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CUTTING PLOTTER

Abstract

A cutting plotter (**11**) includes: a stage (**13**) configured to support a medium-to-be-cut (**12**); a pen carriage (**16**) configured to move above the stage; and a tool holder (**21**) supported by the pen carriage for holding a pen tool (**19**). The tool holder (**21**) includes: a supporting member (**25**) having a through hole (**24**); a sliding member (**26**) supported by the supporting member to be movable along a front-rear direction; and a pressing mechanism (**45, 52, 36**) configured to selectively bias the sliding member in either direction along the front-rear direction relative to the supporting member. The through hole (**24**) is formed in an oblong shape elongated in the front-rear direction as viewed from above. The sliding member (**26**) includes: a first pressing portion (**46, 47**) for pressing the pen tool against the front side (**30**) of the inner wall on the through hole (**24**); and a second pressing portion (**48, 49**) for pressing the pen tool against the other side, in the first bidirectional direction, of the inner wall on the through hole.

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Background/Summary

TECHNICAL FIELD

[0001] The present invention relates to a cutting plotter configured to cut a sheet-like medium-to-be-cut by moving a cutting pen which has a cutter and which is held by a pen carriage in a two-dimensional direction relative to the medium-to-be-cut. In particular, the present invention relates to a cutting plotter that holds a pen tool, such as a cutting pen, at different positions on the pen carriage.

BACKGROUND ART

[0002] Conventionally, a cutting plotter is known to cut a sheet-like medium-to-be-cut while moving a pen carriage having a cutting pen in a left-right direction while feeding the medium-to-be-cut back and forth on a stage. Among this type of cutting plotters, there is a cutting plotter capable of performing, if the medium-to-be-cut is an adhesive sheet to which an adhesive has been applied to a sheet-like base material, a half-cut for cutting only the sheet portion while leaving the release paper in the adhesive sheet, and a full-cut for completely cutting the medium-to-be-cut including the release paper. In such a cutting plotter, it is necessary to change the position at which the cutting pen is attached to the pen carriage when performing a half-cut and a full-cut.

[0003] The reason why the position at which the cutting pen is attached has to be changed is that the shape of the part of the stage supporting the medium-to-be-cut and the position at which the cutting is performed relative to the stage are different between the case where the half-cut is performed and the case where the full-cut is performed. That is, the half-cut is performed while supporting the medium-to-be-cut, and therefore it is performed on a surface formed on the stage, whereas the full-cut is performed over a groove formed on the stage so that the blade of the cutting pen can penetrate the medium-to-be-cut. The surface for the half-cut and the groove for the full-cut are provided spaced apart in the conveyance direction of the medium-to-be-cut.

[0004] There are also cutting plotters capable of drawing on the medium-to-be-cut by attaching a writing pen instead of a cutting pen. The writing pen is attached to a position where a cutting pen would be attached for performing a half-cut to enable drawing on the medium-to-be-cut. Hereinafter, the cutting pen and the writing pen are collectively referred to as a “pen tool.”

[0005] FIG. **17** shows an example of a pen carriage capable of changing the position to attach a cutting pen. In a cutting plotter having the pen carriage **1** shown in FIG. **17**, the medium-to-be-cut (not shown) is conveyed from the lower left to the upper right direction in FIG. **17**. Here, the conveyance direction of the medium-to-be-cut is referred to as a “first bidirectional direction”, the upstream, i.e., the lower left side of FIG. **17**, is referred to as “front” of the cutting plotter, and the downstream, i.e., the upper right side of FIG. **17**, is referred to as “rear” of the cutting plotter.

[0006] The pen carriage **1** shown in FIG. **17** supports a tool holder **3** for holding the cutting pen **2**, movably in the up-down direction. The tool holder **3** includes: a main body **5** having a through hole **4** extending in the up-down direction, and a tool fastener **7** attached to the main body **5** by a screw member **6**. The screw member **6** and the tool fastener **7** are provided at the front end of the main body **5**. The screw member **6** has an external thread **6***a* (see FIG. **18**) and is screwed onto the main body **5** while the external thread **6***a* is extending in the front-rear direction.

[0007] The tool fastener **7** moves rearward by screwing the screw member **6** into the main body **5** and moves forward by loosening the screw member **6**.

[0008] Here, there are a front pen holding portion **8** and a rear pen holding portion **9** on the through hole **4**. The front pen holding portion **8** and the rear pen holding portion **9** each have an opening having a substantially circular shape when viewed from above such that the cutting pen **2** can be

inserted into each of the front pen holding portion **8** and the rear pen holding portion **9**. In the through hole **4**, parts of the two openings overlap each other to form an opening having a substantially figure "8" shape, and the through hole **4** is configured to not allow the cutting pen **2** inserted into the front pen holding portion **8** or the rear pen holding portion **9** to move in the front-rear or left-right direction.

[0009] The cutting pen **2** includes: a shaft portion **2***a* having a cylindrical shape and inserted into the front pen holding portion **8** and the rear pen holding portion **9** constituting a part of the through hole **4**; and an annular flange **2***b* projecting to the outside in the radial direction from a part above the shaft portion **2***a*. The flange **2***b* is placed on a top surface of the main body **5** by inserting the shaft portion **2***a* into the front pen holding portion **8** or the rear pen holding portion **9**. By placing the flange **2***b* on the top surface of the main body **5**, the cutting pen **2** is held on the main body **5** without falling out of the tool holder **3**. A writing pen (not shown) instead of the cutting pen **2** may be attached to the rear pen holding portion **9**. A flange is also provided on the shaft portion of the writing pen similarly to the cutting pen **2**.

[0010] The tool fastener **7** is a member for pressing the cutting pen **2**, which is held by the front pen holding portion **8** or the rear pen holding portion **9**, toward the rear so as to be fixed on the front pen holding portion **8** or the rear pen holding portion **9**. As shown in FIGS. **17**-**19**, the tool fastener **7** has a pair of upper and lower protrusions **7***a* and **7***b*.

