element and a second frame element and wherein each of the feed roller, platen, the feed roller support and the platen support is mounted to the first frame element at a respective first end and is mounted to the second frame element at a respective second end, which respective second end is opposite to the respective first end in the first support direction. This embodiment enhances an easy and accurate assembly of the print substrate transport assembly with respect to each other.

[0027] In another aspect of the present invention a printing system is provided, comprising the print substrate transport assembly according to any one of the preceding claims, further comprising a print head, wherein said print surface comprising a print area and wherein the print head is adapted for in printing operation applying an image on the print substrate in the printing area.

In an embodiment the first adjusting direction and the second adjusting direction may be are arranged substantially parallel to the gravity direction. In this embodiment the print surface may be adjusted to substantially the same level as the feed roller in a height orientation (i.e. gravity direction) of the print substrate transport assembly in the printing system. The feed roller support and the platen support may be arranged below the printing area of the print surface. Below as used herein is defined as a level of positioning with respect of the height orientation (i.e. gravity direction) of the print substrate transport assembly in the printer.

The printing system may be an inkjet printing apparatus or may be any other printing apparatus. The inkjet printing apparatus may comprise a number of inkjet print heads, which are arranged facing the print surface for printing an inkjet image on the print substrate in the printing area. The print substrate may be a web substrate and may be a cut sheet substrate. The feed roller may transport the print substrate in a stepwise movement (e.g. in between printing passes) or may transport the print substrate in a continuous movement in the transport direction.

[0028] In an embodiment of the printing system, the print head comprises a nozzle plate surface, and wherein the position of the print surface is adjusted in the second adjusting direction by means of the second adjusting elements based on a desired distance between the print surface and the nozzle plate surface in the second adjusting direction. In particular the position of the print surface is adjusted in the second adjusting direction based on a desired distance between the print area and the nozzle plate surface in the second adjusting direction.

[0029] In an embodiment of the printing system, the printing system further comprising a guide rail and a carriage, wherein the guide rail extends in a carriage scanning direction, wherein the print head is mounted on the carriage, and wherein the carriage is guided in the carriage scanning direction over the print surface by means of the guide rail wherein the carriage scanning direction is substantially perpendicular to the transport direction. Said carriage may be adapted for moving scan wise along said guide rail. In particular the print head is guided in the carriage scanning direction over the printing area.

[0030] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating embodiments of the invention, are given by way of illustration only, since various changes and modifications within the scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] Hereinafter, the present invention is further elucidated with reference to the appended drawings showing non-limiting embodiments and wherein

- Fig. 1A shows an image forming apparatus, wherein printing is achieved using a wide format inkjet printer.
- Fig. 1 B shows a schematic perspective view of an ink jet printing assembly.
- Fig. 2A and Fig. 2B show an ink jet printing assembly comprising a print substrate transport assembly according to the present invention.

Fig. 3A shows a side view of an embodiment of the print substrate transport assembly according to the present invention.

Fig. 3B shows a perspective view of the embodiment shown in Fig. 3A.

Fig. 4A shows a side view of an embodiment of the print substrate transport assembly according to the present invention.

Fig. 4B shows a perspective view of the embodiment shown in fig. 4A.

Fig. 5A shows a side view of an embodiment of the print substrate transport assembly according to the present invention.

Fig. 5B shows a perspective view of the embodiment shown in fig. 5A showing second suspensions structures.

Fig. 6 shows an example of an adjusting element for adjustably positioning an object with respect to a reference element.

Fig. 7 shows a side view of an embodiment of the print substrate transport assembly according to the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0032] The present invention will now be described with reference to the accompanying drawings, wherein the same reference numerals have been used to identify the same or similar elements throughout the several views.

[0033] Fig. 1A shows an image forming apparatus 11, wherein printing is achieved using a wide format inkjet printer. The wide-format image forming apparatus 11 comprises a housing 16, wherein the printing assembly, for example the ink jet printing assembly shown in Fig. 1B is placed. The image forming apparatus 11 also comprises an input station for storing print substrate 18, 19, an output station to collect the print substrate 18, 19 after printing and storage means for marking material 15. In Fig. 1A, the output station is embodied as a delivery tray 17. Optionally, the output station may comprise processing means for processing the print substrate 18, 19 after printing, e.g. a roll-up unit, a folder or a puncher. The wide-format image forming apparatus 11 furthermore comprises means for receiving print jobs and optionally means for manipulating print jobs. These means may include a user interface unit 14 and/or a control unit 13, for example a computer.

[0034] Images are printed on a print substrate, for example paper, supplied by a roll 18, 19. The roll 18 is supported on the roll support R1, while the roll 19 is supported on the roll support R2. Alternatively, cut sheet print substrates may be used instead of rolls 18, 19 of print substrate. Printed sheets of the print substrate, cut off from the roll 18, 19, are deposited in the delivery tray 17.

[0035] Each one of the marking materials for use in the printing assembly are stored in four containers 15 arranged in fluid connection with the respective print heads for supplying marking material to said print heads.

[0036] The local user interface unit 14 is integrated to the print engine and may comprise a display unit and a control panel. Alternatively, the control panel may be integrated in the display unit, for example in the form of a touch-screen control panel. The local user interface unit 14 is connected to a control unit 13 placed inside the printing apparatus 11. The control unit 13, for example a computer, comprises a processor adapted to issue commands to the print engine, for example for controlling the print process. The image forming apparatus 11 may optionally be connected to a network N. The connection to the network N is diagrammatically shown in the form of a cable 12, but nevertheless, the connection could be wireless. The image forming apparatus 11 may receive printing jobs via the network. Further, optionally, the controller of the printer may be provided with a USB port, so printing jobs may be sent to the printer via this USB port.

[0037] Fig. 1B shows a schematic perspective view of an ink jet printing assembly 3. The ink jet printing assembly 3 comprises a print substrate transport assembly 100. The print substrate transport assembly 100 comprises supporting means for supporting a print substrate 2. The supporting means are shown in Fig. 1B as a platen 10 having a flat print surface 12. A feed roller 20 is arranged adjacent to the platen 10 and is rotatable about its axle as indicated by arrow R. The supporting means may be optionally provided with suction holes for holding the print substrate in a fixed position with respect to the supporting means. The ink jet printing assembly 3 comprises print heads 4a - 4d, mounted on a scanning print carriage 5. The scanning print carriage 5 is guided by suitable guiding means 6, 7 to move in reciprocation in the main scanning direction X. The schematic view in Fig. 1B is in a direction from below through the platen 10 and the feed roller 20 in the direction of the scanning print carriage 5. Each print head 4a - 4d comprises a nozzle plate surface 9, which nozzle plate surface 9 is provided with at least one nozzle 8. The print heads 4a - 4d are configured to eject droplets of marking material onto the print substrate 2. The feed roller 20, the carriage 5 and the print heads 4a - 4d are controlled by suitable controlling means 1 a, 1b and 1c, respectively.

[0038] The print substrate 2 may be a medium in web or in sheet form and may be composed of e.g. paper, cardboard, label stock, coated paper, plastic or textile. The print substrate 2 is moved in the transport direction T by said feed roller 20 along the print surface 12 and four print heads 4a - 4d provided with a fluid marking material.

[0039] A scanning print carriage 5 carries the four print heads 4a - 4d and may be moved in reciprocation in the main scanning direction X parallel to the platen 10, such as to enable scanning of the print substrate 2 in the main scanning direction X. Only four print heads 4a - 4d are depicted for demonstrating the invention. In practice an arbitrary number of print heads may be employed. In any case, at least one print head 4a - 4d per color of marking

material is placed on the scanning print carriage 5. For example, for a black-and-white printer, at least one print head 4a - 4d, usually containing black marking material is present. Alternatively, a black-and-white printer may comprise a white marking material, which is to be applied on a black print substrate 2. For a full-color printer, containing multiple colors, at least one print head 4a - 4d for each of the colors, usually black, cyan, magenta and yellow is present. Often, in a full-color printer, black marking material is used more frequently in comparison to differently colored marking material. Therefore, more print heads 4a - 4d containing black marking material may be provided on the scanning print carriage 5 compared to print heads 4a - 4d containing marking material in any of the other colors. Alternatively, the print head 4a - 4d containing black marking material may be larger than any of the print heads 4a - 4d, containing a differently colored marking material.

[0040] The carriage 5 is guided by guiding means 6, 7. These guiding means 6, 7 may be rods as depicted in Fig. 1B. The rods may be driven by suitable driving means (not shown). Alternatively, the carriage 5 may be guided by other guiding means, such as an arm being able to move the carriage 5. Another alternative is to move the print substrate 2 in the main scanning direction X. Each print head 4a - 4d comprises a nozzle plate surface 9 having at least one nozzle 8, in fluid communication with a pressure chamber containing fluid marking material provided in the print head 4a - 4d. On the nozzle plate surface 9, a number of nozzles 8 is arranged in a single linear array parallel to the transport direction T. Eight nozzles 8 per print head 4a - 4d are depicted in Fig. 1B, however obviously in a practical embodiment several hundreds of nozzles 8 may be provided per print head 4a - 4d, optionally arranged in multiple arrays. As depicted in Fig. 1B, the respective print heads 4a - 4d are placed parallel to each other such that corresponding nozzles 8 of the respective print heads 4a - 4d are positioned in-line in the main scanning direction X. This means that a line of image dots in the main scanning direction X may be formed by selectively activating up to four nozzles 8, each of them being part of a different print head 4a - 4d. This parallel positioning of the print heads 4a - 4d with corresponding in-line placement of the nozzles 8 is advantageous to increase productivity and/or improve print quality. Alternatively multiple print heads 4a - 4d may be placed on the print carriage adjacent to each other such that the nozzles 8 of the respective print heads 4a - 4d are positioned in a staggered configuration instead of in-line. For instance, this may be done to increase the print resolution or to enlarge the effective print area, which may be addressed in a single scan in the main scanning direction. The image dots are formed by ejecting droplets of marking material from the nozzles 8.

