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Lithography apparatus

Abstract

Provided is a lithography apparatus including a wafer stage, a cable connected to the wafer stage, the cable being configured to bend based on the wafer stage moving, a support unit configured to prevent the cable from sagging, the support unit including a plurality of clamps configured to restrict movement of the cable and a connection member connecting the plurality of clamps to each other, and a protective unit under the cable, the protective unit being configured to collide with the support unit based on the wafer stage moving, wherein the protective unit includes ultra-high molecular weight polyethylene (UHMWPE).

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

(1) This application claims priority to Korean Patent Application No. 10-2023-0051275 filed on Apr. 19, 2023 and Korean Patent Application No. 10-2023-0074306 filed on Jun. 9, 2023 in the Korean Intellectual Property Office, the disclosures of which are incorporated herein in their entireties by reference.

BACKGROUND

1. Field

(2) Embodiments of the present disclosure relate to a lithography apparatus, and more specifically, to a lithography apparatus using extreme ultraviolet (EUV).

2. Description of Related Art

(3) EUV lithography provides a finer pattern resolution than a resolution which can be achieved using optical lithography, and thus, is currently considered a candidate for next-generation lithography. Increasing the resolution using the EUV lithography stems from a fact that the optical

lithography is performed using a wavelength in a range of 150 to 250 nm, whereas the EUV lithography is performed using a wavelength in a range of 11 to 15 nm. In general, the shorter the wavelength of the light used for pattern imaging in lithography, the finer the resolution that can be obtained.
(4) An EUV lithography apparatus needs to move a mask and a wafer to form a pattern. The mask or the wafer moves on a stage. Particles are produced due to collision or abrasion between units connected to each other during an operation of the stage. These particles contaminate the wafer and cause decrease in yield.
(5) Therefore, a lithography apparatus that reduces the production of the particles during the operation of the stage is required.
SUMMARY
(6) embodiments are One or more embodiments provide a lithography apparatus in which a material usable in the lithography apparatus is used as a material of a protective unit such that particle production is reduced.
(7) According to an aspect of an embodiment, there is provided a lithography apparatus including a wafer stage, a cable connected to the wafer stage, the cable being configured to bend based on the wafer stage moving, a support unit configured to prevent the cable from sagging, the support unit including a plurality of clamps configured to restrict movement of the cable and a connection member connecting the plurality of clamps to each other, and a protective unit under the cable, the protective unit being configured to collide with the support unit based on the wafer stage moving, wherein the protective unit includes ultra-high molecular weight polyethylene (UHMWPE).
(8) According to another aspect of an embodiment, there is provided a lithography apparatus including a chamber, a body plate in the chamber, the body plate including a first surface and a second surface opposite to the first surface, a stage configured to move on the first surface of the body plate, a cable on the stage and extending to the second surface of the body plate, the cable being configured to bend based on the stage moving, a support unit configured to prevent the cable from sagging, a grounding unit on the support unit, and a protective unit under the cable, the protective unit being configured to collide with the support unit, wherein the protective unit includes ultra-high molecular weight polyethylene (UHMWPE).
(9) According to another aspect of an embodiment, there is provided a lithography apparatus including a chamber, a wafer stage in the chamber and configured support a wafer, a cable on the wafer stage, the cable being configured to bend based on the wafer stage moving, a support unit configured to prevent the cable from sagging, the support unit includes a plurality of clamps configured to restrict movement of the cable and a connection member connecting the plurality of clamps to each other, a grounding unit on the support unit, and a protective unit under the cable, the protective unit being configured to collide the support unit based on the wafer stage moving, wherein the protective unit includes UHMWPE.

Description

BRIEF DESCRIPTION OF DRAWINGS
(1) The above and other aspects and features of the present disclosure will become more apparent by describing in detail illustrative embodiments thereof with reference to the attached drawings, in which:
(2) FIG. **1** is a diagram illustrating a lithography apparatus according to some embodiments;
(3) FIG. **2** is a diagram illustrating the wafer stage of FIG. **1** and a protective unit:
(4) FIG. **3** is a diagram illustrating a support unit of FIG. **2**:
(5) FIG. **4** and FIG. **5** are diagrams illustrating an operation of the wafer stage and a cable:
(6) FIG. **6** is a diagram illustrating a lithography apparatus according to some embodiments:

