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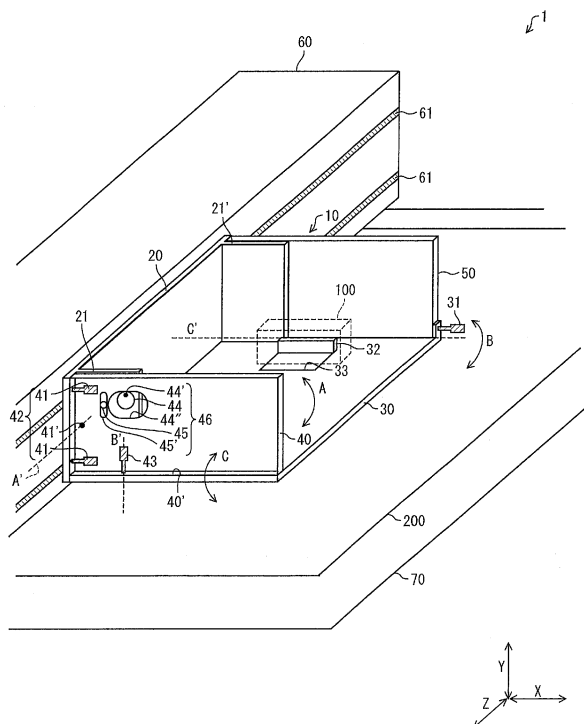
(54) **CARRIAGE AND INKJET DEVICE**

(57) [Problem] To alleviate the operation of adjusting the position of a head by a user.

[Means for Resolution] A carriage 10 includes a back face portion 20 fixed to a guide mechanism 60, a bottom face portion 30 opposite to a platen 70, side face portions

40 and 50 connected to the back face portion 20 and the bottom face portion 30, and a θ angle adjusting screw 41 adjusting an θ angle corresponding to a position in a direction of rotation indicated by an arrow A about a straight line A' in parallel with a travel direction as a rotation angle.

Figure 1



Description

Technical Field

[0001] The present invention relates to a carriage and an ink-jet apparatus.

Background Art

[0002] Patent Literature 1 has described an ink-jet recording apparatus having an object of preventing a reduction in accuracy of ink droplet discharge due to vibrations of an ink-jet head.

Citation List

Patent Literature

[0003] PTL 1: JP-A-2010-269453 (published on Dec. 2nd, 2010)

Summary of Invention

Technical Problem

[0004] Typically, a conventional apparatus requires the adjustment of the position of a head when a user mounts the head on a carriage, which represents complicated operation for preparation for printing.

[0005] The complicated operation performed by the user can be alleviated if only a part of the adjustment of the carriage can be completed during the process of manufacturing the apparatus. In general, however, the carriage is fixed to the ink-jet apparatus body in the manufacture, so that the user is responsible for the head position adjustment.

[0006] The present invention has been made in view of the problem, and it is an object thereof to provide a carriage and an ink-jet apparatus in which the operation performed by a user to adjust the position of head is alleviated.

Solution to Problem

[0007] A carriage according to the present invention is included by an ink-jet apparatus including: the carriage traveling over a medium for recording, a head being mounted on the carriage; a fixing portion fixing the carriage to the apparatus (the body of the ink-jet apparatus); and a mount stage, the medium for recording being placed on the mount stage at a position opposite to a face of the head, a nozzle of the head being provided on the face, the carriage including: a back face portion fixed to the fixing portion; a bottom face portion opposite to the mount stage; a side face portion connected to the back face portion and the bottom face portion; and a θ angle adjusting portion adjusting a θ angle corresponding to a position in a direction of rotation about a straight line in

parallel with a travel direction of the carriage as a rotation axis.

[0008] The carriage can adjust the θ angle corresponding to the position of the bottom face in the direction of rotation about the straight line in parallel with the travel direction as the rotation axis.

[0009] Since the back face portion is fixed to the guide mechanism serving as the body of the ink-jet apparatus, the θ angle of the bottom face portion connected to the back face portion is adjusted and then fixed to fix the θ angle of the bottom face portion with respect to the body of the ink-jet apparatus.

[0010] When the θ angle is adjusted in the carriage and then the head is mounted to be placed on the bottom face portion, the adjustment of the θ angle is not required after the mounting of the head. In other words, the manufacturer can adjust, during the manufacture, the θ angle of the head bottom face to be set in mounting the head, which eliminates the need to adjust the θ angle of the head when the user mounts the head. This can alleviate the operation of adjusting the position of the head by the user.

[0011] More preferably, in the carriage according to the present invention, the side face portion includes two side face portions at both ends of the bottom face portion in the travel direction, and the θ angle adjusting portion is provided for each of the two side face portions.

[0012] The θ angle can be adjusted in each of the two side face portions. In other words, the θ angles can be adjusted independently at both ends of the bottom face portion, so that the overall twist of the bottom face portion can be adjusted.

[0013] More preferably, in the carriage according to the present invention, the θ angle adjusting portion fixes the relative position of the side face portion to the back face portion at one point and changes the relative position of the side face portion to the back face portion at another point.

[0014] When the relative position is fixed at the one point and the relative position of the side face portion to the back face portion is changed at the other point, the side face portion is pivoted about the straight line passing through the one point and in parallel with the travel direction. This can change and adjust the θ angle of the bottom face portion.

[0015] More preferably, the carriage according to the present invention further includes a connecting portion connecting the side face portion to the bottom face portion to fix the relative position of the side face portion to the bottom face portion at the connecting position, and a head tilt angle adjusting portion adjusting a head tilt angle corresponding to the position of the bottom face portion in the direction of rotation about the straight line passing through the connecting portion and perpendicular to the bottom face portion as the rotation axis.