[0011] When attaching the cutting pen **2** to the front pen holding portion **8**, the cutting pen **2** is inserted into the front pen holding portion **8** with the screw member **6** being loosened and the tool fastener **7** being moved relatively forward as shown in FIG. **18**. FIG. **18** depicts this situation with the interior of the cutting pen **2** omitted. In this case, the cutting pen **2** is inserted into the front pen holding portion **8** while the screw member **6** is loosened to the extent that it does not come off the main body **5**, and then the screw member **6** is screwed onto the main body **5**. By thus screwing the screw member **6** into the main body **5**, the upper and lower protrusions **7***a* and **7***b* of the tool fastener **7** push the cutting pen **2** from front to rear such that the cutting pen **2** is fixed in the front pen holding portion **8**.

[0012] The upper protrusion **7***b* contacts the flange **2***b* of the cutting pen **2** from above and the flange **2***b* is sandwiched by the upper protrusion **7***b* and the main body **5** such that the upward movement of the cutting pen **2** is restricted.

[0013] When attaching the cutting pen **2** to the rear pen holding portion **9**, the screw member **6** is screwed onto the main body **5** until the tool fastener **7** reaches the cutting pen **2**, with the cutting pen **2** being inserted into the rear pen holding portion **9**, as shown in FIG. **19**. Then, the upper and lower protrusions **7***a* and **7***b* of the tool fastener **7** push the cutting pen **2** such that the cutting pen **2** is pressed against the rear pen holding portion **9** for fixation. In this case as well, the upper protrusion **7***a* overlaps the flange **2***b* from above and restricts the upward movement of the cutting pen **2**.

SUMMARY OF THE INVENTION

[0014] In the tool holder **3** shown in FIGS. **17**-**19**, when performing a half-cut to cut only an upper layer of the medium-to-be-cut after performing a full-cut that completely cuts through the entire thickness of the medium-to-be-cut, it is necessary to pull out the cutting pen **2**, for example, upward from the front pen holding portion **8**, and reinsert the cutting pen **2** into the rear pen holding portion **9** after performing the full-cut. Therefore, when switching between a full-cut mode and a half-cut mode, the cutting pen **2** must be removed and inserted every time, which is troublesome.

[0015] The present invention aims to provide a cutting plotter that can selectively use two pen holding portions on different locations without the need for removing and inserting the cutting pen.

[0016] In order to achieve this objective, a cutting plotter in accordance with an embodiment of the present invention comprises: [0017] a stage configured to support a medium-to-be-cut; [0018] a conveyance mechanism configured to convey a medium-to-be-cut placed on the stage along a

surface of the stage in a first bidirectional direction; [0019] a guide rail which is spaced apart from the surface of the stage and which extends in a second bidirectional direction parallel to the surface of the stage and intersecting with the first bidirectional direction; [0020] a pen carriage configured to move along the guide rail above the stage; and [0021] a tool holder which is supported by the pen carriage movable in a third bidirectional direction perpendicular to the first bidirectional direction and the second bidirectional direction and which holds a pen tool in a posture in which the pen tool extends in the third bidirectional direction, wherein the tool holder comprises: [0022] a supporting member having a through hole into which the pen tool is to be inserted; [0023] a sliding member supported by the supporting member movably along the first bidirectional direction; and [0024] a pressing mechanism configured to selectively bias the sliding member in either direction along the first bidirectional direction relative to the supporting member, [0025] the through hole has an oblong shape extending longer along the first bidirectional direction when viewed from the third bidirectional direction such that the pen tool is movable in the through hole from one end to the other along the first bidirectional direction, and [0026] the sliding member comprises: [0027] a first pressing portion for pressing the pen tool onto one side, in the first bidirectional direction, of an inner wall on the through hole by moving the pen tool in one direction along the first bidirectional direction relative to the supporting member; and [0028] a second pressing portion for pressing the pen tool onto the other side, in the first bidirectional direction, of the inner wall on the through hole by moving the pen tool in the other direction along the first bidirectional direction relative to the supporting member.

[0029] In accordance with the present invention, the pen tool can move parallel along the first bidirectional direction in the through hole formed on the supporting member of the tool holder so as to be fixed onto either one side or the other side of the inner wall on the through hole in the first bidirectional direction. Therefore, in accordance with the present invention, it is possible to provide a cutting plotter that can selectively use pen holding portions on two locations without removing and inserting the cutting pen.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] FIG. **1** shows a perspective view schematically illustrating a structure of a cutting plotter according to the present invention.

[0031] FIG. **2** shows a cross-sectional view for explaining the shape of a stage.

[0032] FIG. **3** shows a perspective view of a pen carriage.

[0033] FIG. **4** shows an exploded perspective view of a tool holder.

[0034] FIG. **5** shows a plan view illustrating a part of the tool holder.

[0035] FIG. **6** shows a perspective view of a supporting member and the cutting pen as viewed obliquely from above.

[0036] FIG. **7** shows a perspective view of the supporting member as viewed obliquely from below.

[0037] FIG. **8** shows a plan view of a sliding member.

[0038] FIG. **9** shows a cross-sectional view of a connection between the supporting member and a pressing mechanism in a transversal direction as viewed from the front.

[0039] FIG. **10** shows a cross-sectional view of the tool holder in the longitudinal direction.

[0040] FIG. **11** shows a cross-sectional view of the tool holder in a longitudinal direction.

[0041] FIG. **12**A shows a front view of the presser as viewed from the supporting member side.

[0042] FIG. **12**B shows a plan view illustrating the presser.

[0043] FIG. **12**C shows a side view illustrating the presser.

[0044] FIG. **12**D shows a perspective view illustrating the presser.

[0045] FIG. **13** shows a cross-sectional view of the tool holder in the transversal direction.

[0046] FIG. **14** shows a perspective cross-sectional view illustrating the tool holder wherein a cross section is taken along a part of the tool holder.
[0047] FIG. **15** shows a perspective view of the tool holder with the slider being moved to the front.
[0048] FIG. **16** shows a perspective view of the tool holder with the slider being moved to the rear.
[0049] FIG. **17** shows a perspective view of a conventional pen carriage.
[0050] FIG. **18** shows a cross-sectional view of a conventional tool holder and cutting pen.
[0051] FIG. **19** shows a cross-sectional view of a conventional tool holder and cutting pen.