(7) FIG. **7** is a diagram illustrating a protective unit of a lithography apparatus according to some embodiments:
(8) FIG. **8** and FIG. **9** are diagrams illustrating a protective unit of a lithography apparatus according to some embodiments; and
(9) FIG. **10** is a diagram illustrating a lithography apparatus according to some embodiments.
DETAILED DESCRIPTIONS
(10) Embodiments described herein are example embodiments, and thus, the disclosure is not limited thereto.
(11) FIG. **1** is a diagram illustrating a lithography apparatus according to some embodiments.
(12) Referring to FIG. **1**, the lithography apparatus according to some embodiments may include a main chamber **200**, a first sub-chamber **210**, a second sub-chamber **220**, a third sub-chamber **230**, a reticle stage **250**, a reticle stage power supply **300**, a light source **400**, an illumination system mirror **501** and **502**, a projection optical-system mirror **601**, **602**, **603**, and **604**, and a wafer stage **100**.
(13) An inner space of the main chamber **200** may be maintained in a vacuum state. For example, an inner space of each of the first sub-chamber **210**, the second sub-chamber **220**, and the third sub-chamber **230** may be maintained in a vacuum state.
(14) The first sub-chamber **210** may be disposed in the main chamber **200**. At least one illumination system mirror **501** and **502** may be disposed in the first sub-chamber **210**.
(15) An exposure light reflected from the illumination system mirror **501** and **502** and then passing through the first sub-chamber **210** may reach a reticle **240** fixed to the reticle stage **250**. In order to increase efficiency in reflection of the exposure light, the inner space of the first sub-chamber **210** may be maintained in a vacuum state.
(16) The second sub-chamber **220** may be disposed in the main chamber **200**. At least one projection optical-system mirror **601**, **602**, **603**, and **604** may be disposed in the second sub-chamber **220**.
(17) The reticle stage **250** may be disposed on a top surface of the main chamber **200**. The reticle **240** may be fixed onto the reticle stage **250**. The reticle stage **250** may perform a scanning operation. The reticle stage **250** may perform a stepping operation.
(18) The reticle **240** may reflect the exposure light which has passed through the first sub-chamber **210** toward the second sub-chamber **220**. The exposure light which has passed through the first sub-chamber **210** may be incident on a first surface of the reticle where a pattern area is formed.
(19) A remaining portion of the exposure light not absorbed by the pattern area of the first surface of the reticle **240** may be incident on the first projection optical-system mirror **601** disposed in the second sub-chamber **220**.
(20) The exposure light reflected by the first surface of the reticle **240** into the second sub-chamber **220** may be sequentially reflected from the first to fourth projection optical-system mirrors **601**, **602**, **603**, and **604**, and then, may be transmitted into the third chamber **230**. For example, the exposure light reflected from the surface of the reticle **240** may be reflected from the projection optical-system mirrors **601**, **602**, **603**, and **604** and then may be transmitted onto a wafer on the wafer stage **100**. In order to increase efficiency in the reflection of the exposure light, the inner space of the second sub-chamber **220** may be maintained in a vacuum state.
(21) The reticle stage power supply **300** is electrically connected to the reticle **240** and the reticle stage **250**. Based on the reticle stage power supply **300** being connected to the reticle stage **250** and the reticle **240**, an electrostatic force is generated between the reticle stage **250** and the reticle **240**. For example, the reticle **240** may be fixed to the reticle stage **200** under the electrostatic force.
(22) The light source **400** may be positioned external to the main chamber **200**. The light source **400** may provide the exposure light used for lithography. The light source **400** may emit the exposure light to the illumination system mirrors **501** and **502** disposed in the first sub-chamber **210**.

