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(54) **HEIGHT CONTROL SYSTEM FOR PRINTING SUBSTRATES FOR DIGITAL PRINTING MACHINES**

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Description

Technical field

[0001] The present invention is related to the digital printing industry, and more specifically the industry dedicated to manufacturing digital printing machines for printing on printing substrates that are supplied substantially flat.

State of the art

[0002] Currently, printing on printing substrates by means of digital printing machines in order to provide them with a desired finish or outer appearance is widely known. These printing substrates are difficult to print when, for example, they are boards formed by two flat outer layers and at least one wavy intermediate layer.

[0003] Said printing substrates are subjected to stresses from the moment they are obtained due to the described configuration. These stresses develop into deformations of the substrates, being arranged according to a concave or convex arrangement on a support table or surface for the printing thereof.

[0004] These deformations increase when a prior primer coat is applied to the printing substrates in order for a suitable ink droplet acceptance when the printing is carried out. These ink droplets are applied by means of inkjet technology on the primer coat such that a desired dimension of each of the ink droplets on the printing substrate is obtained.

[0005] Currently, in order to maintain the printing substrates according to a flat arrangement on the support tables for a suitable application or injection of ink droplets, that is, a suitable printing of said substrates, applying aspiration in order to create suction on the printing substrates resulting in a vacuum effect is well known. However, the effectiveness of this solution is severely limited by the geometries of the substrates and the degree of deformation that they can reach as a result of the configuration thereof and/or the application of the aforementioned primer coat

[0006] The document US 8 840 212 B2 discloses a printing system that comprises a printing module configured to eject ink drops from one or multiple print heads onto a substrate when loaded onto a substrate support. In one example the printing module is configured to remain stationary whilst the substrate support moves in the direction of a printing axis.

[0007] In one example, each section of the substrate support comprises an array of orifices. The orifices of each section can selectively be connected to a vacuum source.

[0008] In light of the described disadvantages of the currently existing solutions, it is clear that a solution is needed that enables the correct arrangement of the substrates for the printing thereof according to a flat arrangement.

Object of the invention

[0009] In order to fulfil this aim and resolve the aforementioned technical problems to date, in addition to providing additional advantages that can be derived later, the present invention provides a height control system for printing substrates for digital printing machines with heads defining a printing area in order to ensure a correct arrangement of the printing substrates while they are the object of ink droplet printing or injection.

[0010] The height control system of printing substrates comprises a support table for moving the printing substrates to the printing area; an aspiration assembly for exerting aspiration through the support table such that the printing substrates can be retained by suction against the support table when they are moved.

[0011] The control system of the invention additionally comprises a pressure assembly that has runners distributed transversely on the support table and arranged to limit the height of the printing substrates with respect to the support table according to an actuation height of the aspiration assembly. As such, deformations of the printing substrates are dealt with such that the surface of the printing substrates that can be subjected to the aspiration of the aspiration assembly is optimised.

[0012] The runners comprise a base to come into contact with the printing substrates moved by the support table and a body for fastening to the digital printing machine, the bases being connected to the bodies by means of plates such that the bases are movable with respect to the bodies. As such, the guiding of the printing substrates towards the support table is smoothed by contact by the bases.

[0013] The runners comprise protruding shafts that are joined at one end to the bodies and through the bases, and the pressure assembly comprises first elastic springs that partially encase the protruding shafts between the bodies and the bases. The protruding shafts are configured to be linearly movable such that the bases are movable, the separation distance between the bases and the support table being varied. In turn, the separation distance between the bodies and the support table is maintained. In this way, the pressure to be exerted by the runners on the printing substrates is adjustable, only the bases being positioned according to different thicknesses or widths of the printing substrates.

[0014] There are at least two side runners and one central runner, the side runners being movable such that they can be moved closer or further away with respect to the central runner. In this way, the side runners can be positioned according to the dimensions of each of the substrates, that is, the width thereof depending on the direction and sense of the movement of the support table.

[0015] The height control system for printing substrates comprises a barrier assembly that has panels arranged to tilt and defining a passage height of the printing substrates to the printing area. This height is defined according to a measurement that enables an optimal print-

ing finish to be obtained.

[0016] The barrier assembly comprises at least one proximity sensor arranged to generate a signal in accordance with detections carried out depending on tilting measurements of the panels. This enables the operation of the digital printing machine to be adjusted and even stopped. This prevents damage in the digital printing machine, in addition to printing of an undesired quality.

[0017] The bases and panels are arranged together such that when the bases are swung, the panels can tilt through contact. As such, the proximity sensors detect movements both of the panels and the bases.

[0018] The height control system for printing substrates comprises height adjustment means that include a third motor and two threaded spindles, the two threaded spindles being actuated by the third motor and each of the threaded spindles being joined at one end to a sheet arranged corresponding to a side of the support table.

[0019] The pressure assembly is joined to the two sheets, such that a gap between the runners and the support table is adjusted by the two sheets being moved by the threaded spindle. In this way, the gap can be selected depending on the thickness of the printing substrates.

[0020] The barrier assembly is joined to the two sheets, such that a space between the panels and the support table is adjusted by the two sheets being moved by the threaded spindle. In this way, the space can be selected depending on the thickness of the printing substrates.

[0021] The height control system for printing substrates comprises a covering assembly comprising bands that are implemented or extended according to the longitudinal direction of the support table and arranged to limit the height of the printing substrates located on the support table corresponding to the printing area. Therefore, the bands are located between the support table and the heads of the digital printing machines. In this way, the printing substrates are prevented from coming into contact with the heads of the digital printing machine in such a way that they result in being damaged.

[0022] There are two side bands and at least one central band, the two side bands being movable such that they can be moved closer together or further from each other. Additionally, there can be two central bands, which are configured to be movable such that they can be moved closer together or further from each other. In this way, flexibility when protecting the heads is provided.

Description of the drawings

[0023]

Figure 1 shows a schematic cross-sectional view of a support table comprised in a height control system for printing substrates object of the present invention.
Figure 2 is a perspective schematic cross-sectional view of a support table, which also shows a pressure assembly and a barrier assembly, comprised in a height control system for printing substrates object of the present invention.
Figure 3 shows a perspective view of the pressure assembly comprised in the height control system for printing substrates object of the present invention.
Figure 4 shows a detailed view indicated with the reference "D" in figure 3.
Figure 5 shows a perspective schematic cross-sectional view of the printing assembly of the height control system for printing substrates object of the present invention.
Figure 6 shows a perspective schematic cross-sectional view of the barrier assembly of the height control system for printing substrates object of the present invention.
Figure 7 shows a plan schematic cross-sectional view of the barrier assembly of the height control system for printing substrates object of the present invention.
Figure 8 shows a perspective view of the covering assembly comprised in the height control system for printing substrates object of the present invention.

Detailed description of the invention

[0024] The invention relates to a height control system for printing substrates for digital printing machines with heads defining a printing area. The height control system for printing substrates ensures the correct arrangement of the substrates for the printing thereof according to a flat arrangement. A digital printing machine is subsequently derivable comprising the height control system for printing substrates.