DETAILED DESCRIPTION OF THE INVENTION

[0052] Hereinafter, an embodiment of the cutting plotter according to the present invention will be described in detail with reference to FIGS. **1**-**16**.
[0053] The cutting plotter **11** shown in FIG. **1** includes: a stage **13** configured to support a sheet **12**, which is a medium-to-be-cut; a conveyance mechanism configured to convey the medium-to-be-cut placed on the stage **13** along a front-rear direction (first bidirectional direction) along a surface of the stage **13**; a guide rail **16***a* which is spaced apart from the surface of the stage **13** and which extends in a left-right direction (second bidirectional direction) parallel to the surface of the stage **13** and intersecting the front-rear direction; a pen carriage **16** configured to move along the guide rail **16***a* above the stage **13**; and a tool holder **21** which is supported by the pen carriage **16** movable in an up-down direction (third bidirectional direction) and which holds the pen tool **17** in a posture in which the pen tool **17** extends in the up-down direction.
[0054] In the cutting plotter **11** shown in FIG. **1**, the sheet **12** is placed on the stage **13** forming a conveyance path so as to be transported from the upper right side to the lower left side or from the upper left side to the lower right side in FIG. **1** while the sheet **12** is sandwiched between a drive roller **14** and a push roller **15**, which constitute a conveyance mechanism. The cutting plotter **11** performs a full-cut, a half-cut, drawing, etc. on the sheet **12** by raising and lowering the pen tool **17** in the up-down direction while conveying the sheet **12** in the front-rear direction and moving the pen carriage **16** in the left-right direction.
[0055] The pen carriage **16** is movably supported on guide rail **16***a* arranged above the stage **13** such that the pen carriage **16** can move in the left-right direction (from the upper left to the lower right in FIG. **1**) perpendicular to the conveyance direction of the sheet **12**. Hereinafter, when referring to an orientation of a part, the downstream of the sheet **12** in the conveyance direction (the lower left side in FIG. **1**) is referred to as the “front” of the cutting plotter **11**. FIG. **1** shows a view of the cutting plotter **11** as viewed from the front.
[0056] A tool holder **21** is attached to the pen carriage **16** such that the tool holder **21** can be raised or lowered. The pen carriage **16** includes a driving device, such as a solenoid (not shown), for raising and lowering the tool holder **21**. The tool holder **21** is connected to the driving device installed inside the pen carriage **16** and moves by the driving device in the up-down direction.
[0057] As shown in FIG. **2**, the tool holder **21** holds a cutting pen **18** used for a full-cut and a half-cut, a writing pen **19** used for drawing, etc. in a posture in which they extend in the up-down direction. Here, there is a protruding blade **18***a* on a lower end of the cutting pen **18**. In addition, there is a writing device body **19***a* on a lower end of the writing pen **19**. As shown in FIG. **4**, the cutting pen **18** and the writing pen **19** respectively include: a cylindrical shaft portion **17***a*, **18***a* which is to be inserted into the tool holder **21**; and an annular flange **29** projecting radially outwards from a part above the shaft portion **17***a*, **18***a*. Hereinafter, the cutting pen **18** and writing pen **19** may be collectively referred to as a “pen tool **17**”.
[0058] As shown in FIG. **2**, on the stage **13**, there are a first pen receiving portion **22** for a full-cut, and a second pen receiving portion **23** for a half-cut or writing, spaced apart in the front-rear direction. The first pen receiving portion **22** is constituted by a groove that extends in the horizontal direction (left-right direction), which is perpendicular to the conveyance direction of the sheet **12**. The second pen receiving portion **23** is constituted by a flat surface extending in the left-right

direction.

[0059] As described below, the tool holder **21** attached to the pen carriage **16** is configured to be able to hold the pen tool **17** respectively above the first pen receiving portion **22** and above the second pen receiving portion **23**. The pen tool **17** held in the tool holder **21** is raised and lowered between a cutting/drawing position on a lower level and a retracted position on an upper level by moving the tool holder **21** with a driving device. By lowering the cutting pen **18** or the writing pen **19** to a position corresponding to the first pen receiving portion **22** for the full-cut and the second pen receiving portion **23** for the half-cut/writing, formed on the stage **13**, it becomes possible to perform a full-cut, a half-cut, drawing, etc.

Tool Holder

[0060] As shown in FIGS. **3** and **4**, in the cutting plotter **11** according to this embodiment, the tool holder **21** includes: a supporting member **25** having a through hole **24** into which the pen tool **17** is to be inserted; a sliding member **26** supported by the supporting member **25** movably along the front-rear direction (conveyance direction of the sheet **12**); and a pressing mechanism **27** configured to selectively bias the sliding member **26** in either direction along the front-rear direction, i.e., forward or rearward, relative to the supporting member **25**.

Supporting Member

[0061] Here, the supporting member **25** includes a tubular body **25***a* defining the through hole **24** as shown in FIG. **4**. Although not shown in the drawings, a driving device is connected to the left end of the tubular body **25***a* via a connecting arm. As shown in FIG. **5**, the through hole **24**, when viewed from above, is elliptically elongated in the front-rear direction, allowing the pen tool **17** inserted into the through hole **24** to move from a front end (one end, which is a downstream end, of the sheet **12** in the conveyance direction) to a rear end (the other end, which is an upstream end, of the sheet **12** in the conveyance direction) in the through hole **24**. Such a supporting member **25** can be formed using resin, or metal such as aluminum.

[0062] As shown in FIG. **6**, a recessed portion **28** is formed on the entire circumference of the opening on the through hole **24**, on the upper side of the supporting member **25**, more specifically, on the peripheral edge of the opening on the through hole **24** on the top surface of the tubular body **25***a*, such that the width is partially wider on the opening. A flange **29** formed on the outer circumference of the pen tool **17** is placed on the recessed portion **28**. The flange **29** is formed over the entire outer circumference of the pen tool **17** such that the outer diameter is partially larger on the flange **29**. The depth of the recessed portion **28** is shallower than the thickness (length formed in the up-down direction) of the flange **29**. Therefore, when the flange **29** is placed on the recessed portion **28**, the upper end surface of the flange **29** is positioned above the top surface of the tubular body **25***a*.

[0063] A front inner wall surface **30** (see FIG. **7**) on the front end of the tubular body **25***a*, and the rear inner wall surface **31** on the rear end of the tubular body **25***a*, on the inner wall surface of through hole **24**, are shaped to fit thereon the shaft portion **17***a* (**18***a*) formed in a cylindrical shape under the flange **29** of the pen tool **17** (cutting pen **18**). By sliding the pen tool **17** forward while the flange **29** is placed on the recessed portion **28**, the shaft portion **17***a* of the pen tool **17** comes in close contact with the front inner wall surface **30**. Meanwhile, by sliding the pen tool **17** rearward while the flange **29** is placed on the recessed portion **28**, the shaft portion **17***a* comes in close contact with the rear inner wall surface **31**.