(23) The light source **400** may be, for example, a discharge produced plasma (DPP) EUV light source, a laser produced plasma (LPP) EUV light source, a hybrid EUV light source, a synchrotron EUV light source, etc. However, embodiments are not limited thereto. The mirrors **501**, **502**, **601**, **602**, **603**, and **604** may be included in the first sub-chamber **210** and the second sub-chamber **220**. Each of the mirrors **501**, **502**, **601**, **602**, **603**, and **604** may be an oblique incidence mirror in which the exposure light emitted from the light source **400** is incident on a reflective surface of the mirror at an oblique incident angle, or a multi-layer mirror in which reflective surfaces are multi-layered.
(24) In order to transfer a fine pattern on the wafer, each of the projection optical-system mirrors **601**, **602**, **603**, and **604** may have a relatively high resolution. The number of mirrors **501**, **502**, **601**, **602**, **603**, and **604** may be, for example, six (6). However, embodiments are not limited thereto.
(25) The third sub-chamber **230** may be positioned in the main chamber **200**. The wafer stage **100** may be disposed in the third sub-chamber **230**. Although one wafer stage **100** is shown in the third sub-chamber **230**, embodiments are not limited thereto. For example, there may be two or more wafer stages **100** in the third sub-chamber **230**. The inner space of the third sub-chamber **230** may be maintained in a vacuum state.
(26) The wafer stage **100** may be disposed in the third sub-chamber **230**. The wafer stage **100** may load the wafer thereon. The wafer may be fixed onto the wafer stage **100**. The wafer stage **100** may be movable for fine alignment. The wafer stage **100** may perform the scanning operation and the stepping operation.
(27) Hereinafter, the wafer stage **100** and components around the wafer stage **100** will be described in detail.
(28) FIG. **2** is a diagram for illustrating the wafer stage of FIG. **1** and a protective unit. FIG. **3** is a diagram for illustrating a support unit of FIG. **2**. FIG. **4** and FIG. **5** are diagrams for illustrating an operation of the wafer stage and a cable.
(29) Referring to FIG. **2** to FIG. **5**, a lithography apparatus according to some embodiments may include a stage **100**, a body plate **101**, a cable **110**, a support unit **120**, a protective unit **130**, and a cable fixing member **140**.
(30) The body plate **101** may include a first surface **101**A and a second surface **101**B opposite to each other. The first surface **101**A of the body plate **101** may be a surface opposite to the second surface **101**B of the body plate **101**. The first surface **101**A and the second surface **101**B of the body plate **101** may be connected to each other via a side surface of the body plate **101**. The wafer stage **100** may be disposed on the first surface **101**A of the body plate **101**.
(31) The wafer stage **100** may move on the first surface **101**A of the body plate **101**. However, embodiments are not limited thereto. In some embodiments, the wafer stage **100** may move on the second surface **101**B of the body plate **101**. Hereinafter, it is assumed that the wafer stage **100** moves on the first surface **101**A of the body plate **101**.
(32) One end of the cable **110** may be connected to the wafer stage **100**. The cable **110** may extend in a length direction. The other end of the cable **110** may be fixed to the cable fixing member **140**. For example, lengths of sub-cables of the cable **110** extending from the cable fixing member **140** to the wafer stage **100** may be equal to each other. The cable **110** may be connected to the wafer stage **100** and may extend along the first surface **101**A, the side surface, and the second surface **101**B of the body plate **101**. The cable fixing member **140** may be disposed on the second surface **101**B of the body plate **101**.
(33) The cable **110** may include a plurality of sub-cables. Each of the plurality of sub-cables may extend in a length direction. The plurality of sub-cables may be clamped by a clamp **122** to be described later.
(34) The cable **110** may be used as a path for transmitting data. For example, the cable **110** may transmit a value sensed from a sensor provided on the wafer stage **100** to an optical system in the lithography apparatus. The cable **110** may deliver a signal generated from the optical system in the lithography apparatus to the wafer stage **100**.