[0016] The head tilt angle corresponding to the position of the bottom face portion in the direction of rotation about the straight line perpendicular to the bottom face portion

as the rotation axis serves as the head tilt angle when the head is mounted. With the configuration, the head tilt angle can be adjusted by the carriage.

[0017] Since the back face portion is fixed to the guide mechanism serving as the body of the ink-jet apparatus, the head tilt angle of the bottom face portion connected to the back face portion is adjusted and then fixed to fix the head tilt angle of the bottom face portion with respect to the body of the ink-jet apparatus.

[0018] When the head tilt angle is adjusted in the carriage and then the head is mounted to be placed on the bottom face portion, the adjustment of the head tilt angle is not required after the mounting of the head. In other words, the manufacturer can adjust, during the manufacture, the head tilt angle of the head bottom face to be set in mounting the head, which eliminates the need to adjust the head tilt angle of the head when the user mounts the head. This can alleviate the operation of adjusting the position of the head performed by the user.

[0019] More preferably, in the carriage according to the present invention, the side face portion includes two side face portions at both ends of the bottom face portion in the travel direction, the connecting portion fixes one of the side face portions to the bottom face portion, and the head tilt angle adjusting portion changes the distance between the end of the other of the side face portions opposite to the back face portion and the end of the bottom face portion opposite to the back face portion in the direction in parallel with the plane direction of the bottom face portion and perpendicular to the travel direction.

[0020] The one of the side face portions is fixed, and then the distance between the end of the other side face portion opposite to the back face portion and the end of the bottom face portion opposite to the back face portion is changed, so that the bottom face portion can be pivoted about the fixing point. This can change and adjust the head tilt angle of the bottom face portion.

[0021] More preferably, the carriage according to the present invention further includes a protruding portion protruding from the bottom face portion toward the side on which the head is to be mounted, and the protruding portion is fixed to the bottom face portion and is provided in the position for mounting the head at one end in the travel direction.

[0022] The head can be mounted along the protruding portion previously formed to provide a desired head tilt angle, thereby easily fixing the head at the desired head tilt angle.

[0023] More preferably, the carriage according to the present invention further includes a bottom face height level adjusting portion adjusting the bottom face height level corresponding to the position of the bottom face portion in the direction of rotation about the straight line perpendicular to the travel direction and in parallel with the surface of the mount stage as the rotation axis.

[0024] The bottom face height corresponding to the position of the bottom face portion in the direction of rotation about the straight line perpendicular to the travel

direction and in parallel with the surface of the mount stage as the rotation axis serves as the height of the head when the head is mounted. With this configuration, the height of the head can be adjusted by the carriage.

[0025] Since the back face portion is fixed to the guide mechanism serving as the body of the ink-jet apparatus, the height of the bottom face portion connected to the back face portion is adjusted and then fixed to fix the height of the bottom face portion with respect to the mount stage.

[0026] When the bottom height level is adjusted in the carriage and then the head is mounted to be placed on the bottom face portion, the adjustment of the height of the head is not required after the mounting of the head. In other words, the manufacturer can adjust, during the manufacture, the height of the head to be set in mounting the head, which eliminates the need to adjust the height of the head when the user mounts the head. This can alleviate the operation of adjusting the position of the head by the user.

[0027] More preferably, in the carriage according to the present invention, the bottom face height level adjusting portion changes the position of the side face portion with respect to the back face portion in the direction in parallel with the straight line perpendicular to the plane of the bottom face portion.

[0028] The side face portion can be moved vertically along the back face portion to move upward or downward the bottom face portion connected to the side face portion. This can adjust the bottom face height level.

[0029] More preferably, in the carriage according to the present invention, the side face portion includes two side face portions at both ends of the bottom face portion in the travel direction, and the bottom face height level adjusting portion is provided at each of two points to change the height of each of the two side face portions.

[0030] The height face height level is adjusted by each of the two side face portions to enable the more precise adjustment of the distance between the bottom face and the mount stage. The adjustment of the bottom face height level at the two points can also adjust the tilt of the bottom face portion.

[0031] Since the ink-jet apparatus according to the present invention includes the carriage according to the present invention described above, the operation of adjusting the position of the head by the user can be alleviated.

Advantageous Effects of Invention

[0032] According to the present invention, the advantageous effect of alleviating the operation of adjusting the position of the head by the user can be achieved.

Brief Description of Drawing

[0033] [Fig. 1] Fig. 1 is a diagram showing the configuration of an ink-jet apparatus 1 according to an embod-

iment of the present invention near a carriage 10 thereof.

Description of Embodiments

[Configuration of Carriage 10]

[0034] An embodiment of the present invention will hereinafter be described in detail with reference to Fig. 1. Figure 1 is a diagram showing the configuration of an ink-jet apparatus 1 near a carriage 10 thereof. As shown in Fig. 1, the ink-jet apparatus 1 includes the carriage 10, a guide mechanism (fixing portion) 60, and a platen (mount stage) 70. The ink-jet apparatus 1 is an apparatus for drawing through ink-jet printing on a medium (medium for recording) 200 placed on the platen 70.

[0035] In the following description, directions are described by using arrows X, Y, and Z. The direction indicated by the arrow X shows a direction perpendicular to a travel direction and in parallel with a plane direction of the platen 70. The direction indicated by the arrow Y shows a direction perpendicular to the plane of the platen 70. The direction indicated by the arrow Z shows a direction in parallel with the travel direction.