[0025] The height control system for printing substrates comprises a support table (1) and an aspiration assembly. The support table (1) has conduits (1.1) that connect an inner face to an outer face of the support table (1), that is, they connect an inner volumetric space to an outer portion. Figures 1 and 2 do not show the conduits (1.1) on the outer resting face of the printing substrates for the purposes of clarity. The height control system for printing substrates has an actuation device (1.2) to actuate the support table (1) such that the printing substrates are movable thereon (1) towards the printing area.

[0026] The aspiration assembly comprises fixed side walls (2) and a lower wall (3) to define, along with the support table (1), the inner volumetric space. The aspiration assembly additionally comprises ducts (4) for communicating the inner volumetric space to the outer portion through the inner wall (3) and laterally movable inner panels (5). The inner panels (5) are parallel to the fixed side walls (2) and are implemented according to the longitudinal extension of the feeder table. In order to laterally move the inner panels (5) in the inner volumetric space, the aspiration assembly comprises first motors (6), an actuator shaft (7.1) and drive shafts (7.2).

[0027] The first motors (6) actuate the actuator shaft (7.1) for the rotation thereof, which takes place at an outer

side of one of the fixed side walls (2). The actuator shaft (7.1) is connected to the drive shafts (7.2) such that the rotation of the actuator shaft (7.1) is transmitted to the drive shafts (7.2). The drive shafts (7.2) are distributed according to the longitudinal extension of the drive shaft (7.1) and arranged through the fixed side walls (2) and the inner panels (5). In accordance with this arrangement, according to a rotation direction of the drive shafts (7.2), the inner panels (5) move closer together, and according to another rotation direction of the drive shafts (7.2), the inner panels (5) move further from each other.

[0028] As is derived from figures 1 and 2, the inner panels (5) are laterally movable, the communication ducts (4) in the connection or access thereof to the volumetric space being located therebetween. In this way, the surface of the support table (1), through which the suction takes place, is adaptable in a lateral measurement or width to the dimensions of the printing substrates. In this way, aspiration generated by the aspiration assembly, for which it also comprises an aspiration pump which is not shown in the figures, results in a vacuum effect that tends to establish contact between the printing substrates and the support table (1). As such, the aspiration or suction carried out on each of the printing substrates is adjustable and adaptable in a particular way, which significantly improves the efficiency of the aspiration assembly.

[0029] The height control system for printing substrates comprises a pressure assembly. The pressure assembly comprises a bridge beam (8) that runs the width of the support table (1) and two sheets (9), each end of the bridge beam (8) being arranged fixed to one of the two sheets (9).

[0030] The pressure assembly additionally comprises runners (10, 11), these being side runners (10) that are laterally movable and at least one central runner (11) that is fixed or not laterally movable, in addition to rotary shafts (12), guides (13) and a central support (14). Preferably, there are two central runners (11) arranged together such that it is possible for the pressure assembly to actuate on the printing substrates supplied two by two in parallel at the same time

[0031] The guides (13) are located on the bridge beam (8) and define the side path due to being followed by the side runners (10) in the movements thereof due to being arranged fitted in said guides (13). Likewise, the rotary shafts (12) extend from the sheets (9) to the central support (14) joined to the bridge beam (8). The rotary shafts (12) can be actuated for the rotation thereof by means of a second motor (15) such that the side runners (10), which the rotatory shafts (12) pass through, are moved as a result of the rotation of said shafts (12) such that they move closer together or further from each other. The central support (14) additionally serves as a joining element of the central runners (11) to the bridge beam (8).

[0032] The side runners (10) and the central runners (11) comprise a base (16) to come into contact with the printing substrates as they pass under them and a body (17), through which the rotary shafts (12) pass. The side runners (10) are also fitted into the guides (13) by means of the parts corresponding to the bodies (17). The bases (16) are connected to the bodies (17), hanging from the same by means of plates (18) such that the bases (16) can move in accordance with a swinging movement while the bodies (17) are maintained immobile due to the rotary shafts (12) passing through the same and being fitted in the guides (13).

[0033] The bases (16) include a convex point (16') in order to minimise an energy to be transmitted to the bases (16) by impact or contact of the printing substrates during the movement thereof towards the printing area. Parts of the printing substrates that are raised due to deformations with respect to the support table (1), are guided by means of contact with the convex points (16') and maintained by pressure closer to the support table (1) by means of the rest of the longitudinal extension of the bases (16). The bases (16) are arranged with respect to the support table (1) according to a separation, such that the aspiration assembly can act on the printing substrates to exert a suction on the same.

[0034] The adjustment that can be made in the positioning of the side runners (16) according to the width of the support table (1) enables a side sealing of the printing substrates on the end side parts thereof to be established according to the movement thereof on the support table (1) towards the printing area. This sealing of the printing substrates on the parts closest to the fixed side walls (2), along with the pressure exerted on the printing substrates by means of the central runners (11), optimises the suction that can be carried out on the printing substrates by means of the aspiration assembly upon ensuring the maximum surface of the printing substrates to receive the corresponding suction or aspiration.

[0035] The side runners (10) and central runners (11) additionally comprise a protruding shaft (19) joined to the corresponding body (17) at one end and passing through the bases (16). A free end of the protruding shafts (19), opposite the join to the bodies (17), is located on the convex points (16') such that the convex points (16') are between said free ends and the support table (1).

[0036] The protruding shafts (19) are movable with respect to the bodies (17) and the bases (16), the movement being adjusted by a first elastic spring (20). The protruding shafts (19) are configured to be rotated such that an adjustment or variation in a compressive strength is established, which have the first elastic springs (20), as they are moved linearly as a result of being rotated. That is, the rotation of the protruding shafts (19) adjusts the compression of the first elastic spring (20).

[0037] Likewise, the rotation of the protruding shafts (19) through the free ends adjusts the position of the bases (16) with respect to the bodies (17). That is, due to the protruding shafts (19) being rotated, the bases (16) are moved according to the swinging movement resulting from the join thereof to the bodies (17) by means of plates (18). This entails adjusting the separation distance be-

tween the bases (16) and the support table (1), the separation distance between the bodies (17) and the support table (1) being maintained. In this way, the pressure to be exerted by the runners (10, 11) on the printing substrates is adjustable. The adjustment is adaptable to different thicknesses and widths of the printing substrates.

[0038] The height control system for printing substrates comprises a barrier assembly. The barrier assembly, similarly to the pressure assembly, extends from one of the sheets (9) to the other sheet (9). That is, the sheets (9) serve as side fastening limits of both assemblies in accordance with the direction and sense of longitudinal travel of the printing substrates on the support table (1) towards the printing area.

[0039] The height control system for printing substrates comprises height adjustment means. The height adjustment means move the sheets (9) in a direction perpendicular to the support table (1), and with respect to the same (1), and also the barrier assembly and the pressure assembly with the sheets (9). The height adjustment means comprise a third motor (21) and threaded spindles (22), each of the threaded spindles (22) being joined to one of the sheets (9). In this way, a control of the height of the printing substrates can be established, this control being adaptable, for example, to different thicknesses of the printing substrates.