[0041] Upon ejection of the marking material, some marking material may be spilled and stay on the nozzle plate surface 9 of the print head 4a - 4d. The ink present on the nozzle plate surface 9 may negatively influence the ejection of droplets and the placement of these droplets on the print substrate 2. Therefore, it may be advantageous to remove excess of ink from the nozzle plate surface 9. The excess of ink may be removed for example by wiping with a wiper and / or by application of a suitable anti-wetting property of the surface, e.g. provided by a coating.

[0042] Fig. 2A and Fig. 2B shows an ink jet printing assembly 3 comprising a print substrate transport assembly 100 according to the present invention. The ink jet printing assembly 3 further comprises a print head 4, a carriage 5 and a guide rail 6. Fig. 2A is a side view of the ink jet printing assembly 3 and the print substrate transport assembly 100. Fig. 2B is a top plan view of the print substrate transport assembly 100 when viewed in a gravity direction g.

The print substrate transport assembly 100 comprises a platen 10 comprising a print surface 12, a feed roller 20, a feed roller support 30 and a platen support 40. The print surface 12 comprises a printing area 14. The print head 4 is arranged facing said printing area 14 and arranged above said printing area 14 with respect to the gravity direction g. The print head 4 is mounted on the carriage 5. The carriage 5 is movably along the guide rail 6, which extends in a carriage scanning direction (which is perpendicular to the plane of viewing in Fig. 2A). The feed roller 20 forms a feed pinch in conjunction with back roller 22. The feed roller 20, and as such the feed pinch, is adapted for transporting a print substrate 2 in a transport direction T of the print substrate along the print surface 12 and the printing area 14. The feed roller 20 is mounted on an axle 21 and is driven by a driving means (not shown). As shown in Fig. 2B the feed roller 20 including the axle 21 and the back roller 22 both extend in a lateral direction W_1, which is a lateral direction of the print substrate transport assembly 100. The print surface 12 extends in a first print surface direction P_1 and a second print surface direction P_2. The printing area 14 is part of the print surface 12. The first print surface direction P_1 is substantially parallel to the lateral direction W_1 and the second print surface direction P_2 is substantially parallel to the transport direction T. The print surface 12 is arranged at a height h_1 with respect to the gravity direction g. Said height h_1 is selected based on a desired distance to the print head 4.

A feed roller support 30 extends in a first support direction S_1 and is adapted for adjustably supporting the feed roller in a first adjusting direction as indicated by arrow A_1.The first support direction S_1 is substantially parallel to the lateral direction W_1. The first adjusting direction A_1 is substantially parallel and opposite to the gravity direction g. A platen support 40 extends in a second support direction S_2 and is adapted for adjustably supporting the print surface 12 in a second adjusting direction which is indicated by arrows A_2. The second support direction S_2 is substantially parallel to the lateral direction W_1. The second adjusting direction A_2 is substantially parallel and opposite to the gravity direction g. Both the feed roller support

30 and the platen support 40 comprise a box beam structure. The first support direction S_1 is substantially parallel to the second support direction S_2. In this embodiment the feed roller support 30 is enclosed by the platen support 40. Said feed roller support 30 is an inner support and said platen support 40 is an outer support. Alternatively the platen support 40 may be enclosed by the feed roller support 30 (not shown).

The axle 21 of the feed roller 20 is supported by the feed roller support 30 in the gravity direction g (as indicated by arrow A_1 in Fig. 2A) at a number of positions along the axle 21 between a first end 211 and a second end 212 in the lateral direction W_1. In an embodiment the axle 21 is supported at a middle portion 213 by the feed roller support 30.

The platen 10, including the print surface 12 is adjustably supported by the platen support 40 in the gravity direction g as indicated by arrow A_2 in Fig. 2A at a plurality of positions along the print surface 12. The plurality of positions for supporting the print surface may be distributed along the first print surface direction P_1 and the second print surface direction P_2.

[0043] Fig. 3A and Fig. 3B show an embodiment of the print substrate transport assembly 100 according to the present invention. Fig. 3A shows a side view of the embodiment of the print substrate transport assembly 100. Fig. 3B shows a perspective view of the embodiment shown in Fig. 3A.

In Fig. 3A the feed roller support 30 is connected to the platen support 40 at a first end in the first support direction S_1 via a stiff pillar connection 66. The feed roller support 30 is expandable in the first support direction S_1 at a second end 31 as indicated by arrow E_1, wherein the second end 31 is opposite to the first end in the first support direction S_1. The second end 31 is expandable in the first support direction S_1 independently of the platen support 40.

Fig. 3B shows a perspective view of an embodiment of the print substrate transport assembly 100 according to the present invention. In Fig. 3B a first frame element 50 and a bridge structure 60 is shown. The bridge structure 60 comprises two leaf springs 65 a first bridge element 61 and a second bridge element 63. The first bridge element 61 comprises a plurality of connection holes 62 for fixing the second end 31 of the feed roller support 30 to the bridge structure 60. The second bridge element 63 comprises a plurality of connection holes 64 for fixing the platen support 40 to the bridge structure 60.

The leaf springs 65 connect the first bridge element 61 to the second bridge element 63. Each of the leaf springs 65 extends perpendicular to the first support direction S_1 and the second support direction S_2. In particular each of the leaf springs 65 extends substantially in the second direction T and the gravity direction g in between the first bridge element 61 and the second bridge element 63. The leaf springs 65 are arranged substantially parallel to each other. In case the first end 31 of the feed roller support 30 moves in a direction S_1, the first bridge element 61 may move in the direction S_1 substantially unhindered due to the flexible deformation of both leaf springs 65 in the direction S_1.

[0044] Fig. 4A and Fig. 4B show an embodiment of the print substrate transport assembly 100 according to the present invention. Fig. 4A shows a side view of the embodiment of the print substrate transport assembly 100. Fig. 4B shows a perspective view of the embodiment shown in fig. 4A.

In Fig. 4A the feed roller support 30 comprises a first suspension structure 32. The first suspension structure 32 is adapted for connecting the feed roller support 30 to the axle 21 of the feed roller 20 and is further adapted for positioning the feed roller 20 with respect to the feed roller support 30. The first suspension structure 32 comprises a cantilever element 33, two frame elements 35, 37 and two first adjusting elements 34, 36.

The cantilever element 33 extends in the transport direction T between the feed roller 20 and the feed roller support 30 and supports the axle 21 at a first end 331. As shown in Fig. 4B the cantilever element 33 is connected to the axle 21 at a middle portion of the feed roller 20. The feed roller 20 is further supported by a first frame element 50 at a first end and is supported by a second frame element 52 at a second end in the lateral direction W_1.

The cantilever element 33 is supported by the two first adjusting elements 34, 36. Each of the two frame elements 35, 37 is connected to the feed roller support 30 and protrudes downwards in the gravity direction g from the feed roller support 30, thereby freely passing through openings of the platen support 40. On a lower end of each of the two frame elements 35, 37 a corresponding first adjustment element 34, 36 is connected. Both first adjustment elements 34, 36 extend in the first adjusting direction A_1 up to the cantilever element 33 thereby freely passing through openings of the platen support 40. The first adjusting element 34 shown in Fig. 4A and Fig. 4B is connected to an end part of the cantilever element 332, while the other first adjusting element 36 is connected to an intermediate part of the cantilever element 333.

The platen support 40 comprises holes (not shown) for freely letting pass both first adjustment elements 34, 36 and both frame elements 35, 37. As such the first suspension structure 32 is not connected to and not obstructed by the platen support 40.

Each of the first adjusting element 34, 36 is adapted for adjustably positioning said corresponding part of the cantilever element 33 in the first adjusting direction A_1 with respect to the feed roller support 30. Accordingly the feed roller 20 may be adjustably positioned in the first adjusting direction A_1 with respect to the feed roller support 30. The first adjusting direction A_1 is substantially parallel to the gravity direction g. Possible structures of the first adjusting element 34, 36 are known to a person skilled in the art. An example of the first adjusting element 34, 36 is further shown in Fig. 6.

Both first adjusting element 34, 36 may be adjusted co-

operatively in order to adjust the position of the cantilever 33 in the first adjusting direction A_1. Alternatively only one of the first adjusting element 34, 36 may be adjusted, thereby adjusting the position of the corresponding end part 332 or intermediate part 333 of the cantilever element 33 in the first adjusting direction A_1. Depending on the relative positions of the end part 332 and the intermediate part 333 of the cantilever relative to each other and with respect to the axle 21, the axle 21 will be positioned in the first adjusting direction A_1. Furthermore the cantilever element 33 may be tilted around the lateral direction W_1 in case the position of the end part 332 and the intermediate part 333 of the cantilever element 33 are adjusted differently in the first adjusting direction A_1. In an alternative embodiment a plurality of first suspension structures 32 may be connected to the feed roller support 30 at distributed positions along the first support direction S_1 (not shown), each of the plurality of first suspension structures 32 being connected to a corresponding portion of the feed roller 20 along the lateral direction W_1 of the feed roller 20. As such said respective portions of the feed roller 20 may be adjustably positioned with respect to the feed roller support 30 independently of each other.