[0064] In this embodiment, the shapes of the front inner wall surface **30** and the rear inner wall surface **31** on the through hole **24** are described as following the cylindrical side surface of the shaft portion **17***a* of the pen tool **17**. However, as long as the position of the pen tool **17** is fixed in the front-rear direction, the shapes of the front inner wall surface **30** and the rear inner wall surface **31** do not necessarily need to follow the shaft portion **17***a* of the pen tool **17** and can, for example, be formed in a V-shape when viewed from above.

[0065] As shown in FIGS. **4**-**6**, a supporting bracket **32** extending forward from the front end of the

tubular body **25***a* is formed integrally with the supporting member **25**. The supporting bracket **32** is for supporting the sliding member **26** described later. In this embodiment, the supporting bracket **32** includes a pair of upper and lower guide members **33**, **33** and a screw-fixing boss **34**, as shown in FIG. **6**.

[0066] Here, as shown in FIG. **9**, the pair of guide members **33** contact the inner side surface **26***a* of the sliding member **26** so as to regulate the moving direction of the sliding member **26** in the front-rear direction. FIG. **9** shows a cross section taken along line IX-IX in FIG. **13**.

[0067] The screw-fixing boss **34** is formed in a cylindrical shape at the front end of the supporting bracket **32** and protrudes to the right from the front end of the supporting bracket **32**. An internal thread **35** is formed on the shaft center portion of the screw-fixing boss **34**. The screw-fixing boss **34** is for connecting the pressing mechanism **27** described later. A screw member **36** (see FIG. **4**) of the pressing mechanism **27** described later is screwed onto the internal thread **35**.

Sliding Member

[0068] As shown in FIG. **4**, the sliding member **26** includes: a main body **41** which constitutes a front half of the sliding member **26**; and an upper pressing fragment **42** and a lower pressing fragment **43** extending rearward from the rear end of the main body **41**. The main body **41** is formed in a bottom-solid prismatic shape opening to the rear. The supporting bracket **32** of the supporting member **25** is inserted from the rear into the main body **41**. An elongate hole **44** elongated in the front-rear direction is formed on the right side wall **41***a* of the main body **41**. A pair of upper and lower protrusions **45** projecting to the right are formed on the side wall **41***a* on the right side of the main body **41**. Such a sliding member **26** may, for example, be formed by injection molding of resin.

[0069] In this embodiment, the upper pressing fragment **42** and the lower pressing fragment **43** of the sliding member **26** are arranged on the upper and lower sides of the supporting member **25**, respectively. The rear end **46** of the upper pressing fragment **42** and the rear end **47** of the lower pressing fragment **43** of the sliding member **26** act as a first pressing portion, which presses the pen tool **19** against the front inner wall surface **30** on the through hole **24**, as a result of the sliding member **26** moving in the forward direction (one direction along the front-rear direction) relative to the supporting member **25**. The front end **48** of the upper pressing fragment **42** and the front end **49** of the lower pressing fragment **43** act as a second pressing portion, which presses the pen tool **19** against the rear inner wall surface **31** on the through hole **24**, as a result of the sliding member **26** moving in the rearward direction (the opposite direction along the front-rear direction) relative to the supporting member **25**.

[0070] The elongate hole **44** is formed to penetrate the right side wall **41***a* of the main body **41** in the left-right direction. As shown in FIG. **9**, the screw-fixing boss **34** of the supporting bracket **32** is inserted into the elongate hole **44**. The guide member **33** of the supporting bracket **32** is pressed against the right side wall **41***a* (inner side surface **26***a*) inside the main body **41** by the screw-fixing boss **34** being drawn to the right by the pressing mechanism **27** described later, and the right side wall **41***a* of the main body **41** becomes parallel to the guide member **33**. The sliding member **26** is assembled to the supporting member **25** while the sliding member **26** is in parallel to the guide member **33** (while extending in the front-rear direction).

[0071] As shown in FIG. **4**, the upper pressing fragment **42** and the lower pressing fragment **43** are formed in a frame-like shape, each having a substantially elongate hole **42***a*, **43***a* elongated in the front-rear direction when viewed from above. As shown in FIG. **8**, the opening on the holes **42***a*, **43***a* is formed in the same shape as the through hole **24** of the supporting member **25** such that the pen tool **17** can be inserted from above and the inserted pen tool **17** can move from the front end to the rear end of the holes **42***a*, **43***a*. The opening width of the holes **42***a*, **43***a* is larger than the outer diameter of the flange **29** of the pen tool **17**.

[0072] As shown in FIG. **10**, the upper pressing fragment **42** is positioned above the tubular body **25***a* of the supporting member **25** while the sliding member **26** is assembled to the supporting

member **25**. The interior of the pen tool **17** is omitted in FIGS. **10**, **11**, and **13**. FIG. **10** shows a cross section taken along X-X line in FIG. **13**.

[0073] The lower pressing fragment **43** is positioned below the tubular body **25***a* of the supporting member **25** while the sliding member **26** is assembled to the supporting member **25**.

[0074] The upper pressing fragment **42** and the lower pressing fragment **43** cause the holes **42***a*, **43***a* to overlap the through hole **24** of the supporting member **25** when viewed from above by moving the sliding member **26** in the front-rear direction relative to the supporting member **25**. In this way, the pen tool **17** is inserted from above while the holes **42***a*, **43***a* and the through hole **24** overlap.

[0075] When the pen tool **17** is inserted in this way, the flange **29** of the pen tool **17** is placed on the recessed portion **28** on the supporting member **25**. Then, when the sliding member **26** is moved forward from this situation, the rear ends **46** and **47** of the upper pressing fragment **42** and the lower pressing fragment **43** come into contact with the pen tool **17** to push the pen tool **17** forward, as shown in FIG. **10**. The pen tool **17** thus pushed forward is pressed against the front inner wall surface **30** of the supporting member **25**. Hereinafter, the position of the pen tool **17** thus pressed against the front inner wall surface **30** will be referred to as a "first position." The first position is located above the first pen receiving portion **22** described above.