[0040] The barrier assembly comprises a board (23) and braces (24), the braces (24) being located between the board (23) and the bridge beam (8). Said braces (24) are distributed along the longitudinal extension of the bridge beam (8) and act as separation elements between the board (23) and the bridge beam (8), being in contact with both the board (23) and the bridge beam (8). The braces (24) are fastened on one face to the bridge beam (8) and on the other face to the board (23). The barrier assembly additionally comprises a support beam (25) and joining arms (26) of the support beam (25) to the board (23). In this way, a rigid join is established between the pressure assembly and the barrier assembly along the extension of both in order to prevent unwanted bending therein between the sheets (9).

[0041] Likewise, the barrier assembly additionally comprises panels (27), connections (28), bars (29) and connectors (30). The connections (28) connect the panels (27) to the bars (29), enabling an angular rotation of the panels (27) to take place with respect to the bars (29). The bars (29) are in turn joined to the board (23) by means of the connectors (30).

[0042] The barrier assembly comprises proximity sensors (31) fastened to the support beam (25), while the panels (27) include a first extension (27.1). In this way, the proximity sensor (31) and the first extension (27.1) are arranged together such that the proximity sensor (31) detects variations in a separation measurement between one sensor end (31.1) thereof and the first extension (27.1) of the corresponding panel (27). In accordance to this, the proximity sensor (31) has the sensor end (31.1) facing the first extension (27.1) and a connection end (31.2) for transmitting the information or signal generated depending on the detections carried out in relation to the separation measurements.

[0043] In a resting state, figures 6 and 7, that is without external forces applied on the barrier assembly, the panels (27) hang from the bars (29), the first extension (27.1) being close to the sensor end (31.1). In this way, an inactivity position is established for the proximity sensor (31), that is, it does not generate any warning signal.

[0044] When the printing substrates pass under the pressure assembly and strike against one or several of the panels (27), these rotate or swing. This rotation of the panels (27) entails a distancing or increase in the separation measurement between the corresponding sensor end (31.1) and the first extension (27.1). As the separation measurement between the sensor ends (31.1) and the first extensions (27.1) increases, the corresponding proximity sensors (31) generate and transmit a warning signal to adjust and even stop the operation of the digital printing machine.

[0045] In this way, printing on printing substrates that are arranged undesirably for the correct printing thereof can be prevented, that is, substrates that are occasionally excessively distanced with respect to the support table (1) due to deformations that entail an arrangement that is not completely flat of the corresponding printing substrate.

[0046] The barrier assembly comprises retrieval means (32), while the panels (27) include a second extension (27.2). The retrieval means (32) include a joining body (32.1) joined to the support beam (25) and a second elastic spring (32.2), which is arranged joined at an end to the joining body (32.1) and at another end to the second extension (27.2). In this way, means for returning the panels (27) according to the resting state thereof after being rotated or swung are provided.

[0047] The joining body (32.1) includes a slot (32.1.1) to be joined to the support beam (25) by means of spigots (32.1.2) arranged in said support beam (25). The joining body (32.1) is movable in order to be positioned according to different points of the spigots (32.1.2) in the slot (32.1.1). To adjust this movement of the spigots (32.1.2) through the slot (32.1.1) and establish a position of the joining body (32.1) in the support beam (25), the barrier assembly includes a threaded element (33) that joins the joining body (32.1) and the corresponding panel (27), and more specifically, said joining body (32.1) to a third extension (27.3) of the corresponding panel (27). The threaded element (33) is inserted through the joining body (32.1) and the third extension (27.3) such that when rotated, an existing separation between said joining body (32.1) and said third extension (27.3) is adjusted. This in turn results in an adjustment of the arrangement of the second elastic spring (32.2) according to different longitudinal extensions, which entails an adjustment in the actuation of the retrieval means (32).

[0048] The barrier assembly comprises stop means (34), while the panels (27) include a fourth extension

(27.4). In this way, means for limiting the movement of the panels (27) when they return to their position according to the resting state thereof are provided. As such, damages to the proximity sensor (31), for example, as a result of the first extension (27.1) impacting the sensor end (31.1) are prevented.

[0049] The stop means (34) include a threaded shaft (34.1) such that depending on a level of threading of the threaded shaft (34.1), a stop means is determined for the position of the panels (27) when they return to their position according to the resting state thereof. Preferably, the threaded shaft (34.1) is arranged in the support beam (25) and butts against or comes into contact with the fourth extension (27.4), which optionally includes a contact element (34.2) to come into contact with the threaded shaft (33.1).

[0050] The runners (10, 11) and the panels (27) are arranged such that when the bases (16) swing a certain degree, that is, movement with respect to the bodies (17), the corresponding panels (27) are moved by contact with said bases (16) such that they rotate angularly with respect to the bars (29) from which they hang. In this way, strikes received by the runners (10, 11) can equally be detected by the proximity sensors (31). As such, the elements necessary for detecting the printing substrates with deformations that prevent an adequate printing on the same are reduced.

[0051] Preferably, the barrier assembly comprises several panels (27), as well as one of the bars (29), one of the proximity sensors (31), etc. for each of the panels (27).

[0052] The height control system for printing substrates comprises a covering assembly, which can be seen in figure 8. The covering assembly comprises bands (35, 36), side bands (35) and at least one central band (36), configured in the form of flat and elongated strips. Preferably, there are two central bands (36) such that a better control is made possible when supplying printing substrates two by two in parallel at the same time. The bands (35, 36) are implemented through the printing area such that the printing substrates move parallel to the longitudinal extension thereof (35, 36). In other words, the bands (35, 36) extend from an entry point to the printing area of the printing substrates to an exit point of the printing area. In addition, the bands (35, 36) are arranged such that they prevent interference with the heads of the digital printing machine.

[0053] Likewise, the bands (35, 36) are between the heads and the support table (1), leaving a space with respect to the support table (1) for the movement of the printing substrates. Therefore, the bands (35, 36) are arranged in order to prevent the printing substrates from coming into contact with the heads. As such, they limit the height of the printing substrates along the printing area, and both damage to the heads and unwanted ink stains on the printing substrates are prevented. To this end it is taken into account that the separation between the heads and the printing substrates is between 1 and 4 millimetres.

[0054] A first longitudinal end of the side bands (35) is joined to first side columns (37.1) and a second longitudinal end of the side bands (35) is joined to second side columns (37.2). Likewise, a first longitudinal end of the central bands (36) is joined to first central columns (38.1) and a second longitudinal end of the central bands (36) is joined to second central columns (38.2).

[0055] The covering assembly comprises towers (39.1, 39.2), first towers (39.1) and second towers (39.2), with pulleys (not shown in the figures). There are two first towers (39.1), as is the case for the second tower (39.2). The covering assembly comprises straps (40) connecting on the one hand the pulleys of one of the first towers (39.1) to the other first tower (39.1), and on the other hand, the pulleys of one of the second towers (39.2) to the other second tower (39.2).

[0056] The covering assembly additionally comprises fourth motors (41) arranged such that they can actuate the rotation of the pulleys of one of the first towers (39.1) and one of the second towers (39.2), for which reason the covering assembly also includes actuating connections (42). The printing substrates access the printing area by passing between the first towers (39.1) and leave the printing area by passing between the second towers (39.2).

[0057] The covering assembly additionally comprises rails (43) fastened to the digital printing machine. In this way, the first side columns (37.1), the second side columns (37.2), the first central columns (38.1) and the second central columns (38.2) have parts at the vertical, upper and lower ends thereof that engage with the rails (43) in order to move through said rails (43).