[0045] Additionally in an embodiment a transport gap adjusting element 38 may be provided (shown in Fig, 4B). The transport adjusting gap element 38 is mounted to the cantilever element 33 of the first suspension structure 32 at one end of the transport gap adjusting element 38. As a result the transport gap adjusting element 38 is connected to the axle 21 of the feed roller 20 via the cantilever element 33. The transport gap adjusting element 38 is mounted on a base part 105 of the platen 10 (shown in Fig. 4A) at another end of the transport gap adjusting element 38. The transport gap adjusting element 38 is adapted for adjustably positioning the feed roller 20 in the transport direction T with respect to the print surface 12. An example of a structure of the transport adjusting gap element 38 is shown in Fig. 6. Any vibrations of the feed roller, such as vibrations generated during rotational movements of the feed roller, are not transmitted to the platen by the transport gap adjusting element in a direction perpendicular to the print surface, The advantage is that a position of the print surface perpendicular to the transport direction is not disturbed by vibrations of the feed roller.

In an embodiment the transport gap adjusting element 38 may be provided together with at least one of the first adjustment elements 34, 36 as shown in Fig. 4B. The advantage is that a distance between the feed roller 20 and the print surface 12 in the transport direction T may be controlled using the transport gap adjusting element 38 independently of adjustments of the position of the feed roller in the first adjusting direction A_1 using the first adjustment elements 34, 36.

[0046] Fig. 5A and Fig. 5B show an embodiment of the print substrate transport assembly 100 according to the present invention. Fig. 5A shows a side view of the embodiment of the print substrate transport assembly 100. In Fig. 5A a platen support 40 is shown, which encloses a feed roller support 30. Fig. 5B shows a perspective view of the embodiment shown in fig. 5A showing second suspensions structures 42,43 of the platen support 40. Fig. 5A shows two of the second suspension structures 42, 43. Each of the second suspension structures 42, 43 is adapted for connecting the platen support 40 to the platen 10. Each of the second suspension structures 42, 43 comprises a second adjustment element 44, 45. The second adjustment element 44 is connected to the platen support 40 and connected to a first transport end portion 101 of the print surface 12, while the other second adjustment element 45 is connected to the platen support 40 and connected to a second transport end portion 103of the print surface 12. The first transport end portion 101 of the print surface 12 is positioned at a first end of the print surface 12 in the transport direction T, while the second transport end portion 103 of the print surface 12 is positioned at a second end of the print surface opposite to the first end of the print surface 12 in the transport direction T.

Both second adjusting element 42, 43 shown in Fig. 5A may be adjusted cooperatively in order to adjust the position of the print surface 12 in a second adjusting direction A_2. Alternatively only one of the second adjusting element 42, 43 may be adjusted, thereby adjusting the position of the corresponding first transport end portion 101 or second transport end portion 103 of the print surface 12 with respect to the platen support 40 in the second adjusting direction A_2.

[0047] As shown in Fig. 5B five second suspensions structures 42, 43 are distributed along the print surface 12 in a first print surface direction P_1 at each end of the print surface 12 in the transport direction T. Each of the suspension structures 42, 43 comprises a second adjustment element 44, 45 for adjustably positioning a corresponding portion of the print surface 12 in a second adjusting direction A_2 with respect to the platen support 40.

[0048] Fig. 6 shows an example of an adjusting element for adjustably positioning an object with respect to a reference element. Said adjusting element may be used as a first adjusting element, a second adjusting element or a transport adjusting element. The adjusting element 600 comprises a hinge plate 602, having elastic hinges 603, 604 that are formed by portions of the hinge plate 602 where the width thereof is reduced, and comprise at least one lever 606 adapted to push and/or pull the hinge plate in longitudinal direction L_1 thereof, with elastic deflection of at least one of the hinges 603, 604. One elastic hinge 603 is arranged near one end of the hinge plate 602, which end is fixed to the adjusting lever 606 at a connection 609. The other elastic hinge 604 is arranged near another end of the hinge plate 602, which end is fixed to the connecting point 609. Said connecting point 609 is moved in the longitudinal direction L_1 in association with the movement of the hinge plate 602. The

lever 606 is fixed to an adjusting screw 608 on one end while being connected to a metal link 610 on another end via a hinge 607. The hinge 607 is arranged lateral offset to the connecting point 609 of the lever 606 to the hinge plate 602.

The metal link 610 is fixated by fixation points 612, 614 to a reference element 613 (e.g. a support element). The adjusting screw 608 is fixed to the metal link 610. The lever 606 is moved at said on end in the direction L_2 by adjusting the adjusting screw 608. As a result the other end of the lever 606 is moved in the direction L_1, in opposite direction to the direction L_2, thereby moving the hinge plate 602 in the direction L_1. Due to the position of the hinge 607 and the length of the lever 606 the movements of the adjustment screw 608 in the direction L_2 may be transmitted in larger movements than the hinge plate 602 in the direction L_1.

[0049] Fig. 7 shows a side view of an embodiment of the print substrate transport assembly 100 according to the present invention. In Fig. 7a platen support 40 is shown, which encloses a feed roller support 30. The print substrate transport assembly 100 further comprises a platen 10, which comprises a print surface 12, and a feed roller 20. The feed roller 20 forms a feed pinch in conjunction with back roller (not shown). The feed roller 20, and as such the feed pinch, is adapted for transporting a print substrate 2 in a transport direction T of the print substrate along the print surface 12. The feed roller 20 is mounted on an axle 21 and is driven by a driving means (not shown). Said feed roller 20 is arranged upstream if the print surface 12 in the transport direction T of the print substrate 2. The feed roller extends in a lateral direction W_1 (perpendicular to the plane of viewing).

The feed roller support 30 extends in a first support direction S_1 (similar as is shown in the embodiment of Fig. 4B) and is adapted for supporting the feed roller in a first adjusting direction as indicated by arrow A_1. The first support direction S_1 is substantially parallel to the lateral direction W_1. The first adjusting direction A_1 is substantially parallel and opposite to the gravity direction g. The platen support 40 extends in a second support direction S_2 (similar as is shown in the embodiment of Fig. 4B) and is adapted for supporting the print surface 12 in a second adjusting direction which is indicated by arrows A_2. The second support direction S_2 is substantially parallel to the lateral direction W_1. The second adjusting direction A_2 is substantially parallel and opposite to the gravity direction g. Both the feed roller support 30 and the platen support 40 comprise a box beam structure.

The print surface 12 comprises a plurality of suction holes 72. Said suction holes 72 are distributed over the printing surface 12. The suction holes are adapted for communicating an air pressure to the print substrate 2 in order to hold down the print substrate 2 in contact with the print surface 12. The print substrate transport assembly 100 further comprises an air pressure source 70. The air pressure source 70 is a vacuum source, which is adapted for providing a vacuum air pressure for holding the print substrate 2 in contact with the print surface 12. The air pressure source 70 is mounted to and enclosed by the feed roller support 30. The air pressure source 70 is operatively coupled to the plurality of suction holes 72 via a flexible hose 74. The flexible hose 74 communicates the vacuum air pressure to the suction holes 72. In case the air pressure source 70 generates vibrations, said vibrations are absorbed by the feed roller support 30 and are not transmitted to the print surface 12. Transmittance of the vibrations towards the feed roller 20 are prevented or at least attenuated by the first suspension structure 32 and the flexible hose 74. For example the first adjusting elements 34, 36 prevent transmittance of any vibrations in the transport direction T and in the lateral direction W_1 of the feed roller. As such the air pressure source 70 is fully mechanically decoupled from the print surface 12 and is partially mechanically decoupled from the feed roller 20.

Furthermore by mounting the air pressure source 70 inside the feed roller support 30, it may be arranged close to the suction holes 72 and the print surface 12, thereby reducing any loss of vacuum pressure.

Detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriately detailed structure. In particular, features presented and described in separate dependent claims may be applied in combination and any advantageous combination of such claims is herewith disclosed.

Further, the terms and phrases used herein are not intended to be limiting; but rather, to provide an understandable description of the invention. The terms "a" or "an", as used herein, are defined as one or more than one. The term plurality, as used herein, is defined as two or more than two. The term another, as used herein, is defined as at least a second or more. The terms including and/or having, as used herein, are defined as comprising (i.e., open language). The term coupled, as used herein, is defined as connected, although not necessarily directly.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Claims

1. A print substrate transport assembly (100) for transporting a print substrate (2) in a printing apparatus,

comprising a feed roller (20) for transporting the print substrate, a platen (10) for supporting said print substrate, a feed roller support (30) for supporting said feed roller and a platen support (40) for supporting said platen;
wherein the platen comprises a print surface (12) to support the print substrate;
wherein the feed roller comprises an axle (21) which is arranged for transporting the print substrate in a transport direction along the print surface;
wherein the feed roller support extends in a first support direction (S_1), which is directed along the axle of the feed roller, the feed roller support being adapted for adjustably positioning the feed roller in a first adjusting direction (A_1), which first adjusting direction is substantially perpendicular to the print surface;
wherein the platen support extends in a second support direction (S_2), the platen support being adapted for adjustably positioning said platen in a second adjusting direction (A_2), which second adjusting direction is substantially perpendicular to the print surface;
wherein the print substrate transport assembly comprises an inner support (30; 40) which is at least partly enclosed by an outer support (30;40), wherein said inner support is one selected from the feed roller support (30) and the platen support (40) and wherein said outer support is an other selected from the feed roller support (30) and the platen support (40); and
wherein said outer support defines an enclosed volume, and wherein a suspension structure (32) of the inner support, which connects the inner support to the corresponding feed roller or platen, extends outside of the enclosed volume.

2. The print substrate transport assembly according to claim 1, wherein said inner support is expandable in the respective first support direction or second support direction independently of said outer support.

3. The print substrate transport assembly according to claim 2, wherein a first end of said inner support (30; 40) is connected to a first end of said outer support (30; 40) by means of at least one leaf spring (65), wherein each of said at least one leaf spring is extending substantially perpendicular to the respective first support direction or second support direction.