[0076] Meanwhile, when the sliding member **26** is moved rearward while the flange **29** of the pen tool **17** is placed on the recessed portion **28** on the supporting member **25**, the front ends **48** and **49** of the upper pressing fragment **42** and the lower pressing fragment **43** come into contact with the pen tool **17** to push the pen tool **17** rearward, as shown in FIG. **11**. The pen tool **17** thus pushed rearward is pressed against the rear inner wall surface **31** of the supporting member **25**. Hereinafter, the position of the pen tool **17** thus pressed against the rear inner wall surface **31** will be referred to as a "second position." The second position is located above the second pen receiving portion **23** described above.

Pressing Mechanism

[0077] As shown in FIGS. **3** and **4**, the pressing mechanism **27** includes: a protrusion **45** formed on the right side wall **41***a* on the main body **41** of the sliding member **26**; a presser **52** arranged to face the right side wall **41***a* on the main body **41** of the sliding member **26**; and a screw member **36** for attaching the presser **52** to the supporting member **25**.

[0078] As shown in FIG. **8**, the protrusion **45** on the side wall **41***a* of the sliding member **26** is formed in a triangular shape, and convex to the right when viewed from above. The protrusion **45** forms: a front pressure receiving surface **62** constituted by an inclined surface inclined relative to the axis of the screw member **36** in the front-rear direction; and a rear pressure receiving surface **63** constituted by an inclined surface located rearward.

[0079] Meanwhile, as shown in FIGS. **12**A-**12**D, the presser **52** is constituted by: a plate-like pressing member **54** on which a circular through hole **53** is formed in the center; and a pair of arms **55** protruding from the pressing member **54**.

[0080] Among these components, as shown in FIG. **12**B, the pressing member **54** is formed in a trapezoidal shape when viewed from above. As shown in FIG. **9**, the width of the pressing member **54** formed in the up-down direction is such that it covers the right side wall **41***a* of the sliding member **26** (main body **41**) from the right side. The planar shape of the pressing member **54** is trapezoid and the pressing member **54** is used with a shorter parallel side of the trapezoid facing the side wall **41***a* of the sliding member **26**. That is, the front pressing surface **56** and the rear pressing surface **57** constituted by inclining surfaces inclined in the front-rear direction relative to the axis of the screw member **36**, are respectively formed on the front and rear ends of the pressing member **54**. The front pressing surface **56** and the rear pressing surface **57** are inclined such that the thickness of the pressing member **54** gradually decreases towards the right side from the left end (the end facing the side wall **41***a*) of the pressing member **54**.

[0081] The protrusion **45** on sliding member **26** having the aforementioned front pressure receiving

surface **62** and rear pressure receiving surface **63**, and the presser **52** having the front pressing surface **56** and rear pressing surface **57** form a cam that converts the pressing force applied from the presser **52** to the front pressure receiving surface **62** or the rear pressure receiving surface **63** of the protrusion **45** by the screw member **36** into a driving force that moves the sliding member **26** in the front-rear direction.

[0082] On the upper and lower end surfaces of the pressing member **54**, marks **58** are formed to serve as guides for positioning the sliding member **26** when moving the sliding member **26** in the front-rear direction.

[0083] The through hole **53** on the pressing member **54** is a hole for passing a bolt **36***a* of the screw member **36** (see FIG. **9**). As shown in FIGS. **9** and **13**, the screw member **36** is constituted by a bolt **36***a* and a disk-shaped knob **36***b*. A washer **59** is disposed between the knob **36***b* and the pressing member **54**. The diameter of the through hole **53** is such that the screw-fixing boss **34** of the supporting member **25** can be fit into the through hole **53**.

[0084] The arm **55** extends to the left from the central portion of the pressing member **54** in the up-down direction. As shown in FIG. **14**, the width of the arm **55** in the up-down direction is such that the arm **55** can be inserted into the elongate hole **44** of the sliding member **26**. A recessed portion **55***a* (see FIG. **12**D) having a shape resembling an extension of the through hole **53** of the pressing member **54** is formed on the arm **55**. The recessed portion **55***a* fits onto the screw-fixing boss **34** with the arm **55** being inserted into the elongate hole **44** of the sliding member **26**.

[0085] The presser **52** is attached to the screw-fixing boss **34** by the screw member **36** with the arm **55** being inserted into the elongate hole **44** of the sliding member **26** and being fit onto the screw-fixing boss **34**. When tightening or loosening the screw member **36**, the presser **52** does not rotate since the arm **55** abuts the inner wall surface on the elongate hole **44**. Tightening the screw member **36** is carried out with the protrusion **45** on the side wall on the sliding member **26** aligned with the presser **52** in the front-rear direction.

[0086] The front mark **60** and the rear mark **61** are provided in the vicinity to the protrusion **45** on the upper end of the side wall **41***a*. The front mark **60** serves as a guide for positioning the sliding member **26** when attaching the pen tool **17** on the second position. The rear mark **61** serves as a guide for positioning the sliding member **26** when attaching the pen tool **17** on the first position. When moving the sliding member **26** in the front-rear direction, the sliding member **26** is positioned such that the front mark **60** or the rear mark **61** aligns with the mark **58** on the presser **52** in the left-right direction.

[0087] The front pressure receiving surface **62** and the rear pressure receiving surface **63** are formed to face the front pressing surface **56** and the rear pressing surface **57** of the presser **52**, respectively, and cooperate with the presser **52** to form the cam **64** that changes the transmission direction of the force.

[0088] That is, as shown in FIG. **15**, by tightening the screw member **36** while the front pressure surface **56** of the presser **52** is in contact with the rear pressure receiving surface **63** of the protrusion **45**, the pressing force applied from the presser **52** to the rear pressure receiving surface **63** is converted into a driving force that moves the sliding member **26** forward such that the sliding member **26** is biased forward as a result of the driving force. Accordingly, by moving the sliding member **26** forward with the aforementioned movement of the cam **64** while the pen tool **17** is inserted into and held by the holes **42***a*, **43***a* on the sliding member **26** and the through hole **24** on the supporting member **25**, the pen tool **17** is pushed to the front and pressed against the front inner wall surface **30** by the upper pressing fragment **42** and the lower pressing fragment **43** so as to be fixed onto the supporting member **25**, as shown in FIG. **10**.