[0058] There are two pulleys included in each of the towers (39.1, 39.2), there being four towers (39.1, 39.2). The towers (39.1, 39.2) are mechanically connected in pairs to each other, that is two and two, by means of the straps (40) fitted in the pulleys. Specifically, the first towers (39.1) to each other and the second towers (39.2) to each other. In this way, the fourth motors (41), by actuating the pulleys of one of the first towers (39.1) and one of the second towers (39.2), make the pulleys of all the towers (39.1, 39.2) rotate.

[0059] Each of the columns (37.1, 37.2) has a clip (44) to be fastened to one of the straps (40) such that it moves due to the movement transmitted by the strap (40). The clips (44) are distributed, as can be seen in figure 8, such that when one of the straps (40) that joins the first towers (39.1) to each other rotates, the first side columns (37.1) move closer to or further from each other depending on the rotation direction of the strap (40). In a synchronised manner, the corresponding strap (40) joining the second side columns (37.2) rotates in order to move said second side columns (37.2) according to the first side columns (37.1), that is, the second side columns (37.2) facing the first side columns (37.1) or that which is the same, the bands (35) remaining parallel to each other.

[0060] Likewise, the distribution of the clips (44) entails

that when another of the straps (40) that joins the first towers (39.1) together rotates, the two first central columns (38.1) move closer to or further from each other depending on the rotation direction of the strap (40). In a synchronised manner, the corresponding strap (40) joining the second central columns (38.2) rotates in order to move said second central columns (38.2) according to the first central columns (38.1), that is, the second central columns (38.2) facing the first central columns (38.1) or that which is the same, the central bands (36) remaining parallel to each other.

[0061] The first side columns (37.1) and the first central columns (38.1) have a contact strip (45) fastened corresponding to the lower vertical end thereof, that is, that which is closest to the support table (1). The contact strips (45) have a curved or angled shape such that a free end thereof (45) is directed or pointing towards the printing area. In this way, when there are deformations of the printing substrate, the contract strips (45) guide the corresponding parts of the printing substrates towards the support table (1) to reduce the possible strike with the bands (35, 36). The bands (35, 36) limit the height of the printing substrates along the printing area. The second side columns (37.2) and the second central columns (38.2) preferably also have contract strips (45) to smooth the exit of the printing substrates with parts forced by the bands (35, 36) to remain separated from the heads.

[0062] The covering assembly additionally comprises position sensors (46) to detect the position of the first side columns (37.1), the second side columns (37.2), the first central columns (38.1) and the second central columns (38.2). Each of these columns (37.1, 37.2, 38.1, 38.2) has one of the position sensors (46). In this way, it can be formed such that said columns (37.1, 37.2, 38.1, 38.2) are positioned according to desired positions, these positions being in accordance with areas free from ink injection by the heads.

[0063] Likewise, the covering assembly additionally comprises breakage sensors (46) in order to detect a change in the tension of the bands (35, 36) in the fastening thereof at the ends thereof to the corresponding columns (37.1, 37.2, 38.1, 38.2). The breakage sensors (46) include a third elastic spring to control the tension of the bands (35, 36). In this way, the breakage sensors (46) are arranged to detect breakages of the bands (35, 36), for example, by the printing substrates with deformations coming into contact with the same (35, 36).

[0064] In this way, the heads are protected when there are deformations determined for each of the printing substrates. As such, it enables the deformations of the printing substrates to be absorbed or counteracted or even the operation of the digital printing machine to be stopped according to the deformations in the printing substrates.

Claims

1. A height control system for printing substrates for digital printing machines with heads defining a printing area, comprising:

- a support table (1) to move the printing substrates to the printing area;
- an aspiration assembly for exerting aspiration through the support table (1) such that the printing substrates are retained by suction against the support table when they are moved;

characterised in that it additionally comprises:

- a pressure assembly that has runners (10, 11) distributed transversely on the support table (1) and arranged to limit the height of the printing substrates with respect to the support table (1) according to an actuation height of the aspiration assembly.

2. The height control system for printing substrates according to claim 1, **characterised in that** the runners (10, 11) comprise a base (16) in order to come into contact with the printing substrates moved by the support table (1) and a body (17) for fastening to the digital printing machine, the bases (16) being connected to the bodies (17) by means of plates (18) such that the bases (16) are movable with respect to the bodies (17).

3. The height control system for printing substrates according to claim 2, **characterised in that** the runners (10, 11) comprise protruding shafts (19) that are joined at one end to the bodies (17) and through the bases (16), and the pressure assembly comprises first elastic springs (20) that partially encase the protruding shafts (19) between the bodies (17) and the bases (16).

4. The height control system for printing substrates according to claim 3, **characterised in that** the protruding shafts (19) are configured to be linearly movable such that the bases (16) are movable, the separation distance between the bases (16) and the support table (1) being varied.

5. The height control system for printing substrates according to any one of the preceding claims, **characterised in that** the runners (10, 11) are at least two side runners (10) and one central runner (11), the side runners (10) being movable such that they can be moved closer or further away with respect to the central runner (10).

6. The height control system for printing substrates according to any one of the preceding claims, **characterised in that** it comprises a barrier assembly that has panels (27) arranged to swing and defining a passage height of the printing substrates to the print-

ing area.

7. The height control system for printing substrates according to claim 6, **characterised in that** the barrier assembly comprises at least one proximity sensor (31) arranged to generate a signal in accordance with detections carried out depending on tilting measurements of the panels (27).

8. The height control system for printing substrates according to claim 6 or 7, **characterised in that** the bases (16) and the panels (27) are arranged together such that when the bases (16) are swung, the panels (27) can tilt through contact.

9. The height control system for printing substrates according to any one of the preceding claims, **characterised in that** it comprises height adjustment means that include a third motor (21) and two threaded spindles (22), the two threaded spindles (22) being actuated by the third motor (21) and each of the threaded spindles (22) being joined at one end to a sheet (9) arranged corresponding to a side of the support table (1).

10. The height control system for printing substrates according to claim 9, **characterised in that** the pressure assembly is joined to the two sheets (9), such that, by the two sheets (9) being moved, a gap between the runners (10, 11) and the support table (1) is adjusted.

11. The height control system for printing substrates according to claim 6 and to claim 9 or 10, **characterised in that** the barrier assembly is joined to the two sheets (9), such that, by the two sheets (9) being moved, a space between the panels (27) and the support table (1) is adjusted.

12. The height control system for printing substrates according to any one of the preceding claims, **characterised in that** it comprises a covering assembly comprising bands (35, 36) that are implemented according to the longitudinal direction of the support table (1) and arranged to limit the height of the printing substrates located on the support table (1) corresponding to the printing area.

13. The height control system for printing substrates according to claim 12, **characterised in that** the bands (35, 36) are two side bands (35) and at least one central band (36), the two side bands (35) being movable such that they can be moved closer together or further from each other.

14. The height control system for printing substrates according to claim 13, **characterised in that** there are two central bands (36), which are configured to be movable such that they can be moved closer together or further from each other.