[0036] The carriage 10 is provided for mounting a head 100 (in Fig. 1, the head 100 is shown by dotted lines). The travel direction of the carriage 10 corresponds to the direction indicated by the arrow Z. During the travel of the carriage 10, the mounted head 100 discharges ink through its nozzle (not shown) onto the medium 200 to perform the drawing. As the drawing proceeds, the medium 200 is fed in the direction indicated by the arrow Z on the side of the carriage 10 opposite to the guide mechanism 60.

[0037] Although the only one head 100 mounted on the carriage 10 is described for ease of description, a plurality of such heads 100 may be used. When the plurality of heads 100 are mounted, the advantage of alleviating the operation of adjusting the position of each of the heads 100 can also be provided. For example, when the plurality of heads 100 are placed in a staggered arrangement, the operation of adjusting a θ angle, later described, a head tilt angle, and a bottom face height level for each head 100 can be omitted, and a user is only required to adjust the position of the head 100 in the staggered direction.

[0038] The carriage 10 is formed of a back face portion 20, a bottom face portion 30, a side face portion 40, and a side face portion 50. The back face portion 20, the bottom face portion 30, and the two side face portions 40 and 50 are connected to each other. The head 100 is mounted on the bottom face portion 30 such that the face having the nozzle formed thereon is exposed opposite to the platen 70 through an opening portion 33 provided in the bottom face portion 30.

[0039] The back face portion 20 is fixed to the guide mechanism 60. Specifically, the guide mechanism 60 is provided with two guide rails 61 for traveling the carriage 10 in the direction indicated by the arrow Z, and the back

face portion 20 is fixed to the driven part. The carriage 10 can be moved along the guide rails 61 to travel in the Z direction while the carriage 10 is fixed to the guide mechanism 60.

[0040] The back face portion 20 has screw receiving portions 21 and 21'. The screw receiving portion 21 is a seat provided for a decentered screw 44, later described. The screw receiving portion 21' has the same configuration as that of the screw receiving portion 21.

[0041] The screw receiving portion 21 is provided with the decentered screw 44 and a protrusion 45. The decentered screw 44 and the protrusion 45 are members which constitute a bottom face height level adjusting portion 46, later described. The decentered screw 44 has a flange portion formed to fit in a through hole 44" provided in the side face portion 40, and a side wall of the flange portion is in contact with an inner wall of the through hole 44". The protrusion 45 is a protruding structure fitted to a guide groove 45' formed in the side face portion 40 for vertically defining the moving direction of the side face portion 40 with the decentered screw 44.

[0042] The bottom face portion 30 is a member connected to the back face portion 20 and the side face portion 40 and 50 and constituting the bottom face of the carriage 10 opposite to the platen 70. As described above, the head 100 is mounted on the bottom face portion 30 such that the face having the nozzle formed thereon is exposed to the platen 70 through the opening portion 33.

[0043] The bottom face portion 30 includes a head tilt angle adjusting screw (head tilt angle adjusting portion) 31.

[0044] The "head tilt angle" as used herein refers to the position of the bottom face portion in the direction of rotation about a straight line perpendicular to the bottom face portion as a rotation axis, and in the present embodiment, it means the position of the bottom face portion 30 in the direction of rotation about a straight line B' as the rotation axis. The straight line B passes through a connecting screw (connecting portion) 43, later described, and is perpendicular to the bottom face portion 30. Thus, the head tilt angle represents the inclination of the head 100 in the direction indicated by an arrow B. The head tilt angle adjusting screw 31 is provided for adjusting the head tilt angle.

[0045] The bottom face portion 30 is provided with a protruding wall (protruding portion) 32. The protruding wall 32 protrudes from the bottom face portion 30 toward the head 100 to be mounted. The protruding wall 32 is fixed to the bottom face portion 30 and is provided in the position for mounting the head 100 at one end in the travel direction. The head 100 can be mounted along the protruding wall 32 to fix the head at a desired head tilt angle easily. Thus, the user is only required to adjust the position of the head 100 along the protruding wall 32 on the carriage 10 with the θ angle, the head tilt angle, and the bottom face height level adjusted. Although not shown, the carriage 10 includes a fixing screw for fixing

the position of the head 100 after the adjustment of the position of the head 100 along the protruding wall 32. When the plurality of heads 100 are provided as described above, as many protruding walls 32 may be provided as the heads 100.

[0046] The side face portion 40 is a member connected to the back face portion 20 and the bottom face portion 30 and constituting one of the side faces of the carriage 10.

[0047] A θ angle adjusting portion 42 is formed of two θ angle adjusting screws 41 and a pivot pin 41'. The pivot pin 41' is used to fix the relative position of the side face portion 40 to the back face portion 20 at one point, and the relative position of the side face portion 40 to the back face portion 20 is changed at the other two connecting positions of the side face portion 40 and the back face portion 20 through the two θ angle adjusting screws 41. This adjusts the θ angle.

[0048] The " θ angle" as used herein refers to the position of the bottom face portion in the direction of rotation about a straight line in parallel with the travel direction as the rotation axis. In the present embodiment, the θ angle is the angle formed by a straight line in parallel with the plane of the bottom face portion 30 and perpendicular to the plane of the back face portion 20 when the bottom face portion is pivoted about a straight line A' passing through the fixing point of the relative position of the side face portion 40 to the back face portion 20 and in parallel with the travel direction.