[0089] Meanwhile, as shown in FIG. **16**, by tightening the screw member **36** while the rear pressing surface **57** on the presser **52** is in contact with the front pressure receiving surface **62** on the protrusion **45**, the pressing force applied from the presser **52** to the front pressure receiving surface **62** is converted into a driving force that moves the sliding member **26** to the rear such that

the sliding member **26** is biased to the rear by the driving force. When the sliding member **26** moves to the rear as a result of the aforementioned movement of the cam **64** while the pen tool **17** is inserted into and held by the holes **42***a*, **43***a* of the sliding member **26** and the through hole **24** of the supporting member **25**, the pen tool **17** is pressed to the rear inner wall surface **31** by the upper pressing fragment **42** and the lower pressing fragment **43** and is fixed to the supporting member **25**, as shown in FIG. **11**.

[0090] Therefore, when switching between a full cut mode (in which the cutting pen **18** is positioned at the first position) and a half cut mode (in which the cutting pen **18** is positioned at the second position), it is possible to selectively use the pen holding portions on two locations without removing and inserting the pen tool **17**.

[0091] In the cutting plotter **11** according to this embodiment, there are a first pen receiving portion **22** for the full-cut, constituted by a groove extending in the horizontal direction, and a second pen receiving portion **23** for the half-cut and writing, constituted by a surface extending in the horizontal direction, on the stage **13**, spaced apart in the conveyance direction of the sheet **12**. In this embodiment, the first position where the pen tool **17** is attached is located above the first pen receiving portion **22**, and the second position is located above the second pen receiving portion **23**. Therefore, it is possible to provide a cutting plotter that can easily switch between a mode for performing full-cut and a mode for performing half-cut or drawing.

Engaging Structure

[0092] With respect to the conventional tool holder **3** shown in FIGS. **17-19**, the following issues have also been pointed out regarding the structure for fixing the cutting pen **2** to the tool holder **3**.

[0093] The first issue is that, when attaching the cutting pen **2** to the front pen holding portion **8**, the threading amount of the screw member **6** is small, and therefore the screw member **6** tends to fall out of the main body **5** easily. This issue can be solved by lengthening the external thread **6***a* but adopting such a configuration makes the pen carriage **1** larger.

[0094] The second issue is that, when attaching the cutting pen **2** to the rear pen holding portion **9**, the number of times the screw member **6** is rotated is large, making the work troublesome and the working time longer.

[0095] The third issue is that, when the cutting pen **2** is fixed to the front pen holding portion **8** or the rear pen holding portion **9**, the direction of the reaction force acting on the screw member **6** coincides with the longitudinal direction of the screw member **6**. Accordingly, the screw member **6** is likely to loosen due to the reaction force, and the reliability in maintaining the holding force for holding the cutting pen **2** is low.

[0096] The fourth issue is that mistakes may be made in positions of the flange **2***b* of the cutting pen **2** and the upper protrusion **7***a* of the tool fastener **7**, in the up-down direction. That is, there are cases where the screw member **6** is tightened while the upper protrusion **7***a* overlaps above the flange **2***b*. In such cases, the cutting pen **2** may be disconnected by moving upwards out of the main body **5** during full-cut or half-cut.

[0097] With respect to these issues, the cutting plotter **11** according to this embodiment can provide a cutting plotter that prevents parts from falling off, improves operability and prevents incorrect installation, enhances holding force, etc., regarding the fixing structure of the pen tool **19** including the cutting pen **17**.

[0098] In the cutting plotter **11** according to this embodiment, the upper pressing fragment **42** has a protrusion **50** that overlaps the flange **29** of the pen tool **17** from above while the pen tool **17** is pressed against the front inner wall surface **30** or the rear inner wall surface **31**, as shown in FIGS. **10** and **11**. As a result of the protrusion **50** overlapping the flange **29** placed on the recessed portion **28**, the flange **29** is sandwiched by the recessed portion **28** and the protrusion **50** in the up-down direction, disabling the movement in the up-down direction. That is, the supporting member **25** and the sliding member **26** are provided with an engaging structure **51** that engages with the pen tool **17** to restrict up-down movement relative to the supporting member **25** of the pen tool **17** while the

pen tool **17** is pressed against the front end or rear end of the through hole **24**.
[0099] In this embodiment, the upper pressing fragment **42** of the sliding member **26** is arranged above the supporting member **25**, and the lower pressing fragment **43** of the sliding member **26** is arranged below the supporting member **25**. Accordingly, it is possible to apply a pressing force to parts of the pen tool **17** higher or lower than the supporting member **25**, and therefore it is possible to perform cutting and drawing with high precision without the pen tool **17** being inclined.
[0100] In the cutting plotter **11** according to this embodiment, the pressing mechanism **27** includes: a presser **52** attached to the supporting member **25** by the screw member **36**; and a front pressure receiving surface **62** and a rear pressure receiving surface **63** formed on the sliding member **26** so as to face the presser **52**. The presser **52** and the front and rear pressure receiving surfaces **62** and **63** constitute a cam **64** for converting the pressing force applied from the presser **52** to the front pressure receiving surface **62** or the rear pressure receiving surface **63** into a driving force that moves the sliding member **26** in the front-rear direction.
[0101] Therefore, compared to a conventional configuration where the direction of advancement of the screw member is the same as the direction in which the pen tool is pressed against the pen holding portion, the direction (front-rear direction) of the reaction force acting on the presser **52** during pressing is perpendicular to the axial direction (left-right direction) of the screw member **36**, making it harder for the screw member **36** to loosen. Moreover, according to this embodiment, the amount of rotation of the screw member **36** is approximately the same between the case where the pen tool **17** is attached on the first position and the case where the pen tool **17** is attached on the second position.
[0102] Thus, compared to adopting a conventional structure, it is possible to provide a cutting plotter that has improved performance in terms of preventing parts from falling off, operability, and holding force.
[0103] In the cutting plotter **11** according to this embodiment, the pressing mechanism **27** is constituted by a protrusion **45** of the sliding member **26** having the front and rear pressure receiving surfaces **62** and **63**, and the presser **52** attached to the supporting member **25** by the screw member **36**. However, the present invention is not limited to such a configuration. For example, it is also possible to employ a so-called rotary cam, which moves the sliding member **26** in the front-rear direction by a rotor rotatably attached to the supporting member.
[0104] In the cutting plotter **11** according to this embodiment, the engaging structure **51** is constituted by: a recessed portion **28** which is formed on an upper portion of the opening on the through hole **24** of the supporting member **25** such that a flange **29** of the pen tool **17** is placed thereon; and protrusions **50** formed on the front and rear ends of the upper pressing fragment **42** of the sliding member **26** so as to overlap the flange **29** from above.
[0105] Therefore, when attaching the pen tool **17** to the first position or the second position, the flange **29** of the pen tool **17** is always positioned below the protrusions **50** of the upper pressing fragment **42**, thereby ensuring reliable prevention of incorrect attachment of the pen tool **17**.
[0106] In the above-described embodiment, an example is shown where the first pen receiving portion **22** is positioned on the front side of the second pen receiving portion **23**. However, the present invention can also be applied to cases where the second pen receiving portion **23** is provided on the front side of the first pen receiving portion **22**. In this case, a writing tool is attached to the first position above the second pen receiving portion **23**.
[0107] As described above, the cutting plotter according to this embodiment allows to selectively use the two pen holding portions without removing and inserting the cutting pen.
[0108] With respect to the fixing structure of the pen tool **19**, it is possible to provide a cutting plotter that improves performance by, for example, preventing parts from falling off, improving operability and preventing incorrect installation, and enhancing holding power.
[0109] The embodiment of the present invention has been described above. However, the present invention is not limited to the above embodiment. Various modifications, as can be understood by