Patentansprüche

1. Höhensteuersystem für Drucksubstrate für Digitaldruckmaschinen mit Köpfen, die einen Druckbereich definieren, mit:

einem Trägertisch (1) zum Bewegen der Drucksubstrate zum Druckbereich;
einer Ansauganordnung zum Bereitstellen einer Ansaugkraft durch den Trägertisch (1), so dass die Drucksubstrate durch Ansaugen gegen den Trägertisch gehalten werden, wenn sie bewegt werden;
dadurch gekennzeichnet, dass
das System außerdem aufweist:
eine Druckanordnung mit Läufern (10, 11), die quer über den Trägertisch (1) verteilt und dafür eingerichtet sind, die Höhe der Drucksubstrate in Bezug auf den Trägertisch (1) gemäß einer Betätigungshöhe der Ansauganordnung zu begrenzen.

2. Höhensteuersystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die Läufer (10, 11) eine Basis (16) aufweisen, die dazu vorgesehen ist, mit den durch den Trägertisch (1) bewegten Drucksubstraten in Kontakt zu kommen, und einen Körper (17), der dazu vorgesehen ist, an der Digitaldruckmaschine befestigt zu werden, wobei die Basen (16) mittels Platten (18) mit den Körpern (17) derart verbunden sind, dass die Basen (16) in Bezug auf die Körper (17) beweglich sind.

3. Höhensteuersystem nach Anspruch 2, **dadurch gekennzeichnet, dass** die Läufer (10, 11) hervorstehende Wellen (19) aufweisen, die an einem Ende mit den Körpern (17) verbunden sind und sich durch die Basen (16) erstrecken, und wobei die Druckanordnung erste elastische Federn (20) aufweist, die die hervorstehenden Wellen (19) zwischen den Körpern (17) und den Basen (16) teilweise umschließen.

4. Höhensteuersystem nach Anspruch 3, **dadurch gekennzeichnet, dass** die hervorstehenden Wellen (19) derart konfiguriert sind, dass sie linear beweglich sind, so dass die Basen (16) beweglich sind, wodurch der Trennabstand zwischen den Basen (16) und dem Trägertisch (1) verändert wird.

5. Höhensteuersystem nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Läufer (10, 11) mindestens zwei Seitenläufer (10) und ein Mittenläufer (11) sind, wobei die Seitenläufer (10) derart beweglich sind, dass sie in Bezug auf den

Mittenläufer (10) näher oder weiter weg bewegt werden können.

6. Höhensteuersystem nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** es eine Barrierenanordnung aufweist, die Platten (27) aufweist, die dazu eingerichtet sind, eine Schwenkbewegung auszuführen und eine Durchgangshöhe der Drucksubstrate zum Druckbereich definieren.

7. Höhensteuersystem nach Anspruch 6, **dadurch gekennzeichnet, dass** die Barrierenanordnung mindestens einen Annäherungssensor (31) aufweist, der dazu eingerichtet ist, ein Signal gemäß Erfassungen zu erzeugen, die in Abhängigkeit von Neigungsmessungen der Platten (27) ausgeführt werden.

8. Höhensteuersystem nach Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** die Basen (16) und die Platten (27) zusammen derart angeordnet sind, dass die Platten (27), wenn die Basen (16) geschwenkt werden, sich durch Kontakt neigen können.

9. Höhensteuersystem nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** es eine Höheneinstelleinrichtung aufweist, die einen dritten Motor (21) und zwei Gewindespindeln (22) aufweist, wobei die zwei Gewindespindeln (22) durch den dritten Motor (21) betätigt werden, und wobei jede der Gewindespindeln (22) an einem Ende mit einer Platte (9) verbunden ist, die an einer jeweiligen Seite des Trägertisches (1) angeordnet ist.

10. Höhensteuersystem nach Anspruch 9, **dadurch gekennzeichnet, dass** die Druckanordnung mit den beiden Platten (9) verbunden ist, so dass durch Bewegen der beiden Platten (9) ein Spalt zwischen den Läufern (10, 11) und dem Trägertisch (1) eingestellt wird.

11. Höhensteuersystem nach Anspruch 6 und nach Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** die Barrierenanordnung mit den beiden Platten (9) verbunden ist, so dass durch Bewegen der beiden Platten (9) ein Raum zwischen den Platten (27) und dem Trägertisch (1) eingestellt wird.

12. Höhensteuersystem nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** es eine Abdeckanordnung aufweist, die Bänder (35, 36) aufweist, die gemäß der Längsrichtung des Trägertisches (1) implementiert und dazu eingerichtet sind, die Höhe der auf dem Trägertisch (1) angeordneten Drucksubstrate entsprechend dem Druckbereich zu begrenzen.

13. Höhensteuersystem nach Anspruch 12, **dadurch gekennzeichnet, dass** die Bänder (35, 36) zwei Seitenbänder (35) und mindestens ein Mittelband (36) sind, wobei die beiden Seitenbänder (35) derart beweglich sind, dass sie zueinander hin oder voneinander weg bewegt werden können.

14. Höhensteuersystem nach Anspruch 13, **dadurch gekennzeichnet, dass** es zwei Mittelbänder (36) aufweist, die dafür konfiguriert sind, zueinander hin oder voneinander weg bewegt zu werden.

Revendications

1. Système de commande de hauteur pour substrats d'impression pour des imprimantes numériques avec des têtes définissant une zone d'impression, comprenant :

   - une table de support (1) pour déplacer les substrats d'impression jusqu'à la zone d'impression ;
   - un ensemble d'aspiration pour exercer une aspiration à travers la table de support (1) de sorte que les substrats d'impression sont maintenus pas aspiration contre la table de support lorsqu'ils sont déplacés ;

   caractérisé en ce qu'il comprend en outre :

   - un ensemble de pression ayant des coulisseaux (10, 11) répartis transversalement sur la table de support (1) et agencés pour limiter la hauteur des substrats d'impression par rapport à la table de support (1) en fonction d'une hauteur d'actionnement de l'ensemble d'aspiration.

2. Système de commande de hauteur pour substrats d'impression selon la revendication 1, **caractérisé en ce que** les coulisseaux (10, 11) comprennent une base (16) afin de venir au contact des substrats d'impression déplacés par la table de support (1) et un corps (17) pour se fixer à l'imprimante numérique, les bases (16) étant reliées aux corps (17) au moyen de plaques (18) de sorte que les bases (16) soient mobiles par rapport aux corps (17).

3. Système de commande de hauteur pour substrats d'impression selon la revendication 2, **caractérisé en ce que** les coulisseaux (10, 11) comprennent des arbres saillants (19) qui sont joints, à une extrémité, aux corps (17) et à travers les bases (16), et l'ensemble de pression comprend des premiers ressorts élastiques (20) qui renferment partiellement les arbres saillants (19) entre les corps (17) et les bases (16).

4. Système de commande de hauteur pour substrats

d'impression selon la revendication 3, **caractérisé en ce que** les arbres saillants (19) sont configurés pour être mobiles linéairement de sorte que les bases (16) soient mobiles, la distance de séparation entre les bases (16) et la table de support (1) étant variée.