(35) The cable **110** may include a flexible material. For example, a sheath of the cable **110** may include a fluorine (F)-based material. The cable **110** may be bent around the side surface of the body plate **101**.
(36) The cable **110** may be connected to the wafer stage **100** and thus may be used as a path along which air and/or water flows toward the wafer stage **110**.
(37) The wafer stage **100** may move in a first direction DR**1** and/or a second direction DR**2** and on the first surface **101**A of the body plate **101**. In this regard, the first direction DR**1** may be the length direction of the cable **110**. The second direction DR**2** may be a direction intersecting the first direction DR**1**. The first direction DR**1** and the second direction DR**2** may be parallel to the first surface **101**A of the body plate **101**.
(38) As the wafer stage **100** moves in the first direction DR**1**, the cable **110** connected to the wafer stage **100** also moves. As the wafer stage **100** moves in the first direction DR**1**, an amount by which the cable **110** is bent may vary. When the wafer stage **100** moves away from a center of the body plate **101**, the bent amount of the cable **110** may increase. In this case, sagging may occur at a lower portion of the cable **110**. For example, the sagging of the cable **110** may occur on the second surface **101**B of the body plate **101**. When the cable **110** sags excessively, the data transmitted via the cable **110** may be lost. Furthermore, a speed at which the data is transmitted through the cable **110** may be decreased. When the moving speed of the wafer stage **100** is reduced so as to compensate for the data transmission rate, a yield of EUV equipment may decrease.
(39) As the wafer stage **100** moves in the second direction DR**2**, the cable **110** connected to the wafer stage **100** also moves in the second direction. When the wafer stage **100** moves in the second direction DR**2**, the cable **110** may be twisted. When the cable **110** is twisted, the data transmitted through the cable **110** may be lost. Furthermore, a speed at which the data is transmitted through the cable **110** may be decreased.
(40) The support unit **120** may be coupled to the cable **110**. The support unit **120** may restrict the twisting of the cable **110**. The support unit **120** may prevent the sagging of the cable **110**. For example, the support unit **120** may prevent excessive sagging of the cable **110**. Furthermore, the support unit **120** is coupled to the cable **110**, thereby preventing the cable **110** from colliding with the body plate **101** when the wafer stage **100** moves.
(41) The support unit **120** may be disposed adjacent to a lower portion of the cable **110**. An upper portion of the cable **110** is a portion adjacent to the first surface **101**A of the body plate **101**, and the lower portion of the cable **110** is a portion adjacent to the second surface **101**B of the body plate **101**. When the cable **110** is bent, sagging occurs at the upper portion of the cable **110** due to gravity. Accordingly, the support unit **120** may be coupled to the lower portion of the cable **110** to restrict the sagging of the cable **110**.
(42) The support unit **120** may include a plurality of clamps **122** and a connection member **124**.
(43) The clamp **122** may include a first portion **122**A adjacent to and surrounding the cable **110** and a second portion **122**B disposed on each of both opposing sides of the first portion **122**A. The first portion **122**A of the clamp **122** may include a hole. The cable **110** may be received in the hole. The first portion **122**A of the clamp **122** surrounds the cable **110** and may restrict the movement of the cable **110**. For example, the clamp **122** may restrict the twisting of the cable **110**. The clamp **122** may clamp the sub-cables to each other so that they move as a single body.
(44) The plurality of clamps **122** may be spaced apart from each other in the length direction of the cable **110**. The plurality of clamps **122** spaced apart from each other may be coupled to each other via the connection member **124**.
(45) The connection member **124** may be coupled to the second portion **122**B of the clamp **122**. The connection member **124** may be coupled to the second portion **122**B of one clamp **122** and the second portion **122**B of another clamp **122** spaced apart from one clamp **122**. For example, one clamp **122** and another clamp **122** as spaced apart from each other may be coupled to each other via the connection member **124**, and thus may move as a single body.