[0049] The side face portion 40 is provided with the connecting screw 43. The connecting screw 43 extends through a side wall 40' of the side face portion 40 to reach the bottom face portion 30 and screws into a female screw portion formed in the bottom face portion 30. This fixes the relative position of the bottom face portion 30 to the side face portion 40 at the point where the connecting screw 43 is connected.

[0050] The side face portion 40 has the through hole 44" and the guide groove 45' formed therein. The screw receiving portion 21 is provided with the decentered screw 44. The decentered screw 44 has a center 44' shifted from the center of the flange portion of the decentered screw 44 of circular shape. The flange portion of the decentered screw 41 fits in the through hole 44" such that the side wall of the flange portion is in contact with the inner wall of the through hole 44". The protrusion 45 is fitted to the guide groove 45'. The decentered screw 44, the through hole 44", the protrusion 45, and the guide groove 45' constitute the bottom face height level adjusting portion 46. The bottom face height level adjusting portion 46 adjusts the bottom face height level of the bottom face portion 30.

[0051] The screw receiving portion 21' and the side face portion 50 have the same configuration formed thereon as that of the bottom face height level adjusting portion 46.

[0052] The "bottom face height level" as used herein refers to the position of the bottom face portion in the

direction of rotation about a straight line perpendicular to the travel direction and in parallel with the surface of the mount stage as the rotation axis, and in the present embodiment, it means the position in the direction of rotation indicated by an arrow C about a straight line C' which is the line of intersection of the bottom face portion 30 and the side face portion 50 as the rotation axis. The bottom face height level is adjusted by the bottom face height level adjusting portion 46 lifting or lowering the end of the bottom face portion 30 closer to the side face portion 40.

[0053] The side face portion 50 has the same configuration as that of the side face portion 40. Two side face portions 40 and 50 are used to adjust the θ angle to allow the independent adjustment of the θ angle at both ends of the bottom face portion 30 closer to the side face portions 40 and 50, thereby adjusting the overall twist of the bottom face portion 30. In addition, the bottom face height level of the bottom face portion 30 is adjusted at both ends of the bottom face portion 30 closer to the side face portions 40 and 50 to enable the more precise adjustment of the height and tilt of the bottom face portion 30.

[0054] The guide mechanism 60 is provided for fixing the carriage 10 to the body of the ink-jet apparatus 1 and for defining the travel direction of the carriage 10. The carriage 10 is connected to the guide mechanism 60 to reciprocate in the direction indicated by the arrow Z. The fixing portion included in the ink-jet apparatus according to the present invention is not limited to the one for traveling the carriage such as the guide mechanism, and any can be used as long as the fixing portion fixes the carriage to the apparatus. For example, the ink-jet apparatus according to the present invention may be configured such that the position of the carriage may be fixed and the medium for recording may be moved to travel the medium for recording under the carriage.

[0055] The platen 70 is a stage for mounting the medium 200.

[Adjustment of θ Angle]

[0056] Next, the adjustment of the position of the carriage 10 is described. The adjustment of the θ angle is described first. The adjustment of the θ angle is performed in the following manner.

[0057] The pivot pin 41' extends through the side face portion 40 to the screw receiving portion 21, and the relative position of the side face portion 40 to the back face portion 20 is fixed at the point where the pivot pin 41' is connected.

[0058] In addition to the fixing of the relative position of the side face portion 40 to the back face portion 20 at the one point by the pivot pin 41', the relative position of the side face portion 40 to the back face portion 20 is changed at the other two connecting points of the side face portion 40 to the back face portion 20 with the θ angle adjusting screws 41. Thus, the two θ angle adjusting screws 41 change the distance between the side face portion 40 and the back face portion 20 at the points

where the θ angle adjusting screws 41 are connected. This pivots the side face portion 40 about the straight line A' in parallel with the travel direction (Z direction) and passing through the connecting point (the center of the pivot pin 41').

[0059] Since the side face portion 40 is connected to the bottom face portion 30, for example by the connecting screw 43, the pivot of the side face portion 40 causes the bottom face portion 30 to be pivoted. This changes the θ angle, so that the θ angle of the bottom face portion 30 can be adjusted.

[0060] Since the back face portion 20 is fixed to the guide mechanism 60 serving as the body of the ink-jet apparatus 1, the θ angle of the bottom face portion 30 connected to the back face portion 20 is adjusted and then fixed to fix the θ angle of the bottom face portion 30 with respect to the body of the ink-jet apparatus 1.

[0061] When the θ angle is adjusted in the carriage 10 and then the head 100 is mounted to be placed on the bottom face portion 30, the adjustment of the θ angle is not required after the mounting of the head 100. In other words, the manufacturer can adjust, during the manufacture, the θ angle of the head bottom face to be set in mounting the head 100, which eliminates the need to adjust the θ angle of the head 100 when the user mounts the head 100.

[0062] Although the present embodiment sets the two points where the θ angle adjusting screws 41 are provided at the points where the relative position of the side face portion to the back face portion is changed in adjusting the θ angle in the present invention, at least one point may be sufficient.

[0063] Preferably, in the adjustment of the θ angle with the θ angle adjusting portion 42 provided for the side face portion 40, the relative position of the side face portion 40 to the bottom face portion 30 is previously fixed, and the screw fixing the side face portion 50, the back face portion 20, and the bottom face portion 30 is previously loosened.

[Adjustment of Head Tilt Angle]

[0064] The adjustment of the head tilt angle is performed in the following manner. Description is made of the case where the plane of the bottom face portion 30 is in parallel with the plane of the platen 70 for ease of description.