5. Système de commande de hauteur pour substrats d'impression selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les coulisseaux (10, 11) sont au moins deux coulisseaux latéraux (10) et un coulisseau central (11), les coulisseaux latéraux (10) étant mobiles de manière à pouvoir être rapprochés ou éloignées du coulisseau central (10).

6. Système de commande de hauteur pour substrats d'impression selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend un ensemble barrière qui comporte des panneaux (27) agencés pour osciller et définissant une hauteur de passage des substrats d'impression jusqu'à la zone d'impression.

7. Système de commande de hauteur pour substrats d'impression selon la revendication 6, **caractérisé en ce que** l'ensemble barrière comprend au moins un capteur de proximité (31) agencé pour générer un signal selon des détections réalisées en fonction de mesures d'inclinaison des panneaux (27).

8. Système de commande de hauteur pour substrats d'impression selon la revendication 6 ou 7, **caractérisé en ce que** les bases (16) et les panneaux (27) sont agencés conjointement de sorte que, lorsque les bases (16) sont amenées à osciller, les panneaux (27) puissent s'incliner par contact.

9. Système de commande de hauteur pour substrats d'impression selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des moyens d'ajustement de hauteur qui incluent un troisième moteur (21) et deux tiges filetées (22), les deux tiges filetées (22) étant actionnées par le troisième moteur (21) et chacune des tiges filetées (22) étant jointe, à une extrémité, à une feuille (9) agencée en correspondance avec un côté de la table de support (1).

10. Système de commande de hauteur pour substrats d'impression selon la revendication 9, **caractérisé en ce que** l'ensemble de pression est joint aux deux feuilles (9), de sorte que, par le déplacement des deux feuilles (9), un espacement entre les coulisseaux (10, 11) et la table de support (1) soit ajusté.

11. Système de commande de hauteur pour substrats d'impression selon la revendication 6 et la revendication 9 ou 10, **caractérisé en ce que** l'ensemble barrière est joint aux deux feuilles (9) de sorte que, par le déplacement des deux feuilles (9), un espace entre les panneaux (27) et la table de support (1) soit ajusté.

12. Système de commande de hauteur pour substrats d'impression selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend un ensemble de recouvrement comprenant des bandes (35, 36) qui sont mises en œuvre selon la direction longitudinale de la table de support (1) et agencées pour limiter la hauteur des substrats d'impression situés sur la table de support (1) correspondant à la zone d'impression.

13. Système de commande de hauteur pour substrats d'impression selon la revendication 12, **caractérisé en ce que** les bandes (35, 36) sont deux bandes latérales (35) et au moins une bande centrale (36), les deux bandes latérales (35) étant mobiles de manière à pouvoir être rapprochées ou éloignées l'une de l'autre.

14. Système de commande de hauteur pour substrats d'impression selon la revendication 13, **caractérisé en ce qu'**il y a deux bandes centrales (36), qui sont configurées pour être mobiles de manière à pouvoir être rapprochées ou éloignées l'une de l'autre.