(46) The connection member **124** may be disposed on each of the opposing sides of the clamp **122**. The connection member **124** may be spaced apart from the cable **110**. The cable **110** may be disposed in a space between the connection members **124**. As the wafer stage **100** moves, and thus the cable **110** is bent, the cable **110** may come into contact with the clamp **122**. However, in this case, the cable **110** may not contact the connection member **124**.
(47) The connection member **124** may be in a shape of a thin plate. The connection member **124** may include an elastic material. For example, the connection member **124** may include elastic stainless steel.
(48) The protective unit **130** may be disposed under the cable **110**. The protective unit **130** may collide with the support unit **120** as the wafer stage **100** moves. In some embodiments, the protective unit **130** may be positioned in a corresponding manner to the connection member **124** of the support unit **120**. For example, the protective unit **130** may be disposed on each of the opposing sides of the cable **110** so as to collide with the connection member **124** as the cable **110** sags.
(49) The protective unit **130** may include a protective unit frame **132** and a protective cover **134**.
(50) The protective unit frame **132** may be disposed on a lower frame. The protective unit frame **132** may be fixed to a lower frame. In some embodiments, the protective unit frame **132** may include a plastic material. However, embodiments are not limited thereto.
(51) The protective cover **134** may be disposed on the protective unit frame **132**. The protective cover **134** may be fixed onto the protective unit frame **132**.
(52) The protective cover **134** may cover an upper surface of the protective unit frame **132**. The protective cover **134** may collide with the connection member **124**. The protective cover **134** covers the upper surface of the protective unit frame **132** such that the protective unit frame **132** may not directly collide with the connection member **124**.
(53) A width of the protective cover **134** may be equal to a width of the connection member **124**. However, embodiments are not limited thereto. In some embodiments, the width of the protective cover **134** may be different from the width of the connection member **124**. When the width of the protective cover **134** is greater than the width of the connection member **124**, the width of the protective unit frame **132** may have a size such that the protective unit frame **132** does not collide with the cable **110**. When the protective cover **134** and the connection member **124** collide with each other, the protective cover **134** may be spaced apart from the cable **110** and may not collide therewith.
(54) A length of the protective cover **134** may be equal to or smaller than a length of the connection member **124**. While the wafer stage **100** moves, the protective cover **134** may collide with the connection member **124**, and the protective cover **134** may not collide with the clamp **122**. For example, when the protective cover **134** and the connection member **124** collide with each other, the protective cover **134** may be disposed between the clamps **122** spaced apart from each other.
(55) The protective unit **130** may be made of ultra high molecular weight polyethylene (UHMWPE). For example, the protective cover **134** of the protective unit **130** may include the UHMWPE. However, embodiments are not limited thereto. In some embodiments, the protective cover **134** may include a material having a molecular weight greater than several million grams per 1 mol. In addition, when the material is abraded to particles which in turn are dispersed into gas, substances other than carbon (C) and hydrogen (H) should not be produced. When the particle includes substances other than carbon (C) and hydrogen (H), the substance may react with the plasma in the lithography apparatus, such that the operation of the lithography apparatus may be stopped.
(56) In the lithography apparatus according to some embodiments, the protective unit **130** may not include the protective unit frame **132**. The protective unit **130** may be composed of only the protective cover **134**. In this case, the protective cover **134** may be fixed to the lower frame. The protective cover **134** may collide with the connection member **124**.
(57) Referring to FIG. **4** and FIG. **5**, the operation of the cable **110**, the support unit **120** and the

protective unit **130** is described.

(58) As shown in FIG. **4**, sagging may not occur at the lower portion of the cable **110** depending on a location of the wafer stage **100**. The support unit **120** may be disposed along a curved surface of the cable **110**. The support unit **120** may be disposed on the side surface of the body plate **101**. The support unit **120** may be spaced apart from the protective unit **130**. The support unit **120** may not collide with the protective unit **130**.

(59) As shown in FIG. **5**, the wafer stage **100** may move. As the wafer stage **100** moves in the first direction DR**1**, a length of a portion of the cable **110** disposed on the first surface **101**A of the body plate **101** may be reduced. On the other hand, a length of a portion of the cable **110** disposed on the second surface **101**B of the body plate **101** may be increased. As the length of the portion of the cable **110** on the second surface **101**B of the body plate **101** increases, the lower portion of the cable **110** may sag.

(60) The support unit **120** may partially restrict the sagging of the lower portion of the cable **110**. Furthermore, the support unit **120** may collide with the protective unit **130** to partially restrict the sagging of the lower portion of the cable **110**. The support unit **120** may restrict the sagging and the twisting of the cable **110**, compared to a case in which the support unit **120** is absent. The support unit **120** may collide with the protective unit **130** such that the lower portion of the cable **110** is supported thereon so as to be flat.

(61) In the lithography apparatus according to related art, the wafer stage **100** may reciprocate in the first direction DR**1**. As a result, the support unit **120** and the protective unit **130** may continuously collide with each other. Due to the collision, particles may be produced from the support unit **120** and the protective unit **130**. For example, when there is no protective cover **134** of the protective unit **130**, the collision occurs between the support unit **120** and the protective unit frame **132**. The collision results in production of metal or plastic-based particles. The particles may scatter and contaminate the wafer. Thus, the yield of the lithography apparatus may be reduced.