4. The print substrate transport assembly according to claim 1, wherein the feed roller support (30) comprises a first suspension structure (32) connected to the feed roller, wherein the first suspension structure comprises a first adjusting element (34; 36) adapted for adjustably positioning the feed roller (20) in the first adjusting direction (A_1) with respect to the feed roller support.

5. The print substrate transport assembly according to claim 1, wherein the platen support (40) comprises a plurality of second suspension structures (42) being connected to the platen (10), each comprising a second adjusting element (44; 45), wherein each of the second adjusting elements is adapted for adjustably positioning the print surface (12) in the second adjusting direction (A_2) with respect to the platen support.

6. The print substrate transport assembly according to claim 5, wherein at least one of the second suspension structures of the platen support is adapted to adjustably position a first transport end portion of the print surface (12) with respect to the platen support and wherein at least another one of the second suspension structures of the platen support is adapted to adjustably position a second transport end portion of the print surface (12) with respect to the platen support, which second transport end portion is arranged opposite to the first transport end portion with respect to the transport direction.

7. The print substrate transport assembly according to claim 4, wherein the print substrate transport assembly further comprises a transport gap adjusting element (38), which transport gap adjusting element is mounted to the feed roller and to one of the platen and the feed roller support, the transport gap adjusting element being adapted for adjustably positioning the feed roller in the transport direction (T) with respect to the print surface.

8. The print substrate transport assembly according to claim 7, wherein said transport gap adjusting element is part of the first suspension structure (32), which is mounted to the feed roller support, and is adapted for adjustably positioning the feed roller in the transport direction with respect to the print surface independently of said first adjusting element adjustably positioning the feed roller in the first adjusting direction with respect to the feed roller support.

9. The print substrate transport assembly according to claim 4, wherein the first suspension structure comprises a cantilever element (33), which cantilever element extends in a direction substantially perpendicular to the first adjusting direction and is connected to the feed roller near one end of the cantilever element, wherein said first adjusting element is connected to the feed roller support at one end and connected to the cantilever element at another end of said first adjusting element in the first adjusting direction.

10. The print substrate transport assembly according to claim 1, wherein the inner support is said feed roller support and the outer support is said platen support.

11. The print substrate transport assembly according to claim 1, wherein said supension structure of the inner support is disposed partly within the enclosed volume defined by the outer support.

12. The print substrate transport assembly according to claim 1, wherein the print surface comprises a plurality of suction holes (72) and wherein the print substrate transport assembly further comprises an air pressure source (70), wherein said air pressure source is mounted onto said inner support and said air pressure source is operatively coupled to the plurality of suction holes for providing an air pressure to the print substrate.

13. A printing system, comprising the print substrate transport assembly according to any one of the preceding claims, further comprising a print head (4a - 4d), wherein said print surface comprising a print area (14) and wherein the print head is adapted for in printing operation applying an image on the print substrate in the printing area.

14. The printing system according to claim 13, wherein the print head comprises a nozzle plate surface (9), and wherein the position of the print surface is adjusted in the second adjusting direction based on a desired distance between the print surface and the nozzle plate surface in the second adjusting direction.

15. The printing system according to claim 13, wherein the printing system further comprising a guide rail (6;7) and a carriage (5), wherein the guide rail extends in a carriage scanning direction (X), wherein the print head is mounted on the carriage, wherein the carriage is guided in the carriage scanning direction over the print surface by means of the guide rail wherein the carriage scanning direction is substantially perpendicular to the transport direction(T).

Patentansprüche

1. Transportanordnung (100) für den Transport eines Drucksubstrats (2) in einem Druckgerät, mit einer Transportrolle (20) zum Transportieren des Drucksubstrats, einem Stützorgan (10) zum Abstützen des Drucksubstrats, einem Transportrollenträger (30) zum Abstützen der Transportrolle, und einem Stützorganträger (40) zum Abstützen des Stützorgans,
wobei das Stützorgan eine Druckfläche (12) zur Aufiiahme des Drucksubstrats aufweist,
wobei die Transportrolle eine Achse (21) aufweist, die so angeordnet ist, dass das Drucksubstrat in einer Transportrichtung entlang der Druckfläche transportiert wird,
wobei der Transportrollenträger sich in einer ersten Abstützrichtung (S_1) erstreckt, die entlang der Achse der Transportrolle gerichtet ist, wobei der Transportrollenträger dazu eingerichtet ist, die Transportrolle in einer ersten Einstellrichtung (A_1) einstellbar zu positionieren, welche erste Einstellrichtung im wesentlichen rechtwinklig zu der Druckfläche ist,
wobei der Stützorganträger sich in einer zweiten Abstützrichtung (S_2) erstreckt, der Stützorganträger dazu eingerichtet ist, das Stützorgan in einer zweiten Einstellrichtung (A_2) einstellbar zu positionieren, welche zweite Einstellrichtung im wesentlichen rechtwinklig zu der Druckfläche ist,
wobei die Transportanordnung einen inneren Träger (30; 40) aufweist, der zumindest zum Teil von einem äußeren Träger (30; 40) umschlossen ist, wobei der innere Träger entweder der Transportrollenträger (30) oder der Stützorganträger (40) ist und wobei der äußere Träger das andere der beiden Bauteile Transportrollenträger und Stützorganträger ist, und wobei der äußere Träger ein umschlossenes Volumen definiert, und wobei eine Aufhängungsstruktur (32) des inneren Trägers, die den inneren Träger mit der zugehörigen Transportrolle oder dem zugehörigen Stützorgan verbindet, sich außerhalb des umschlossenen Volumens erstreckt.

2. Transportanordnung nach Anspruch 1, bei der der innere Träger unabhängig von dem äußeren Träger in der ersten bzw. zweiten Abstützrichtung ausfahrbar ist.

3. Transportanordnung nach Anspruch 2, bei der ein erstes Ende des inneren Trägers (30; 40) durch wenigstens eine Blattfeder (65) mit einem ersten Ende des äußeren Trägers (30; 40) verbunden ist, wobei jede der wenigstens einen Blattfedern sich im wesentlichen rechtwinklig zu der ersten bzw. zweiten Abstützrichtung erstreckt.

4. Transportanordnung nach Anspruch 1, bei der der Transportrollenträger (30) eine erste Aufhängungsstruktur (32) aufweist, die mit der Transportrolle verbunden ist, wobei die erste Aufhängungsstruktur ein erstes Einstellelement (34; 36) aufweist, das dazu eingerichtet ist, die Transportrolle (20) in der ersten Einstellrichtung (A_1) in Bezug auf den Transportrollenträger einstellbar zu positionieren.

5. Transportanordnung nach Anspruch 1, bei der der Stützorganträger (40) mehrere zweite Aufhängungsstrukturen (42) aufweist, die mit dem Stützorgan (10) verbunden sind und jeweils ein zweites Einstellelement (44; 45) aufweisen, wobei jedes der zweiten Einstellelemente dazu eingerichtet ist, die Druckfläche (12) in der zweiten Einstellrichtung (A_2) in Bezug auf den Stützorganträger einstellbar zu positionieren.

6. Transportanordnung nach Anspruch 5, bei der wenigstens eine der zweiten Aufhängungsstrukturen des Stützorganträgers dazu eingerichtet ist, einen ersten Transportendabschnitt der Druckfläche (12) in Bezug auf den Stützorganträger einstellbar zu positionieren, und bei der wenigstens eine andere der zweiten Aufhängungsstrukturen des Stützorganträgers dazu eingerichtet ist, einen zweiten Transportendabschnitt der Druckfläche (12) in Bezug auf den Stützorganträger einstellbar zu positionieren, wobei der zweite Transportendabschnitt dem ersten Transportendabschnitt in Bezug auf die Transportrichtung entgegengesetzt ist.

7. Transportanordnung nach Anspruch 4, die weiterhin ein Transportspalt-Einstellelement (38) aufweist, das an der Transportrolle und einem der Bauteile Stützorgan und Transportrollenträger montiert ist und das dazu eingerichtet ist, die Transportrolle in der Transportrichtung (T) in Bezug auf die Druckfläche einstellbar zu positionieren.

8. Transportanordnung nach Anspruch 7, bei der das Transportspalt-Einstellelement Teil der ersten Aufhängungsstruktur (32) ist, die an dem Transportrollenträger montiert ist, und das Einstellelement dazu eingerichtet ist, die Transportrolle unabhängig von dem ersten Einstellelement, das die Transportrolle einstellbar in der ersten Einstellrichtung in Bezug auf den Transportrollenträger positioniert, in der Transportrichtung in Bezug auf die Druckfläche einstellbar zu positionieren.

9. Transportanordnung nach Anspruch 4, bei der die erste Aufliängungsstruktur einen Ausleger (33) aufweist, der sich in einer Richtung im wesentlichen rechtwinklig zu der ersten Einstellrichtung erstreckt und mit der Transportrolle in der Nähe eines Endes des Auslegers verbunden ist, wobei das erste Einstellelement an einem Ende mit der Transportrolle und an einem anderen Ende in der ersten Einstellrichtung mit dem Ausleger verbunden ist.

10. Transportanordnung nach Anspruch 1, bei der der innere Träger der Transportrollenträger ist und der äußere Träger der Stützorganträger ist.

11. Transportanordnung nach Anspruch 1, bei der die Aufhängungsstruktur des inneren Trägers zum Teil innerhalb des umschlossenen Volumens angeordnet ist, das durch den äußeren Träger definiert wird.

12. Transportanordnung nach Anspruch 1, bei der die Druckfläche mehrere Sauglöcher (72) aufweist, wobei die Transportanordnung weiterhin eine Druckluftquelle (70) aufweist, wobei die Druckluftquelle an dem inneren Träger montiert und funktionsmäßig mit den mehreren Sauglöchern verbunden ist, um das Drucksubstrat einem Luftdruck auszusetzen.