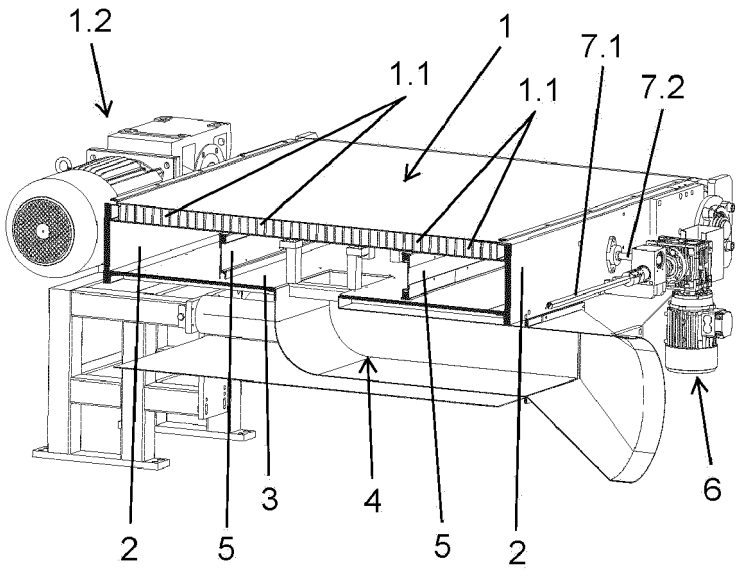


Fig. 1

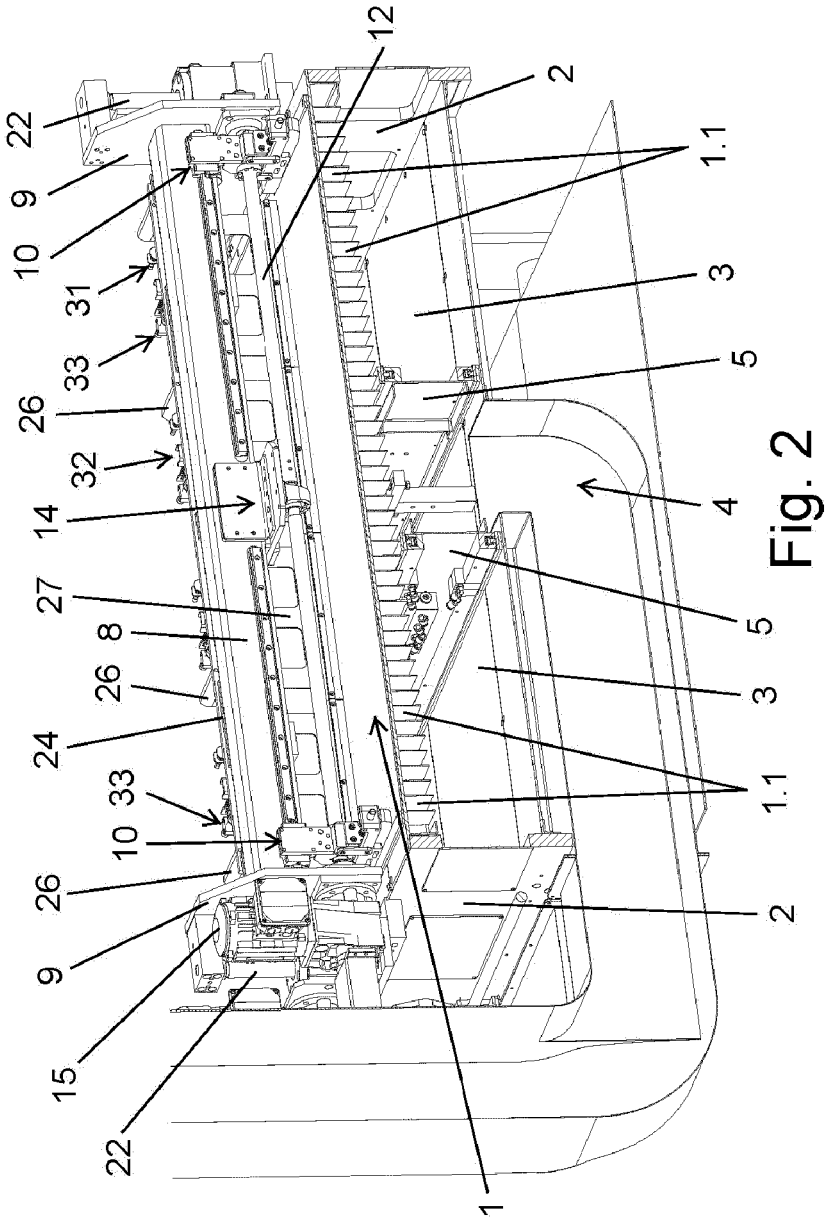


Fig. 2

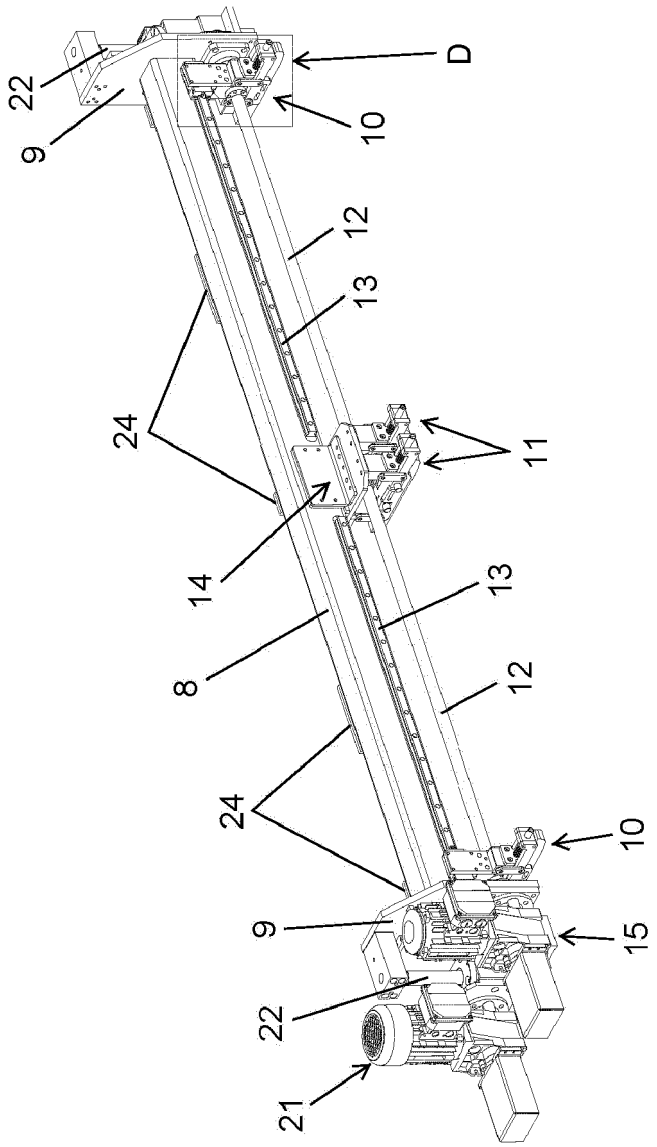


Fig. 3

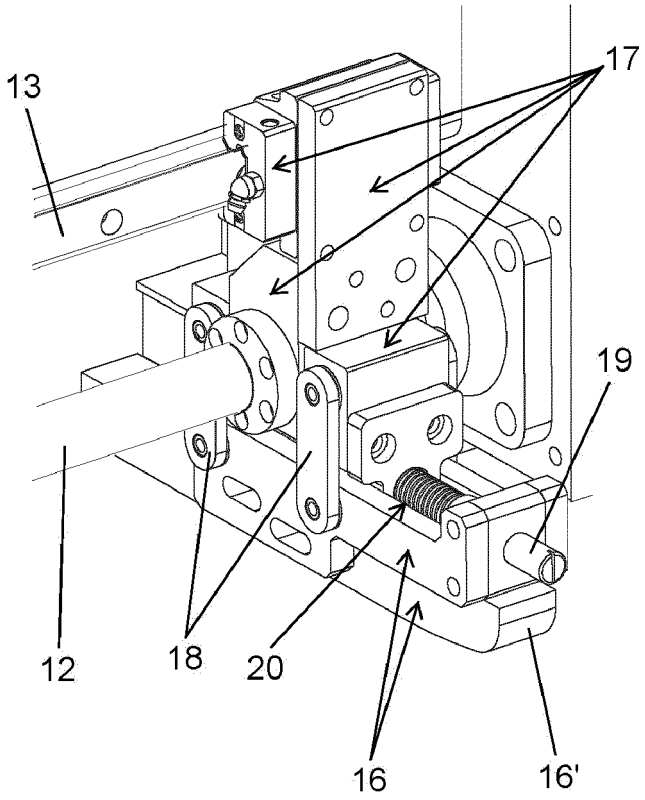
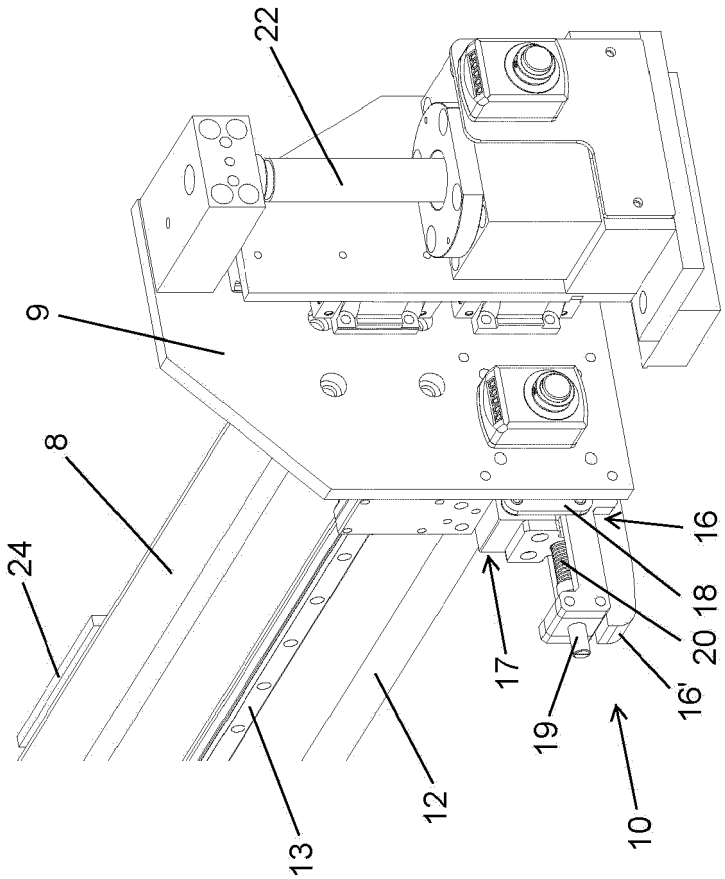