(62) However, in the lithography apparatus according to embodiments, the protective cover **134** of the protective unit **130** may be made of a polymer having a molecular weight of several million grams or larger per 1 mol, and does not produce an element other than carbon (C) and hydrogen (H) when wearing out. The protective cover **134** may include, for example, the UHMWPE. When the UHMWPE is used as the material of the protective cover **134**, an amount of the produced particles may be reduced compared to that when a plastic or metal-based material is used as the material of the protective cover **134**. Furthermore, the UHMWPE has a mean free path. Thus, even when the particles made thereof are produced, a probability at which the particles scatter and reach to the wafer is low.

(63) Therefore, the protective unit **130** including the protective cover **134** according to embodiments may reduce the production of the particles in the lithography apparatus. Thus, reliability of the lithography apparatus may be improved, and a process yield may be improved.

(64) FIG. **6** is a diagram for illustrating a lithography apparatus according to some embodiments. For the convenience of description, the following description is based on differences thereof from those as set forth above with reference to FIG. **1** to FIG. **5**.

(65) Referring to FIG. **6**, the lithography apparatus according to some embodiments may further include a grounding unit **170**.

(66) The grounding unit **170** may be connected to the support unit **120**. The grounding unit **170** may be connected to the connection member **124** of the support unit **120**, for example. The grounding unit **170** may remove electrical energy stored in the support unit **120**.

(67) As the wafer stage **100** moves in the first direction DR**1**, collision and friction between the support unit **120** and the protective unit **130** may occur. As the wafer stage **100** repeatedly moves, the electrical energy stored in the support unit **120** may increase due to the friction. The grounding unit **170** may remove the electrical energy. As the electrical energy of the support unit **120** is removed, carbonization of the support unit **120** and units around the support unit **120** may be

avoided. Furthermore, since the electrical energy of the support unit **120** is removed, the production of particles may be reduced.
(68) FIG. **7** is a diagram for illustrating a protective unit of a lithography apparatus according to some embodiments. For the convenience of description, the following description is based on differences thereof from those as set forth above with reference to FIG. **1** to FIG. **5**.
(69) Referring to FIG. **7**, the protective unit **130** may include the protective unit frame **132** and the protective cover **134**.
(70) The description of the protective unit frame **132** is the same as described above.
(71) The protective unit cover **134** may cover an upper surface and a side surface of the protective unit frame **132**. The upper surface of the protective unit cover **134** may collide with the connection member **124**.
(72) The width of the protective cover **134** may be equal to the width of the connection member **124**. However, embodiments are not limited thereto. In some embodiments, the width of the protective cover **134** may be different from the width of the connection member **124**. When the width of the protective cover **134** is greater than the width of the connection member **124**, the width of the protective unit frame **132** may be sized such that the protective unit frame **132** does not collide with the cable **110**. When the protective cover **134** and the connection member **124** collide with each other, the protective cover **134** may be spaced from the cable **110** and may not collide therewith.
(73) The length of the protective cover **134** may be equal to or smaller than the length of the connection member **124**. While the wafer stage **100** moves, the protective cover **134** may collide with the connection member **124**, and the protective cover **134** may not collide with the clamp **122**. For example, when the protective cover **134** and the connection member **124** collide with each other, the protective cover **134** may be disposed between the clamps **122** spaced from each other.
(74) The protective cover **134** in FIG. **7** may include a larger amount of UHMWPE, compared to that of the protective cover **134** as described in FIG. **1** to FIG. **5**. In this case, a surface roughness Ra and a density of the UHMWPE may be changed such that the properties thereof may be improved. For example, as the properties of the UHMWPE are improved, an amount of particles produced in the protective cover **134** may be reduced.
(75) FIG. **8** and FIG. **9** are diagrams for illustrating a protective unit of a lithography apparatus according to some embodiments. For the convenience of description, the following description is based on differences thereof from those as set forth above with reference to FIG. **1** to FIG. **5** and FIG. **7**.
(76) Referring to FIG. **8**, the protective unit **130** may include a plurality of protective unit frames **132** and the protective cover **134**.
(77) The plurality of protective unit frames **132** may include a first protective unit frame **132_1** and a second protective unit frame **132_2**. The first protective unit frame **132_1** and the second protective unit frame **132_2** may be spaced apart from each other in the second direction DR**2**. The protective cover **134** may cover an upper surface of the first protective unit frame **132_1** and an upper surface of the second protective unit frame **132_2**. The protective cover **134** may extend from the first protective unit frame **132_1** to the second protective unit frame **132_2**.
(78) The length of the protective cover **134** may be equal to or smaller than the length of the connection member **124**. While the wafer stage **100** moves, the protective cover **134** may collide with the connection member **124**, and the protective cover **134** may not collide with the clamp **122**. For example, when the protective cover **134** and the connection member **124** collide with each other, the protective cover **134** may be disposed between the clamps **122** spaced apart from each other.
(79) Referring to FIG. **9**, the protective cover **134** may cover a side surface of the first protective unit frame **132_1** and a side surface of the second protective unit frame **132_2**.
(80) The protective cover **134** in FIG. **8** and FIG. **9** may include a larger amount of the UHMWPE,