13. Druckersystem mit der Drucksubstrat-Transportanordnung nach einem der vorstehenden Ansprüche, weiterhin aufweisend einen Druckkopf (4a - 4b), wobei die Druckfläche eine Druckzone (14) aufweist und wobei der Druckkopf dazu eingerichtet ist, während des Druckbetriebs ein Bild auf das Drucksubstrat in der Druckzone aufzubringen.

14. Druckersystem nach Anspruch 13, bei dem der Druckkopf eine Düsenplattenfläche (9) aufweist und bei der die Position der Druckfläche in der zweiten Einstellrichtung auf der Grundlage eines gewünschten Abstands zwischen der Druckfläche und der Düsenplattenfläche in der zweiten Einstellrichtung eingestellt wird.

15. Druckersystem nach Anspruch 13, das weiterhin eine Führungsschiene (6; 7) und einem Wagen (5) aufweist, wobei die Führungsschiene sich in einer Wagenabtastrichtung (X) erstreckt und wobei der Druckkopf an dem Wagen montiert ist, wobei der Wagen mit Hilfe der Führungsschiene in der Wagenabtastrichtung über die Druckfläche geführt wird, wobei die Wagenabtastrichtung im wesentlichen rechtwinklig zu der Transportrichtung (T) ist.

Revendications

1. Assemblage de transport de substrat d'impression (100) pour transporter un substrat d'impression (2) dans un appareil d'impression, comprenant un rouleau d'alimentation (20) pour transporter le substrat d'impression, une platine (10) pour supporter ledit substrat d'impression, un support de rouleau d'alimentation (30) pour supporter ledit rouleau d'alimentation et un support de platine (40) pour supporter ladite platine ;
dans lequel la platine comprend une surface d'impression (12) pour supporter le substrat d'impression ;
dans lequel le rouleau d'alimentation comprend un essieu (21) qui est disposé pour transporter le substrat d'impression dans une direction de transport le long de la surface d'impression ;
dans lequel le support de rouleau d'alimentation s'étend dans une première direction de support (S_1), qui est orientée le long de l'essieu du rouleau d'alimentation, le support de rouleau d'alimentation étant conçu pour positionner de manière réglable le rouleau d'alimentation dans une première direction de réglage (A_1), ladite première direction de réglage étant essentiellement perpendiculaire à la surface d'impression ;
dans lequel le support de platine s'étend dans une seconde direction de support (S_2), le support de pla-

tine étant conçu pour positionner de manière réglable ladite platine dans une seconde direction de réglage (A_2), ladite seconde direction de réglage étant essentiellement perpendiculaire à la surface d'impression ;
dans lequel l'assemblage de transport de substrat d'impression comprend un support interne (30 ; 40) qui est au moins en partie entouré par un support externe (30 ; 40), dans lequel ledit support interne est un support choisi parmi le support de rouleau d'alimentation (30) et le support de platine (40) et dans lequel ledit support externe représente un autre support choisi parmi le support de rouleau d'alimentation (30) et le support de platine (40) ; et
dans lequel ledit support externe définit un volume clos, et dans lequel une structure de suspension (32) du support interne, qui relie le support interne à la platine ou au rouleau d'alimentation correspondant, s'étend à l'extérieur du volume clos.

2. Assemblage de transport de substrat d'impression selon la revendication 1, dans lequel ledit support interne peut s'étendre dans la première direction de support ou la seconde direction de support respective, indépendamment dudit support externe.

3. Assemblage de transport de substrat d'impression selon la revendication 2, dans lequel une première extrémité dudit support interne (30 ; 40) est reliée à une première extrémité dudit support externe (30 ; 40) au moyen d'au moins un ressort à lames (65), dans lequel chacun desdits au moins ressort à lames s'étend essentiellement perpendiculairement à la première direction de support ou à la seconde direction de support respective.

4. Assemblage de transport de substrat d'impression selon la revendication 1, dans lequel le support de rouleau d'alimentation (30) comprend une première structure de suspension (32) reliée au rouleau d'alimentation, dans lequel la première structure de suspension comprend un premier élément de réglage (34 ; 36) conçu pour positionner de manière réglable le rouleau d'alimentation (20) dans la première direction de réglage (A_1) par rapport au support de rouleau d'alimentation.

5. Assemblage de transport de substrat d'impression selon la revendication 1, dans lequel le support de platine (40) comprend plusieurs secondes structures de suspension (42) qui sont reliées à la platine (10), chacune comprenant un second élément de réglage (44 ; 45), dans lequel chacun des seconds éléments de réglage est conçu pour positionner de manière réglable la surface d'impression (12) dans la seconde direction de réglage (A_2) par rapport au support de platine.

6. Assemblage de transport de substrat d'impression selon la revendication 5, dans lequel au moins une des secondes structures de suspension du support de platine est conçue pour positionner de manière réglable une première portion terminale de transport de la surface d'impression (12) par rapport au support de platine, et dans lequel au moins une autre des secondes structures de suspension du support de platine est conçue pour positionner de manière réglable une seconde portion terminale de transport de la surface d'impression (12) par rapport au support de platine, ladite seconde portion terminale de transport étant disposée à l'opposé de la première portion terminale de transport par rapport à la direction de transport.

7. Assemblage de transport de substrat d'impression selon la revendication 4, dans lequel l'assemblage de transport de substrat d'impression comprend en outre un élément de réglage d'espace libre de transport (38), ledit élément de réglage d'espace libre de transport étant monté sur le rouleau d'alimentation et sur, soit la platine, soit le support de rouleau d'alimentation, l'élément de réglage de l'espace libre de transport étant conçu pour positionner de manière réglable le rouleau d'alimentation dans la direction de transport (T) par rapport à la surface d'impression.

8. Assemblage de transport de substrat d'impression selon la revendication 7, dans lequel ledit élément de réglage d'espace libre de transport fait partie de la première structure de suspension (32), qui est montée sur le support de rouleau d'alimentation, et est conçu pour positionner de manière réglable le rouleau d'alimentation dans la direction de transport par rapport à la surface d'impression indépendamment dudit première élément de réglage positionnant de manière réglable le rouleau d'alimentation dans la première direction de réglage par rapport au support de rouleau d'alimentation.

9. Assemblage de transport de substrat d'impression selon la revendication 4, dans lequel la première structure de suspension comprend un élément en porte-à-faux (33), ledit élément en porte-à-faux s'étendant dans une direction essentiellement perpendiculaire à la première direction de réglage et étant relié au rouleau d'alimentation à proximité d'une extrémité de l'élément en porte-à-faux, dans lequel ledit premier élément de réglage est relié au support de rouleau d'alimentation à une extrémité et relié à l'élément en porte-à-faux à une autre extrémité dudit premier élément de réglage dans la première direction de réglage.

10. Assemblage de transport de substrat d'impression selon la revendication 1, dans lequel le support in-

terne représente ledit support de rouleau d'alimentation et le support externe représente ledit support de platine.

11. Assemblage de transport de substrat d'impression selon la revendication 1, dans lequel ladite structure de suspension du support interne est disposée en partie au sein du volume clos défini par le support externe.

12. Assemblage de transport de substrat d'impression selon la revendication 1, dans lequel la surface d'impression comprend plusieurs trous d'aspiration (72) et dans lequel l'assemblage de transport de substrat d'impression comprend en outre une source de pression d'air (70), dans lequel ladite source de pression d'air est montée sur ledit support interne et ladite source de pression d'air est couplée de manière opérationnelle auxdits plusieurs trous d'aspiration pour fournir une pression d'air au substrat d'impression.

13. Système d'impression comprenant l'assemblage de transport de substrat d'impression selon l'une quelconque des revendications précédentes, comprenant en outre une tête d'impression (4a - 4d), dans lequel ladite surface d'impression comprend une zone d'impression (14) et dans lequel la tête d'impression est conçue pour, dans une opération d'impression, appliquer une image sur le substrat d'impression dans la zone d'impression.

14. Système d'impression selon la revendication 13, dans lequel la tête d'impression comprend une surface de plaque de buse (9), et dans lequel la position de la surface d'impression est réglée dans la seconde direction de réglage en se basant sur une distance désirée entre la surface d'impression et la surface de plaque de buse dans la seconde direction de réglage.

15. Système d'impression selon la revendication 13, dans lequel le système d'impression comprend en outre un rail de guidage (6 ; 7) et un chariot (5), dans lequel le rail de guidage s'étend dans une direction de balayage de chariot (X), dans lequel la tête d'impression est montée sur le chariot, dans lequel le chariot est guidé dans la direction de balayage de chariot par-dessus la surface d'impression au moyen du rail de guidage, la direction de balayage du chariot étant essentiellement perpendiculaire à la direction de transport (T).