those skilled in the art, can be made to the configuration and details of the present invention within the scope of the invention.

APPENDICES

[0110] The following Appendices are also disclosed in relation to the above-described embodiment:

Appendix 1

[0111] A cutting plotter comprising: [0112] a stage (**13**) configured to support a medium-to-be-cut (**12**); [0113] a conveyance mechanism (**14**) configured to convey a medium-to-be-cut placed on the stage along a surface of the stage in a first bidirectional direction; [0114] a guide rail (**16***a*) which is spaced apart from the surface of the stage and which extends in a second bidirectional direction parallel to the surface of the stage and intersecting with the first bidirectional direction; [0115] a pen carriage (**16**) configured to move along the guide rail above the stage; and [0116] a tool holder (**21**) which is supported by the pen carriage movable in a third bidirectional direction perpendicular to the first bidirectional direction and the second bidirectional direction and which holds a pen tool in a posture in which the pen tool extends in the third bidirectional direction, wherein the tool holder (**21**) comprises: [0117] a supporting member (**25**) having a through hole (**24**) into which the pen tool is to be inserted; [0118] a sliding member (**26**) supported by the supporting member movably along the first bidirectional direction; and [0119] a pressing mechanism (**45**, **52**, **36**) configured to selectively bias the sliding member in either direction along the first bidirectional direction relative to the supporting member, [0120] the through hole (**24**) has an oblong shape extending longer along the first bidirectional direction when viewed from the third bidirectional direction such that the pen tool is movable in the through hole from one end to the other along the first bidirectional direction, and the sliding member (**26**) comprises: [0121] a first pressing portion (**46**, **47**) for pressing the pen tool onto one side, in the first bidirectional direction, of an inner wall on the through hole by moving the pen tool in one direction along the first bidirectional direction relative to the supporting member; and [0122] a second pressing portion (**48**, **49**) for pressing the pen tool onto the other side, in the first bidirectional direction, of the inner wall on the through hole by moving the pen tool in the other direction along the first bidirectional direction relative to the supporting member.

Appendix 2

[0123] The cutting plotter according to Appendix 1, wherein [0124] the first pressing portion (**46**, **47**) and the second pressing portion (**48**, **49**) of the sliding member are provided on one side and the other side, in the third bidirectional direction, of the supporting member, respectively.

Appendix 3

[0125] The cutting plotter according to Appendix 1 or 2, wherein [0126] the pressing mechanism (**45**, **52**, **36**) includes: [0127] a pressure receiving surface (**62**, **63**) formed on the sliding member; [0128] a presser (**52**) arranged to face the pressure receiving surface; and [0129] a screw member (**36**) for attaching the presser to the supporting member, [0130] the pressure receiving surface (**62**, **63**) and the presser (**52**) constitutes a cam for converting a pressure force along the second bidirectional direction applied to the pressure receiving surface from the presser by the screw member (**36**) into a driving force that moves the sliding member (**26**) along the first bidirectional direction.

Appendix 4

[0131] The cutting plotter according to any one of Appendices 1-3, wherein [0132] the supporting member (**25**) and the sliding member (**26**) includes an engaging structure (**28**, **29**, **51**) for restricting movement of the pen tool in the second bidirectional direction relative to the supporting member by engaging with the pen tool (**19**) while the pen tool (**19**) is pressed onto the one side (**30**) and the other side (**31**), in the first bidirectional direction, of the inner wall on the through hole (**24**), respectively.

Appendix 5

[0133] The cutting plotter according to Appendix 4, wherein [0134] the engaging structure (**28**, **29**,

51) is constituted by: [0135] a recessed portion (**28**) which is formed on a peripheral edge of an opening on the through hole on an upper side of the supporting member and on which a flange (**29**) is placed on an outer circumference of the pen tool; and [0136] a protrusion (**51**) which is arranged on the first pressing portion and the second pressing portion of the sliding member such that the flange (**29**) is sandwiched between the protrusion and a top surface of the recessed portion on the supporting member.