compared to that of the protective cover **134** as described in FIG. **1** to FIG. **5**. In this case, a surface roughness Ra and a density of the UHMWPE may be changed such that the properties thereof may be improved. For example, as the properties of the UHMWPE are improved, an amount of particles produced in the protective cover **134** may be reduced.

(81) FIG. **10** is a diagram for illustrating a lithography apparatus according to some embodiments. For the convenience of description, the following description is based on differences thereof from those as set forth above with reference to FIG. **1** to FIG. **5**.

(82) Referring to FIG. **10**, the lithography apparatus according to some embodiments may include a first cable **110_1** and a second cable **110_2**.

(83) The first cable **110_1** and the second cable **110_2** may be connected to the wafer stage **100**. Each of the first cable **110_1** and the second cable **110_2** may extend in the first direction DR**1**.

(84) One end of each of the first cable **110_1** and the second cable **110_2** may be connected to the wafer stage **100**. The other end of each of the first cable **110_1** and the second cable **110_2** may be fixed to the cable fixing member **140**. Each of the first cable **110_1** and the second cable **110_2** may extend in a length direction. For example, sub-cables of each of the first cable **110_1** and the second cable **110_2** extending from the cable fixing member **140** to the wafer stage **100** may be equal to each other. Each of the first cable **110_1** and the second cable **110_2** may be connected to the wafer stage **100** and may extend along the first surface **101**A, the side surface, and the second surface **101**B of the body plate **101**.

(85) The first cable **110_1** may be spaced apart from the second cable **110_2** in the second direction DR**2**. Each of the first cable **110_1** and the second cable **110_2** may be used as a path for transmitting data.

(86) The support unit **120** may include a first clamp **122_1**, a second clamp **122_2** and the connection member **124**.

(87) The first clamp **122_1** may clamp the sub-cables of the first cable **110_1** with each other. The first clamp **122_1** may restrict the movement of the first cable **110_1**. For example, the first clamp **122_1** may restrict twisting of the first cable **110_1**.

(88) The second clamp **122_2** may clamp the sub-cables of the second cable **110_2** with each other. The second clamp **122_2** may restrict the movement of the second cable **110_2**. For example, the second clamp **122_2** may restrict twisting of the second cable **110_2**. The number of sub-cables which each of the first clamp **122_1** and the second clamp **122_2** clamp with each other may be smaller than that which the clamp **122** in FIG. **1** to FIG. **5** clamp with each other. For example, the number of sub-cables which each of the first clamp **122_1** and the second clamp **122_2** clamp with each other may be reduced. Thus, the twisting of each of the first cable **110_1** and the second cable **110_2** may be reduced when the wafer stage **100** moves.

(89) The first clamp **122_1** and the second clamp **122_2** may be integrally formed with each other. The clamp **122** may include the first portion **122**A surrounding the cable **110** and the second portion **122**B disposed on each of each of both opposing sides of the first portion **122**A. That is, when the clamp **122** includes the first clamp **122_1** and the second clamp **122_2**, the number of the first portions **122**A may be two, and the number of the second portions **122**B may be three.

(90) The connection member **124** may couple to the second portion **122**B. The connection member **124** may be coupled to the second portion **122**B of one clamp **122** and the second portion **122**B of another clamp **122** spaced apart therefrom. For example, one clamp **122** and another clamp **122** spaced apart from each other may be coupled to each other via the connection member **124** and thus may move as a single body. The number of the connection members **124** may be equal to the number of the second portions **122**B of the clamp **122**.