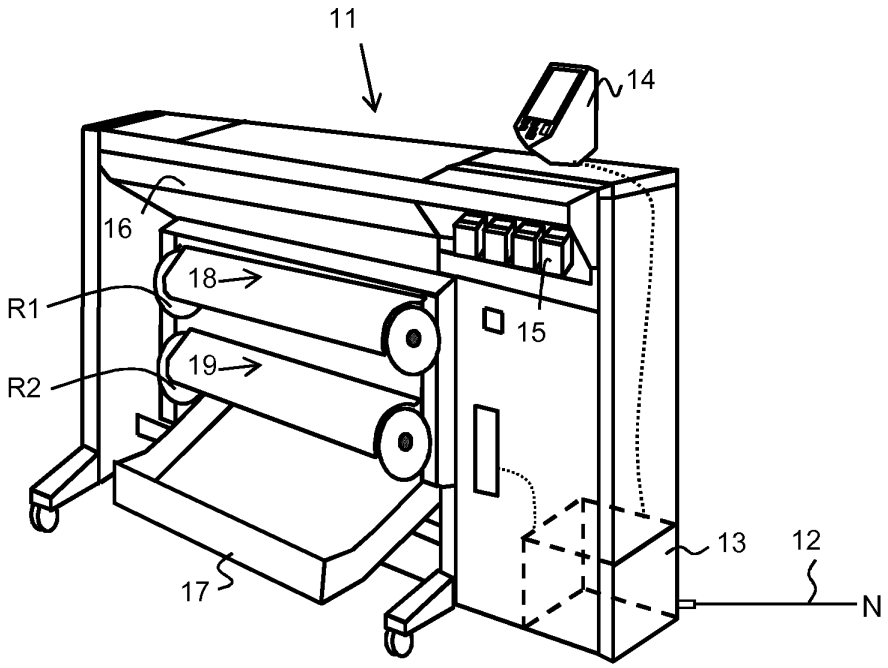

11
14
16
18
R1
19
R2
15
13
12
N
17

Fig. 1A

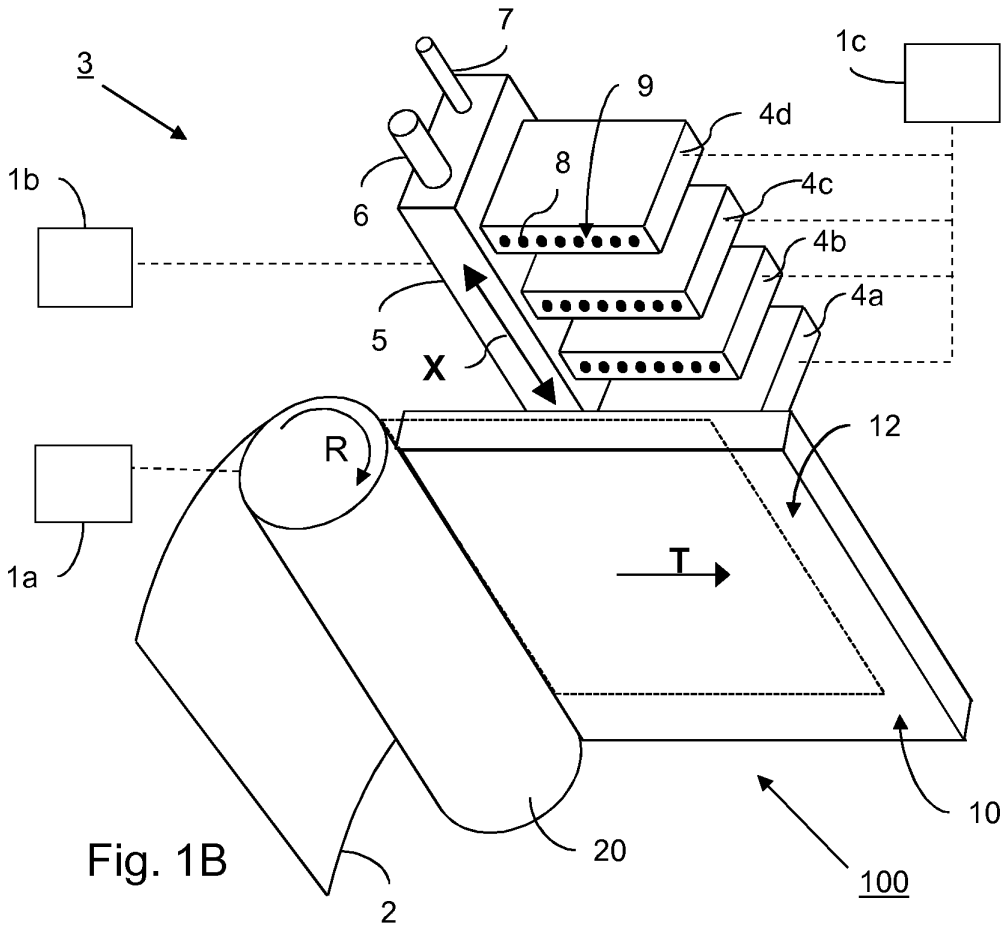

3
7
1c
9
4d
1b
8
4c
6
4b
4a
5
X
12
R
1a
T
10
20
100
2

Fig. 1B

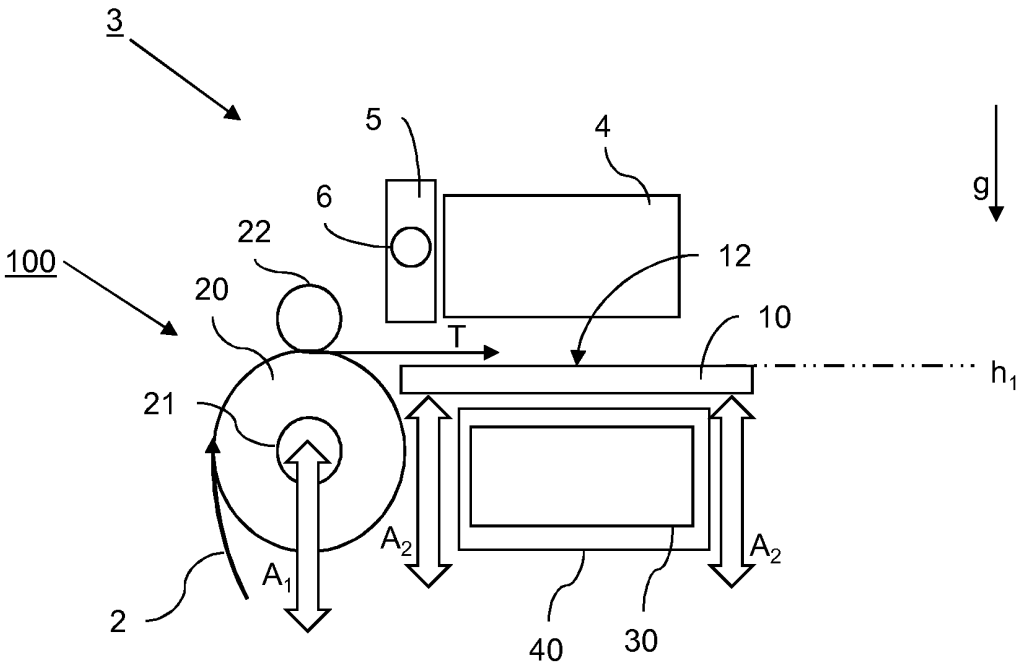

3
5
4
6
g
22
12
100
20
10
T
h1
21
A2
A2
A1
2
40
30

Fig. 2A

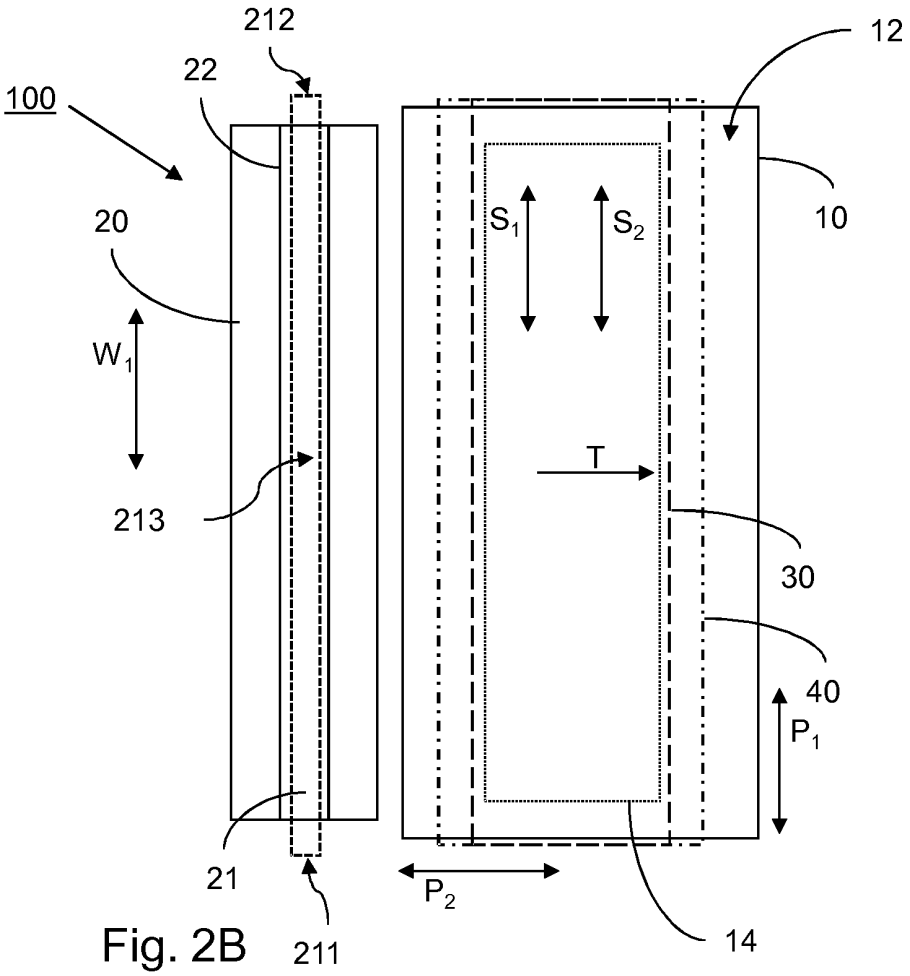

212
12
22
100
10
S1
S2
20
W1
T
213
30
40
P1
21
P2
211
14

Fig. 2B