[0065] First, the side face portion 40 is connected to the bottom face portion 30 by the connecting screw 43 in order to provide the rotation axis for the head tilt angle adjustment. The straight line B' serving as the axial direction of the connecting screw 43 corresponds to the rotation axis.

[0066] Next, the head tilt angle adjusting screw 31 is used to change the distance between the end of the side face portion 50 (the different one from the side face portion 40) opposite to the back face portion 20 and the end of the bottom face portion 30 opposite to the back face

portion 20 in the direction indicated by the arrow X.

[0067] This causes the point where the head tilt angle adjusting screw 31 is provided to be pivoted in the direction indicated by the arrow B about the straight line B' passing through the fixing point of the connecting screw 43 and perpendicular to the plane of the bottom face portion 30. Since the position in the direction indicated by the arrow B corresponds to the head tilt angle, the head tilt angle is adjusted by the operation described above.

[0068] The head tilt angle of the bottom face portion 30 corresponds to the head tilt angle set when the head 100 is mounted. With the configuration, the head tilt angle can be adjusted by the carriage 10.

[0069] Since the back face portion 20 is fixed to the guide mechanism 60 serving as the body of the ink-jet apparatus 1, the head tilt angle of the bottom face portion 30 connected to the back face portion 20 is adjusted and then fixed to fix the head tilt angle of the bottom face portion 30 with respect to the body of the ink-jet apparatus 1.

[0070] When the head tilt angle is adjusted in the carriage 10 and then the head 100 is mounted to be placed on the bottom face portion 30, the adjustment of the head tilt angle is not required after the mounting of the head 100. In other words, the manufacturer can adjust, during the manufacture, the head tilt angle of the head bottom face to be set in mounting the head 100, which eliminates the need to adjust the head tilt angle of the head when the user mounts the head 100.

[0071] When the head tilt angle is adjusted with the bottom face portion 30 fixed to the side face portion 40, it is necessary not to fix the side face portion 50 to the bottom face portion 30.

[Adjustment of Bottom Face Height Level]

[0072] The adjustment of the bottom face height level is performed in the following manner. Description is made of the case where the side face portion 50 is fixed to the bottom face portion 30 at the contacting edges, the back face portion 20 is fixed to the side face portion 50, and the length direction of the guide groove 45' is in parallel with the direction indicated by the arrow Y, for ease of description.

[0073] First, the θ angle adjusting screws 41 and a side face fixing screw 42 are removed to allow the side face portion 40 to be movable freely with respect to the back face portion 20.

[0074] Next, the decentered screw 44 is rotated. Since the center 44' is shifted from the center of the circular flange portion of the decentered screw 44, the side wall of the flange portion is in contact with the inner wall of the through hole 44" and in this state, the motion of lifting or lowering the side wall is performed. To guide the motion accurately in the length direction of the guide groove 45', that is, in the direction indicated by the arrow Y, the protrusion 45 is fitted to the guide groove 45'. Since the protrusion 45 is movable only along the length direction

of the guide groove 45', the side face portion 40 is moved only in the direction indicated by the arrow Y.

[0075] This allows the end of the bottom face portion 30 connected to the side face portion 40 that is closer to the side face portion 40 to be pivoted in the direction indicated by the arrow C about the straight line C' serving as the edge in contact with and fixed to the side face portion 50. Since the height of the end of the bottom face portion 30 closer to the side face portion 40 is changed, the bottom face height level can be adjusted.

[0076] The bottom face height corresponds to the height of the head 100 when the head 100 is mounted. With this configuration, the height of the head 100 can be adjusted by the carriage 10.

[0077] Since the back face portion 20 is fixed to the guide mechanism 60 serving as the body of the ink-jet apparatus 1, the height of the bottom face portion 30 connected to the back face portion 20 is adjusted and then fixed to fix the height of the bottom face portion with respect to the platen 70.

[0078] When the bottom height level is adjusted in the carriage 10 and then the head 100 is mounted to be placed on the bottom face portion 30, the adjustment of the height of the head 100 is not required after the mounting of the head 100. In other words, the manufacturer can adjust, during the manufacture, the height of the head 100 to be set in mounting the head 100, which eliminates the need to adjust the height of the head 100 when the user mounts the head 100.

[0079] For adjusting the overall height of the bottom face portion 30, for example, the bottom face height level is adjusted on the side closer to the side face portion 40, and then the bottom face portion 30, the side face portion 40, and the back face portion 20 are fixed, and the fixing of the back face portion 20 to the side face portion 50 is released, and the bottom face height level adjusting portion provided for the side face portion 50 is used to change the height of the end of the bottom face portion 30 closer to the side face portion 50.

[0080] As described above, the carriage 10 can be manipulated in the present embodiment to adjust the various positions of the bottom face on which the head 100 is mounted. Thus, when the user mounts the head 100 on the carriage 10, the user is only required to adjust a position which is not adjusted in the present invention such as the position of the head 100 in the direction indicated by the arrow X in order to achieve the ink-jet printing with high accuracy.

[0081] For example, in the staggered arrangement of the heads 100, once the θ angle, the head tilt angle, and the bottom face height level of the carriage 10 are adjusted, the user is only required to adjust the positions of the heads 100 in the direction indicated by the arrow X, that is, in the staggered direction, in order to allow the adjustment of the intervals and the like between the heads 100 to achieve the adjustment of the position of the staggered arrangement. As a result, the staggered arrangement of the heads 100 can be easily configured.