Fig. 4

Fig. 5



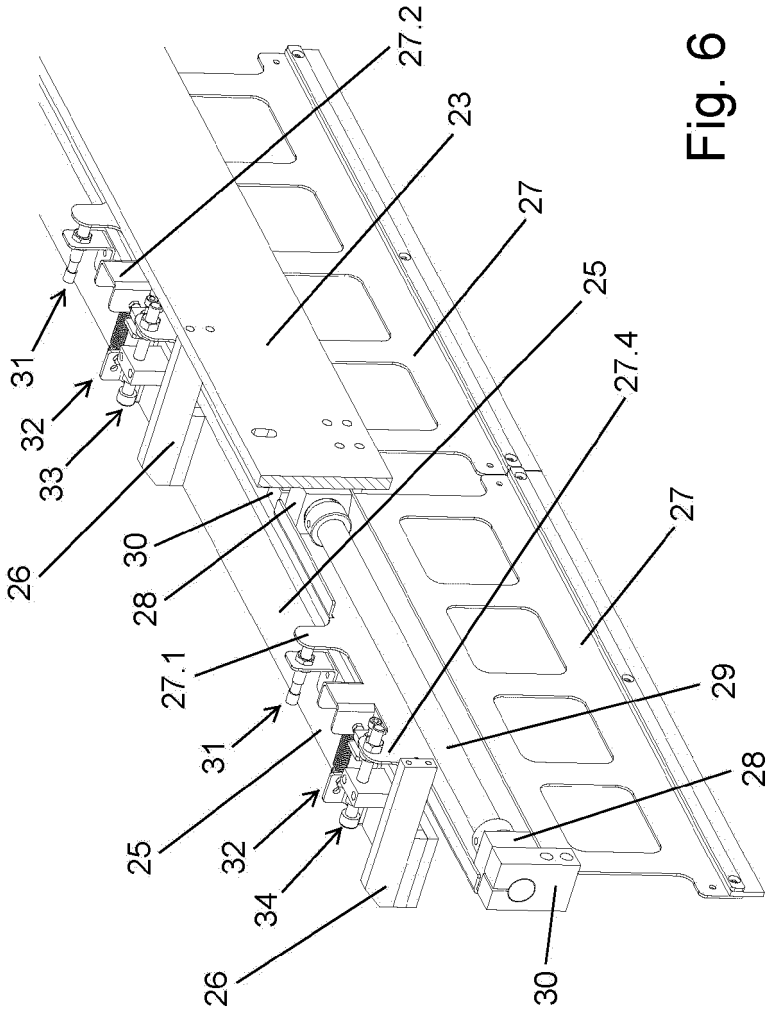


Fig. 6

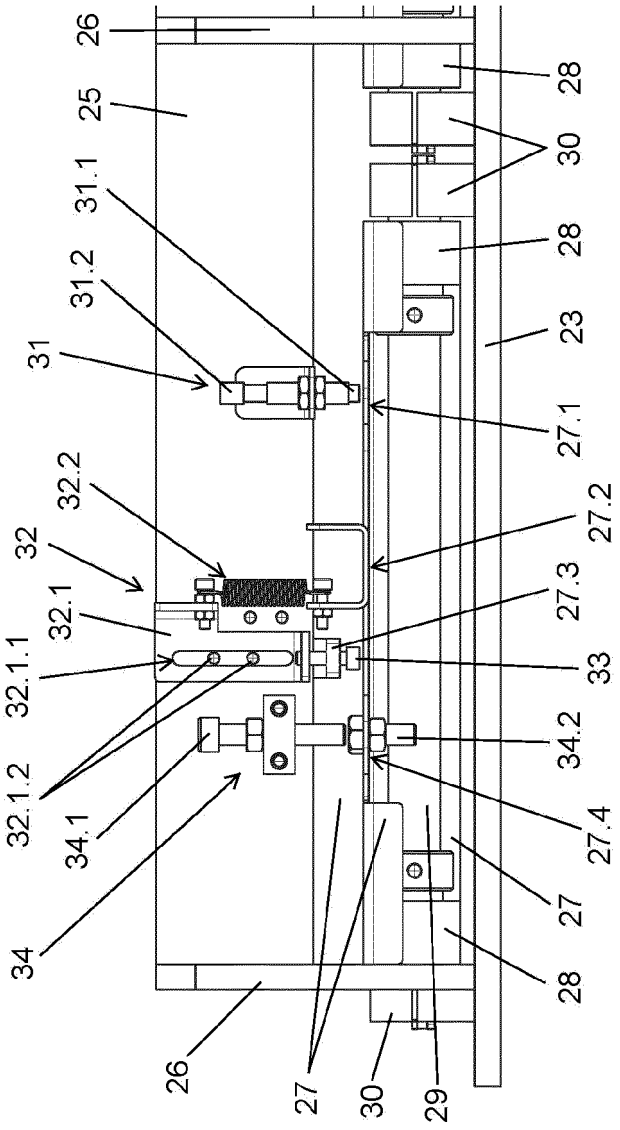

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Fig. 7

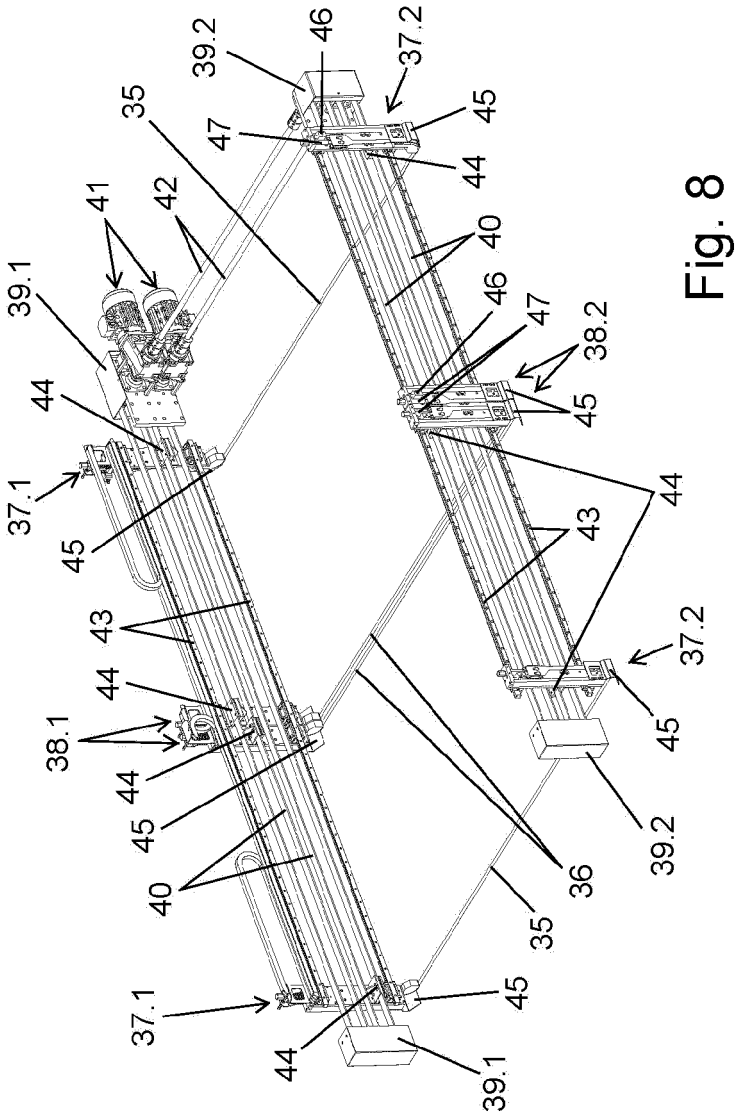
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Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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