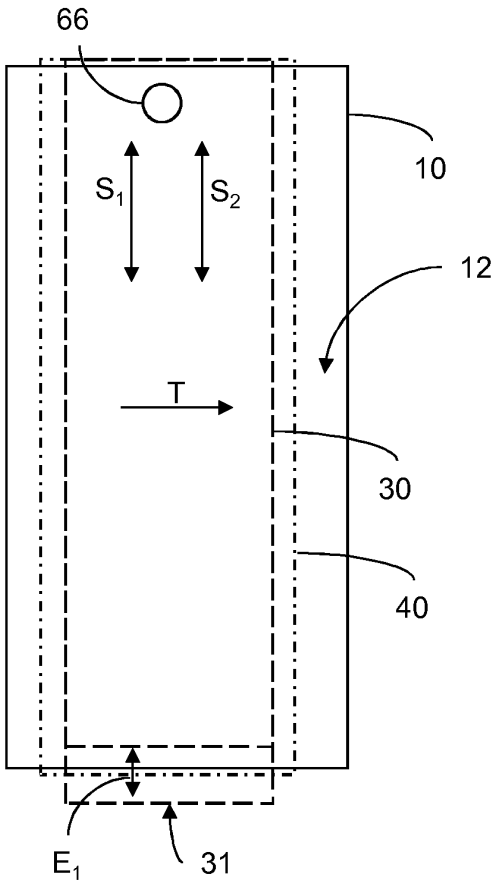


Fig. 3A

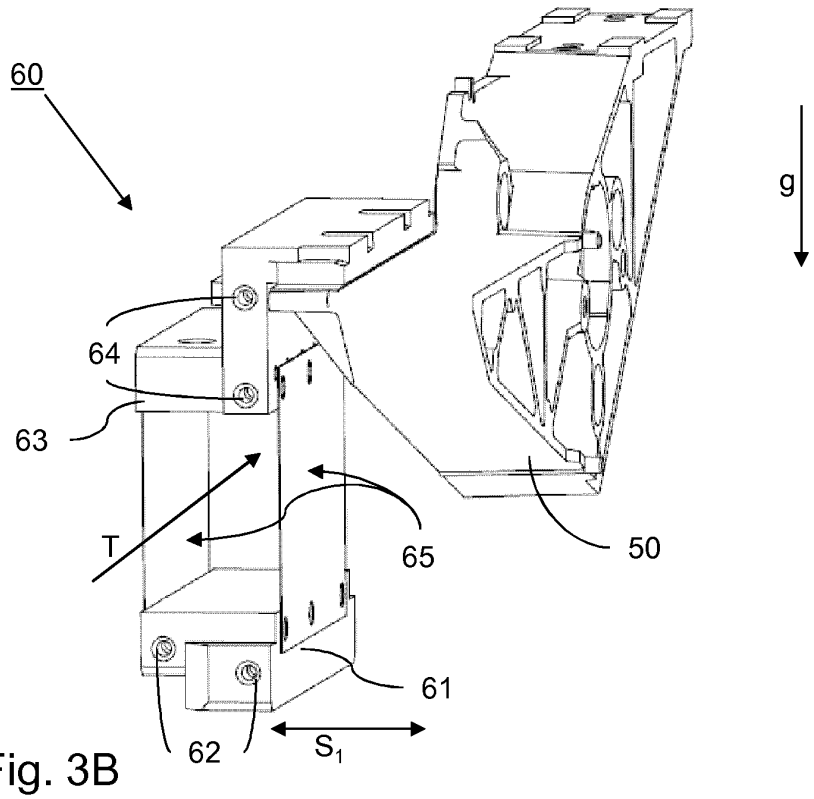


Fig. 3B

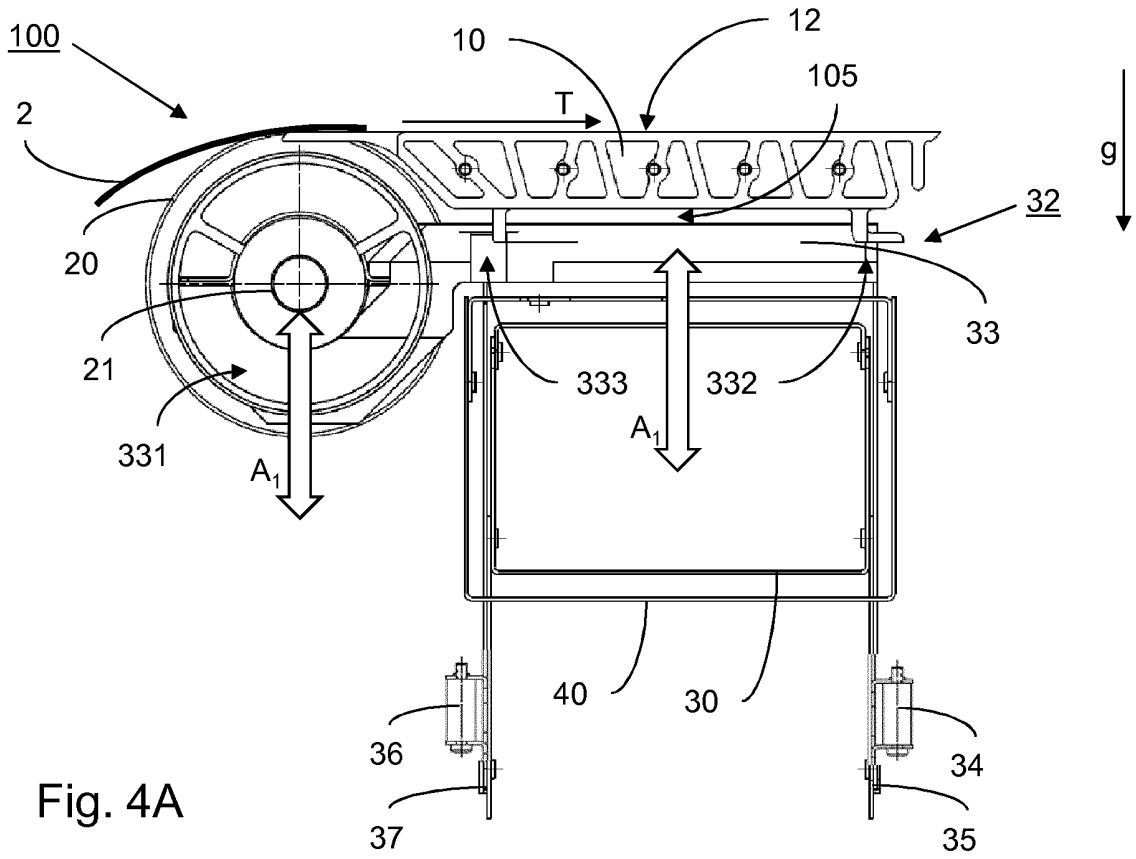

100
10
12
105
T
2
g
32
20
33
21
333
332
331
A1
A1
40
30
36
34
37
35

Fig. 4A

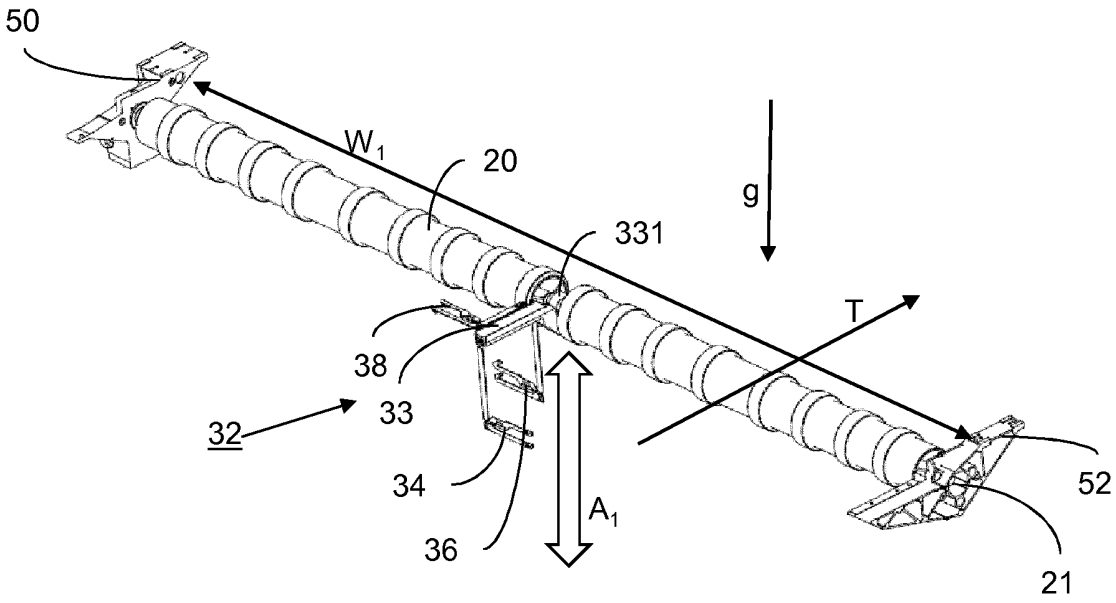

50
W1
20
g
331
T
38
33
32
34
A1
36
52
21

Fig. 4B

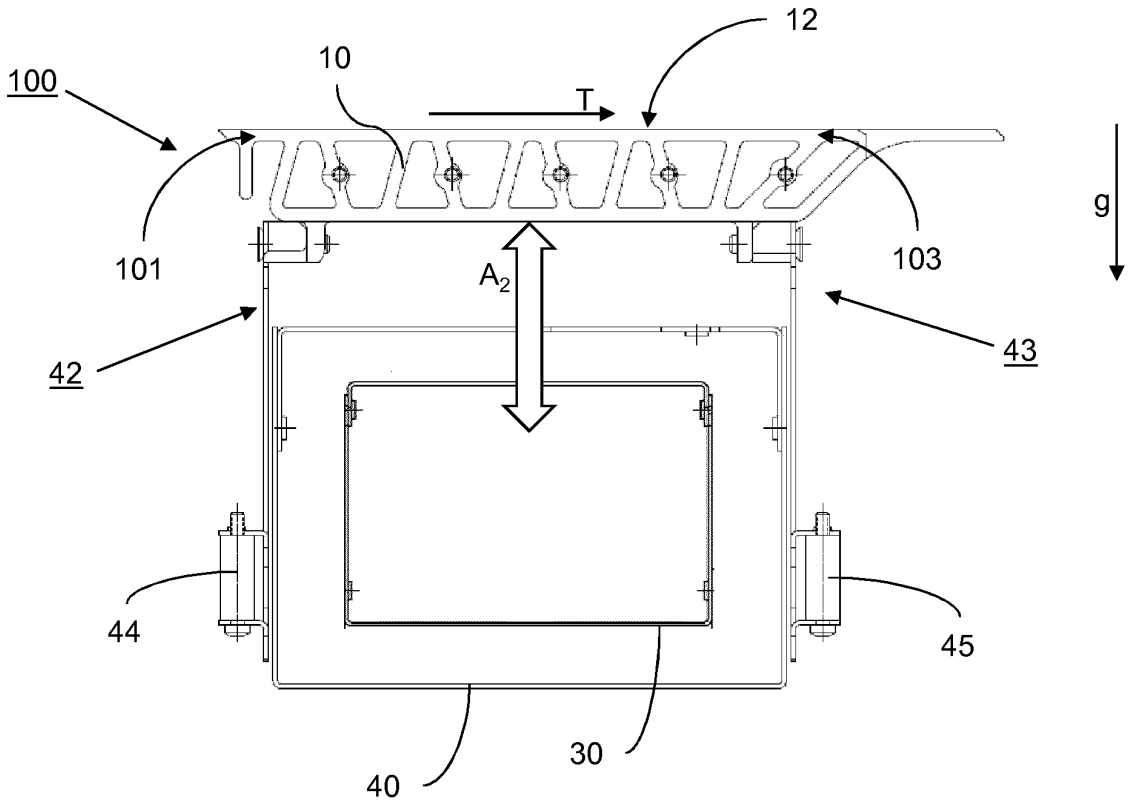

12
10
100
T
101
103
g
A2
42
43
44
45
40
30

Fig. 5A