[Supplementary Notes]

[0082] As described above, the carriage 10 includes the back face portion 20 fixed to the guide mechanism 60, the bottom face portion 30 opposite to the platen 70, the side face portions 40 and 50 connected to the back face portion 20 and the bottom face portion 30, and the θ angle adjusting screw 41 adjusting the θ angle corresponding to the position in the direction of rotation indicated by the arrow A about the straight line A' in parallel with the travel direction as the rotation axis.

[0083] The θ angle corresponding to the position in the direction of rotation about the straight line in parallel with the travel direction on the bottom face as the rotation axis can be adjusted by the carriage 10.

[0084] Since the back face portion 20 is fixed to the guide mechanism 60 serving as the body of the ink-jet apparatus 1, the θ angle of the bottom face portion 30 connected to the back face portion 20 is adjusted and then fixed to fix the θ angle of the bottom face portion 30 with respect to the body of the ink-jet apparatus 1.

[0085] When the θ angle is adjusted in the carriage 10 and then the head 100 is mounted to be placed on the bottom face portion 30, the adjustment of the θ angle is not required after the mounting of the head 100. In other words, the manufacturer can adjust, during the manufacture, the θ angle of the head bottom face to be set in mounting the head 100, which eliminates the need to adjust the θ angle of the head 100 when the user mounts the head 100. This can alleviate the operation of adjusting the position of the head by the user.

[0086] The carriage 10 preferably includes the two side face portions 40 and 50 at both ends of the bottom face portion 30 in the travel direction and the θ angle adjusting screw 41 for each of the two side face portions 40 and 50.

[0087] The θ angle can be adjusted in each of the two side face portions 40 and 50. Since the θ angles at both ends of the bottom face portion 30 can be adjusted independently, the overall twist of the bottom face portion 30 can be adjusted.

[0088] The carriage 10 preferably includes the θ angle adjusting screw 41 which fixes the relative position of the side face portion 40 to the back face portion 20 at one point and changes the relative position of the side face portion to the back face portion at another point.

[0089] When the relative position is fixed at the one point and the relative position of the side face portion 40 to the back face portion 20 is changed at the other point, the side face portion 40 is pivoted about the straight line passing through the one point and in parallel with the travel direction. This can change and adjust the θ angle of the bottom face portion 30.

[0090] Preferably, the carriage 10 further includes the connecting screw 43 which connects the side face portion 40 with the bottom face portion 30 to fix the relative position of the side face portion 40 to the bottom face portion 30 at the connecting position, and the head tilt angle adjusting screw 31 which adjusts the head tilt angle corre-

sponding to the position of the bottom face portion 30 in the direction of rotation indicated by the arrow B about the straight line B' passing through the connecting screw 43 and perpendicular to the bottom face portion 30 as the rotation axis.

[0091] The head tilt angle corresponding to the position of the bottom face portion 30 in the direction of rotation about the straight line B' perpendicular to the bottom face portion 30 as the rotation axis serves as the head tilt angle when the head 100 is mounted. With this configuration, the head tilt angle can be adjusted by the carriage 10.

[0092] Since the back face portion 20 is fixed to the guide mechanism 60 serving as the body of the ink-jet apparatus 1, the head tilt angle of the bottom face portion 30 connected to the back face portion 20 is adjusted and then fixed to fix the head tilt angle of the bottom face portion 30 with respect to the body of the ink-jet apparatus 1.

[0093] When the head tilt angle is adjusted in the carriage 10 and then the head 100 is mounted to be placed on the bottom face portion 30, the adjustment of the head tilt angle is not required after the mounting of the head 100. In other words, the manufacturer can adjust, during the manufacture, the head tilt angle of the head bottom face to be set in mounting the head 100, which eliminates the need to adjust the head tilt angle of the head when the user mounts the head 100. This can alleviate the operation of adjusting the position of the head 100 performed by the user.

[0094] The carriage 10 preferably includes the two side face portions 40 and 50 at both ends of the bottom face portion 30 in the travel direction, the connecting screw 43 fixing the side face portion 40 to the bottom face portion 30, and the head tilt angle adjusting screw 31 changing the distance between the end of the side face portion 50 opposite to the back face portion 20 and the end of the bottom face portion 30 opposite to the back face portion 20 in the direction in parallel with the plane direction of the bottom face portion 30 and perpendicular to the travel direction.

[0095] The side face portion 40 is fixed, and then the distance between the end of the side face portion 50 opposite to the back face portion 20 and the end of the bottom face portion 30 opposite to the back face portion 20 is changed, so that the bottom face portion 30 can be pivoted about the straight line B' passing through the fixing point and perpendicular to the plane of the platen 70. This can change and adjust the head tilt angle of the bottom face portion 30.

[0096] Preferably, the carriage 10 further includes the protruding wall 32 which protrudes from the bottom face portion 30 toward the head 100 to be mounted, and the protruding wall 32 is fixed to the bottom face portion 30 and is provided in the position for mounting the head 100 at one end in the travel direction.

[0097] The head 100 can be mounted along the protruding wall 32 previously formed to provide a desired

head tilt angle, thereby easily fixing the head at the desired head tilt angle.

[0098] Preferably, the carriage 10 further includes the bottom face height level adjusting portion 46 which adjusts the position of the bottom face portion 30 in the direction of rotation about the straight line C' perpendicular to the travel direction and in parallel with the surface of the platen 70 as the rotation axis.

[0099] The bottom face height corresponding to the position of the bottom face portion 30 in the direction of rotation about the straight line C' perpendicular to the travel direction and in parallel with the surface of the mount stage as the rotation axis serves as the height of the head 100 when the head 100 is mounted. With this configuration, the height of the head 100 can be adjusted by the carriage 10.