Appendix 6

[0137] The cutting plotter according to any one of Appendices 1-5, wherein [0138] the stage (**13**) includes a first pen receiving portion (**22**) for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion (**23**) for the half-cut and writing constituted by a surface extending along the second bidirectional direction, [0139] the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and [0140] when a position of the pen tool pressed against the one side (**30**), in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side (**31**), in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

REFERENCE SIGNS LIST

[0141] **11** . . . cutting plotter, **12** . . . sheet, **13** . . . stage, **16** . . . pen carriage, **17** . . . pen tool, **21** . . . tool holder, **22** . . . first pen receiving portion, **23** . . . second pen receiving portion, **24** . . . through hole, **25** . . . supporting member, **26** . . . slide member, **27** . . . pressing mechanism, **28** . . . recessed portion, **29** . . . flange, **36** . . . screw member, **46** . . . rear end of upper pressing fragment (first pressing portion), **47** . . . rear end of lower pressing fragment (first pressing portion), **48** . . . front end of upper pressing fragment (second pressing portion), **49** . . . front end of lower pressing fragment (second pressing portion), **51** . . . engaging structure, **52** . . . presser, **62** . . . front pressure receiving surface, **63** . . . rear pressure receiving surface, **64** . . . cam, **50** . . . protrusion

Claims

1. A cutting plotter comprising: a stage configured to support a medium-to-be-cut; a conveyance mechanism configured to convey a medium-to-be-cut placed on the stage along a surface of the stage in a first bidirectional direction; a guide rail which is spaced apart from the surface of the stage and which extends in a second bidirectional direction parallel to the surface of the stage and intersecting with the first bidirectional direction; a pen carriage configured to move along the guide rail above the stage; and a tool holder which is supported by the pen carriage movable in a third bidirectional direction perpendicular to the first bidirectional direction and the second bidirectional direction and which holds a pen tool in a posture in which the pen tool extends in the third bidirectional direction, wherein the tool holder comprises: a supporting member having a through hole into which the pen tool is to be inserted; a sliding member supported by the supporting member movably along the first bidirectional direction; and a pressing mechanism configured to selectively bias the sliding member in either direction along the first bidirectional direction relative to the supporting member, the through hole has an oblong shape extending longer along the first bidirectional direction when viewed from the third bidirectional direction such that the pen tool is movable in the through hole from one end to the other along the first bidirectional direction, and the sliding member comprises: a first pressing portion for pressing the pen tool onto one side, in the first bidirectional direction, of an inner wall on the through hole by moving the pen tool in one direction along the first bidirectional direction relative to the supporting member; and a second pressing portion for pressing the pen tool onto the other side, in the first bidirectional direction, of

the inner wall on the through hole by moving the pen tool in the other direction along the first bidirectional direction relative to the supporting member.

2. The cutting plotter according to claim 1, wherein the first pressing portion and the second pressing portion of the sliding member are provided on one side and the other side, in the third bidirectional direction, of the supporting member, respectively.

3. The cutting plotter according to claim 1, wherein the pressing mechanism includes: a pressure receiving surface formed on the sliding member; a presser arranged to face the pressure receiving surface; and a screw member for attaching the presser to the supporting member, the pressure receiving surface and the presser constitutes a cam for converting a pressure force along the second bidirectional direction applied to the pressure receiving surface from the presser by the screw member into a driving force that moves the sliding member along the first bidirectional direction.

4. The cutting plotter according to claim 1, wherein the supporting member and the sliding member includes an engaging structure for restricting movement of the pen tool in the second bidirectional direction relative to the supporting member by engaging with the pen tool while the pen tool is pressed onto the one side and the other side, in the first bidirectional direction, of the inner wall on the through hole, respectively.

5. The cutting plotter according to claim 4, wherein the engaging structure is constituted by: a recessed portion which is formed on a peripheral edge of an opening on the through hole on an upper side of the supporting member and on which a flange is placed on an outer circumference of the pen tool; and a protrusion which is arranged on the first pressing portion and the second pressing portion of the sliding member such that the flange is sandwiched between the protrusion and a top surface of the recessed portion on the supporting member.

6. The cutting plotter according to claim 1, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

7. The cutting plotter according to claim 2, wherein the pressing mechanism includes: a pressure receiving surface formed on the sliding member; a presser arranged to face the pressure receiving surface; and a screw member for attaching the presser to the supporting member, the pressure receiving surface and the presser constitutes a cam for converting a pressure force along the second bidirectional direction applied to the pressure receiving surface from the presser by the screw member into a driving force that moves the sliding member along the first bidirectional direction.

8. The cutting plotter according to claim 2, wherein the supporting member and the sliding member includes an engaging structure for restricting movement of the pen tool in the second bidirectional direction relative to the supporting member by engaging with the pen tool while the pen tool is pressed onto the one side and the other side, in the first bidirectional direction, of the inner wall on the through hole, respectively.

9. The cutting plotter according to claim 8, wherein the engaging structure is constituted by: a recessed portion which is formed on a peripheral edge of an opening on the through hole on an upper side of the supporting member and on which a flange is placed on an outer circumference of the pen tool; and a protrusion which is arranged on the first pressing portion and the second pressing portion of the sliding member such that the flange is sandwiched between the protrusion and a top surface of the recessed portion on the supporting member.

10. The cutting plotter according to claim 2, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

11. The cutting plotter according to claim 3, wherein the supporting member and the sliding member includes an engaging structure for restricting movement of the pen tool in the second bidirectional direction relative to the supporting member by engaging with the pen tool while the pen tool is pressed onto the one side and the other side, in the first bidirectional direction, of the inner wall on the through hole, respectively.

12. The cutting plotter according to claim 11, wherein the engaging structure is constituted by: a recessed portion which is formed on a peripheral edge of an opening on the through hole on an upper side of the supporting member and on which a flange is placed on an outer circumference of the pen tool; and a protrusion which is arranged on the first pressing portion and the second pressing portion of the sliding member such that the flange is sandwiched between the protrusion and a top surface of the recessed portion on the supporting member.

13. The cutting plotter according to claim 3, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

14. The cutting plotter according to claim 4, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

15. The cutting plotter according to claim 5, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner

wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

16. The cutting plotter according to claim 9, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

17. The cutting plotter according to claim 8, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

18. The cutting plotter according to claim 12, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.

19. The cutting plotter according to claim 11, wherein the stage includes a first pen receiving portion for the full-cut constituted by a groove extending along the second bidirectional direction, and a second pen receiving portion for the half-cut and writing constituted by a surface extending along the second bidirectional direction, the first pen receiving portion and the second pen receiving portion are arranged spaced apart from each other in the first bidirectional direction, and when a position of the pen tool pressed against the one side, in the first bidirectional direction, of the inner wall on the through hole is a first position, and a position of the pen tool pressed against the other side, in the first bidirectional direction, of the inner wall on the through hole is a second position, the first position is located above either one of the first pen receiving portion and the second pen receiving portion and the second position is located above the other one of the first pen receiving portion and the second pen receiving portion.