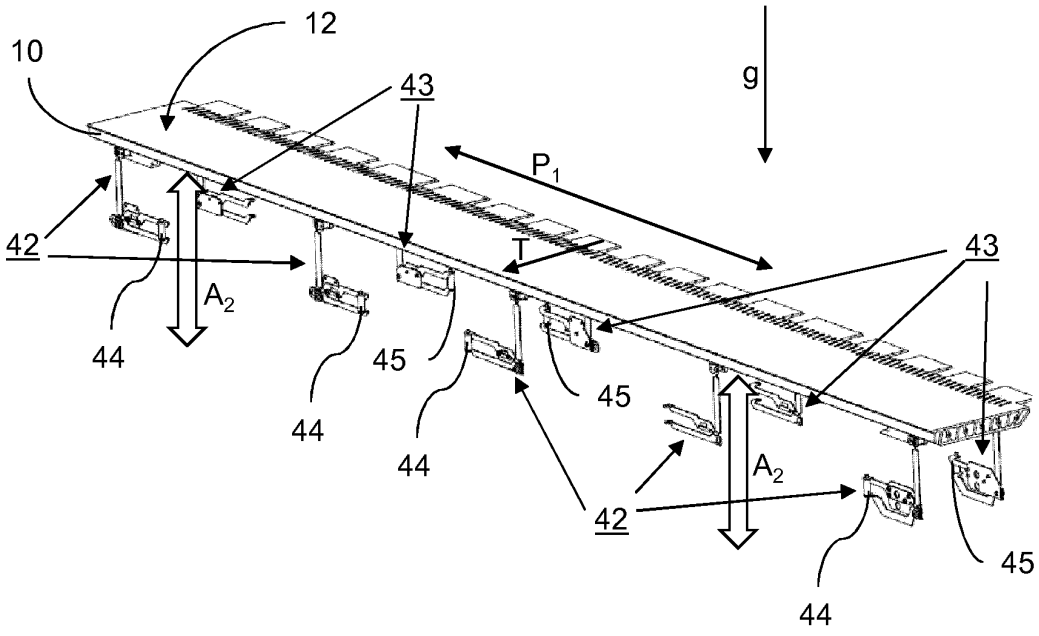

12
10
43
g
P1
42
T
43
A2
44
45
45
44
44
A2
42
45
44

Fig. 5B

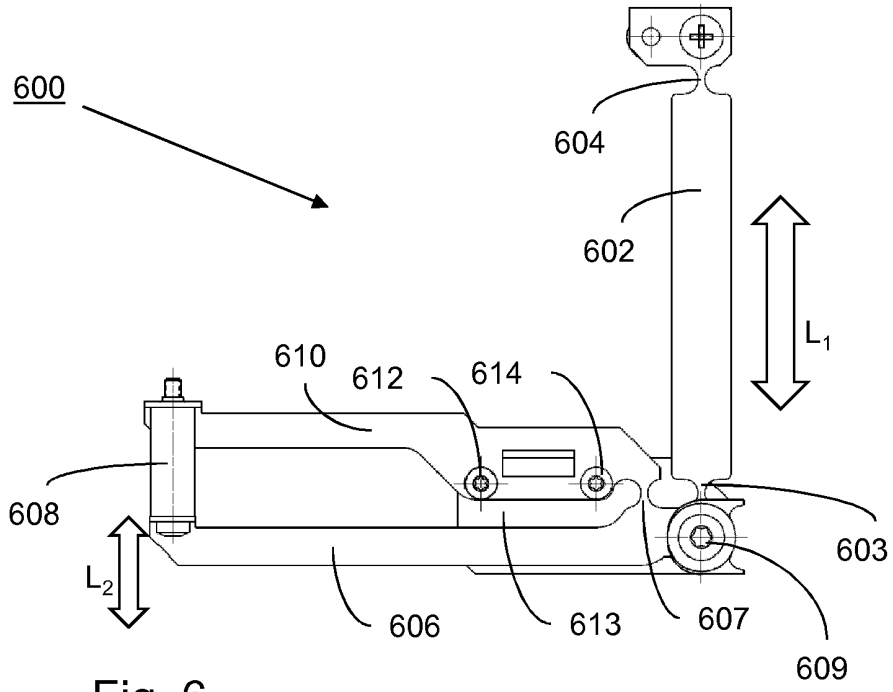

600
604
602
L1
610
612
614
608
603
L2
606
613
607
609

Fig. 6

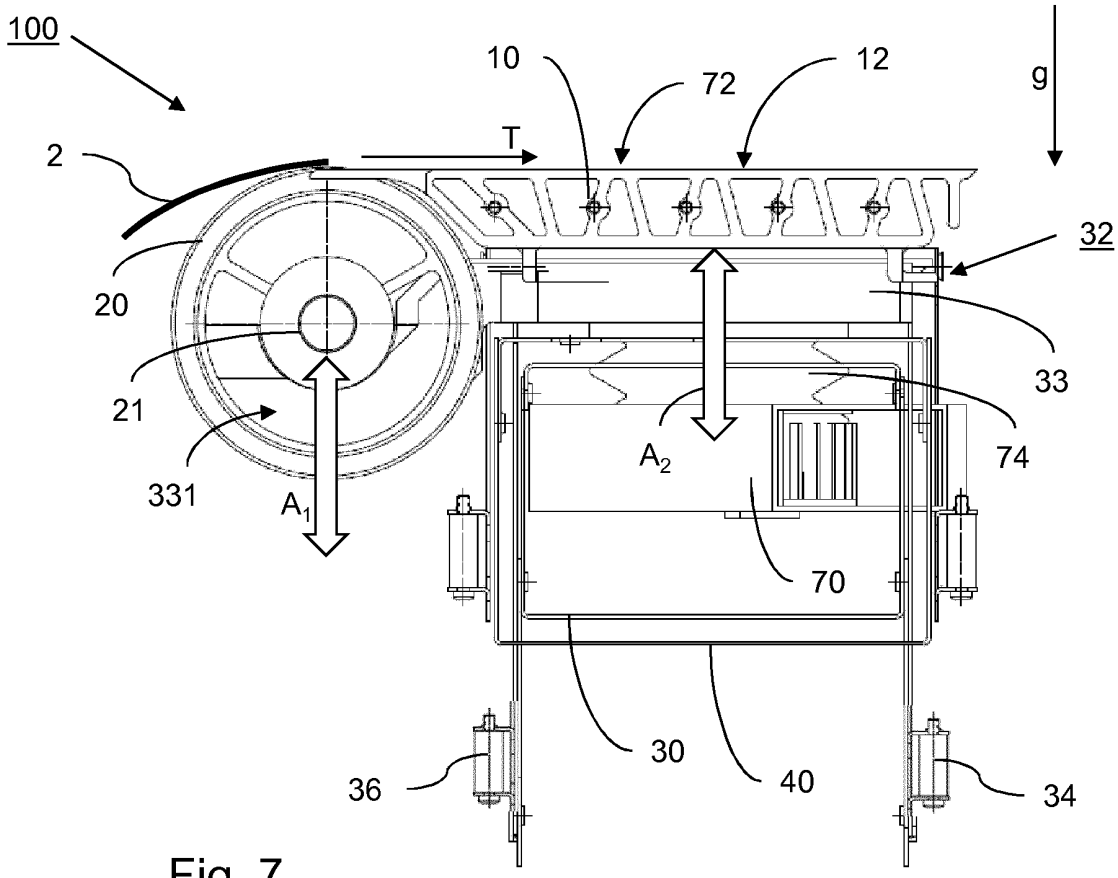

100
10
72
12
g
T
2
32
20
33
21
A2
74
331
A1
70
30
40
36
34

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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