[0100] Since the back face portion 20 is fixed to the guide mechanism 60 serving as the body of the ink-jet apparatus 1, the height of the bottom face portion 30 connected to the back face portion 20 is adjusted and then fixed to fix the height of the bottom face portion with respect to the platen 70.

[0101] When the bottom height level is adjusted in the carriage 10 and then the head 100 is mounted to be placed on the bottom face portion 30, the adjustment of the height of the head 100 is not required after the mounting of the head 100. In other words, the manufacturer can adjust, during the manufacture, the height of the head 100 to be set in mounting the head 100, which eliminates the need to adjust the height of the head 100 when the user mounts the head 100. This can alleviate the operation of adjusting the position of the head 100 by the user.

[0102] The carriage 10 preferably includes the bottom face height level adjusting portion 46 which changes the position of the side face portion 40 with respect to the back face portion 20 in the direction in parallel with the straight line perpendicular to the plane of the bottom face portion 30.

[0103] The side face portion 40 can be moved vertically along the back face portion 20 to move upward or downward the bottom face portion 30 connected to the side face portion 40. This can adjust the bottom face height level.

[0104] The carriage 10 preferably includes the two side face portion 40 and 50 at both ends of the bottom face portion 30 in the travel direction and the bottom face height level adjusting portion 46 provided at each of the two points to change the height of each of the two side face portions 40 and 50.

[0105] The height face height level is adjusted by each of the two side face portions 40 and 50 to enable the more precise adjustment of the distance between the bottom face and the mount stage. The adjustment of the bottom face height level at the two points can also adjust the tilt of the bottom face portion 30.

[0106] Since the ink-jet apparatus 1 includes the carriage 10, the operation of adjusting the position of the head 100 by the user is alleviated.

[0107] The present invention is not limited to the embodiment described above, and various modifications can be made within the scope of the claims, and embodiments provided by appropriately combining technical approaches disclosed in different embodiments are included in the technical scope of the present invention.

Industrial Applicability

[0108] The present invention is applicable to ink-jet printing.

Reference Signs List

[0109]

1	INK-JET APPARATUS	
10	CARRIAGE	
20	BACK FACE PORTION	
30	BOTTOM FACE PORTION	
31	HEAD TILT ANGLE ADJUSTING SCREW (HEAD TILT ANGLE ADJUSTING PORTION)	
32	PROTRUDING WALL (PROTRUDING PORTION)	
40, 50	SIDE FACE PORTION	
42	θ ANGLE ADJUSTING PORTION	
43	CONNECTING SCREW (CONNECTING PORTION)	
44	DECENTERED SCREW	
44'	THROUGH HOLE	
44'	CENTER	
44"	THROUGH HOLE	
45	PROTRUSION	
45'	GUIDE GROOVE	
46	BOTTOM FACE HEIGHT LEVEL ADJUSTING PORTION	
60	GUIDE MECHANISM (FIXING PORTION)	
70	PLATEN (MOUNT STAGE)	
100	HEAD	
200	MEDIUM (MEDIUM FOR RECORDING)	

Claims

1. A carriage included by an ink-jet apparatus including: the carriage traveling over a medium for recording, a head being mounted on the carriage; a fixing portion fixing the carriage to the apparatus; and a mount stage, the medium for recording being placed on the mount stage at a position opposite to a face of the head, a nozzle of the head being provided on the face, the carriage comprising:

a back face portion fixed to the fixing portion;
a bottom face portion opposite to the mount stage;
a side face portion connected to the back face portion and the bottom face portion; and

a θ angle adjusting portion adjusting a θ angle corresponding to a position in a direction of rotation about a straight line in parallel with a travel direction of the carriage as a rotation axis.

2. The carriage according to claim 1, wherein the side face portion comprises two side face portions at both ends of the bottom face portion in the travel direction, and the θ angle adjusting portion is provided for each of the two side face portions.

3. The carriage according to 1 or 2, wherein the θ angle adjusting portion fixes a relative position of the side face portion to the back face portion at one point and changes the relative position of the side face portion to the back face portion at another point.

4. The carriage according to any one of claims 1 to 3, further comprising:

a connecting portion connecting the side face portion to the bottom face portion to fix a relative position of the side face portion to the bottom face portion at the connecting position; and
a head tilt angle adjusting portion adjusting a head tilt angle corresponding to a position of the bottom face portion in a direction of rotation about a straight line passing through the connecting portion and perpendicular to the bottom face portion as a rotation axis.

5. The carriage according to claim 4, wherein the side face portion comprises two side face portions at both ends of the bottom face portion in the travel direction, the connecting portion fixes one of the side face portions to the bottom face portion, and the head tilt angle adjusting portion changes a distance between an end of the other of the side face portions opposite to the back face portion and an end of the bottom face portion opposite to the back face portion in a direction in parallel with a plane direction of the bottom face portion and perpendicular to the travel direction.

6. The carriage according to claim 4 or 5, further comprising a protruding portion protruding from the bottom face portion toward a side on which the head is to be mounted, wherein the protruding portion is fixed to the bottom face portion and is provided in a position for mounting the head at one end in the travel direction.

7. The carriage according to any one of claims 1 to 6, further comprising a bottom face height level adjusting portion adjusting a bottom face height level corresponding to a position of the bottom face portion in a direction of rotation about a straight line perpen-

dicular to the travel direction and in parallel with a surface of the mount stage as a rotation axis.