(91) The lithography apparatus according to some embodiments may include a plurality of protective units **130**. The number of the protective units **130** may correspond to the number of the connection members **124**. For example, when the number of the connection members **124** is three, the number of the protective units **130** may be three.

(92) While embodiments have been described with reference to the figures, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope as defined by the following claims and their equivalents.

Claims

1. A lithography apparatus comprising: a wafer stage; a cable connected to the wafer stage, the cable being configured to bend based on the wafer stage moving; a support unit configured to prevent the cable from sagging, the support unit comprising a plurality of clamps configured to restrict movement of the cable and a connection member connecting the plurality of clamps to each other; and a protective unit under the cable, the protective unit being configured to collide with the support unit based on the wafer stage moving, wherein the protective unit comprises ultra-high molecular weight polyethylene (UHMWPE).
2. The lithography apparatus of claim 1, wherein the protective unit further comprises a protective unit frame and a protective cover on the protective unit frame, and wherein the protective cover comprises UHMWPE.
3. The lithography apparatus of claim 2, wherein the connection member is configured to collide with the protective unit based on the cable being bent.
4. The lithography apparatus of claim 1, further comprising a grounding unit connected to the support unit.
5. The lithography apparatus of claim 1, wherein each of the plurality of clamps comprises a first portion adjacent to the cable and a second portion on each of opposing sides of the first portion, and wherein the connection member is on the second portion.
6. The lithography apparatus of claim 5, wherein the protective unit is configured to collide with the connection member and not collide with the plurality of clamps.
7. The lithography apparatus of claim 1, further comprising a lower frame, the protective unit being on the lower frame, wherein the lower frame is configured to not collide with the cable.
8. The lithography apparatus of claim 1, wherein the connection member is configured to not contact the cable.
9. The lithography apparatus of claim 1, wherein the protective unit further comprises a protective unit frame and a protective cover on an upper surface and side surfaces of the protective unit frame, and wherein the protective cover comprises UHMWPE.
10. The lithography apparatus of claim 1, wherein the connection member comprises stainless steel.
11. A lithography apparatus comprising: a chamber; a body plate in the chamber, the body plate comprising a first surface and a second surface opposite to the first surface; a stage configured to move on the first surface of the body plate; a cable on the stage, the cable extending to the second surface of the body plate, the cable being configured to bend based on the stage moving; a support unit configured to prevent the cable from sagging; a grounding unit on the support unit; and a protective unit under the cable, the protective unit being configured to collide with the support unit, wherein the protective unit comprises ultra-high molecular weight polyethylene (UHMWPE).
12. The lithography apparatus of claim 11, wherein the support unit comprises a plurality of clamps configured to restrict movement of the cable and a connection member connecting the plurality of clamps to each other.
13. The lithography apparatus of claim 12, wherein the connection member is configured to collide with the protective unit based on the cable being bent.
14. The lithography apparatus of claim 12, wherein the connection member is on each of opposing sides of the cable.
15. The lithography apparatus of claim 11, wherein the protective unit further comprises a protective unit frame and a protective cover on the protective unit frame, and wherein the

protective cover comprises UHMWPE.
16. The lithography apparatus of claim 11, wherein the stage comprises a wafer stage configured to support a wafer.
17. The lithography apparatus of claim 11, further comprising a lower frame, the protective unit being on the lower frame, wherein the lower frame is configured to not collide with the cable.
18. The lithography apparatus of claim 11, wherein the protective unit further comprises a protective unit frame and a protective cover on an upper surface and side surfaces of the protective unit frame, and wherein the protective cover comprises UHMWPE.
19. A lithography apparatus comprising: a chamber; a wafer stage in the chamber, the wafer stage being configured support a wafer; a cable on the wafer stage, the cable being configured to bend based on the wafer stage moving; a support unit configured to prevent the cable from sagging, the support unit comprises a plurality of clamps configured to restrict movement of the cable and a connection member connecting the plurality of clamps to each other; a grounding unit on the support unit; and a protective unit under the cable, the protective unit being configured to collide the support unit based on the wafer stage moving, wherein the protective unit comprises ultra-high molecular weight polyethylene (UHMWPE).
20. The lithography apparatus of claim 19, wherein the protective unit further comprises a protective unit frame and a protective cover on the protective unit frame, and wherein the protective cover comprises UHMWPE.