8. The carriage according to claim 7, wherein the bottom face height level adjusting portion changes a position of the side face portion with respect to the back face portion in a direction in parallel with a straight line perpendicular to a plane of the bottom face portion.
9. The carriage according to claim 8, wherein the side face portion comprises two side face portions at both ends of the bottom face portion in the travel direction, and the bottom face height level adjusting portion is provided at each of two points to change a height of each of the two side face portions.
10. An ink-jet apparatus comprising the carriage according to any one of claims 1 to 9.

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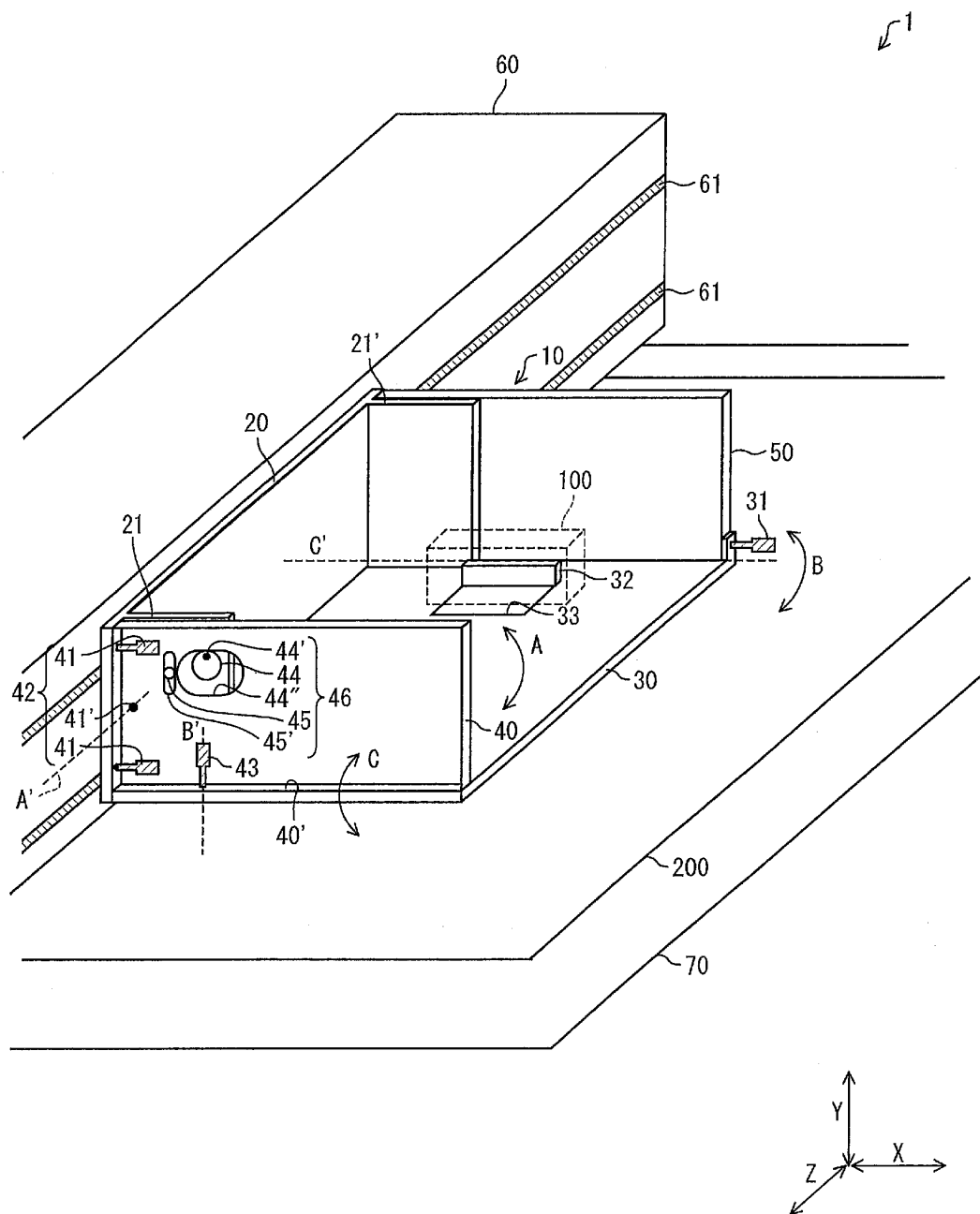
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Figure 1



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/081708

A. CLASSIFICATION OF SUBJECT MATTER

B41J2/01 (2006.01) i, B41J25/304 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B41J2/01, B41J25/304

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2002-205439 A (Seiko Epson Corp.), 23 July 2002 (23.07.2002), paragraphs [0033] to [0049]; fig. 11 to 17 (Family: none)	1, 3-5, 7-10 2, 6
Y	JP 2005-212147 A (Konica Minolta Holdings, Inc.), 11 August 2005 (11.08.2005), paragraphs [0030] to [0033]; fig. 3 (Family: none)	2
Y	JP 2000-198217 A (Canon Inc.), 18 July 2000 (18.07.2000), paragraphs [0058] to [0059]; fig. 4 & US 6536870 B1 & EP 1000750 A2	6

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
29 January, 2013 (29.01.13)Date of mailing of the international search report
05 February, 2013 (05.02.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/081708

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The inventions of claims 1, 3-5, and 7-10 are disclosed in the document 1 which is cited in this international search report.

Therefore, the inventions of claims 1-10 have no common single inventive concept.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2010269453 A [0003]