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(71) Applicant: **Samwoeco Co., Ltd.**
Gwangyang-si, Jeollanam-do 57759 (KR)

(72) Inventors:
• **HEO, Ki Bok**
Suncheon-si, Jeollanam-do 57947 (KR)
• **KIM, Youn Ja**
Gwangyang-si, Jeollanam-do 57798 (KR)
• **HEO, Sung**
Suncheon-si, Jeollanam-do 57947 (KR)
• **JOO, Deok Bong**
Suncheon-si, Jeollanam-do 57947 (KR)
• **JEONG, Seung Kil**
Suncheon-si, Jeollanam-do 58015 (KR)

(74) Representative: **BCKIP Part mbB**
Siegfriedstraße 8
80803 München (DE)

(54) **BAFFLE DEVICE FOR HOT-DIP PLATING PROCESS**

(57) Proposed is a baffle apparatus for a hot-dip plating process. The baffle apparatus includes a baffle plate and a support supporting the baffle plate from above the baffle plate. The support includes an upper support provided with a first insertion groove, a second insertion groove, and a first fixing member. In addition, the support further includes a lower support provided with a first roller, a second roller, and a second fixing member. For coupling the upper support to the lower support, the first and the second rollers are inserted into the first and second insertion grooves. When the first roller and the second roller are inserted into the first insertion groove and the second insertion groove, the first fixing member and the second fixing member are in close contact with each other, thereby preventing a movement of the lower support with respect to the upper support.

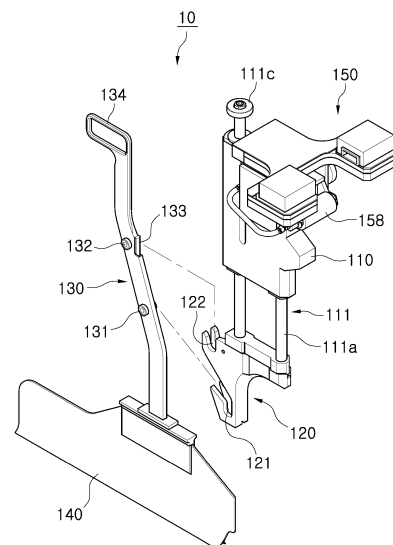


FIG. 4

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Description

Technical Field

[0001] An embodiment of the present disclosure relates to a baffle apparatus which includes a baffle plate and which is used together with an air knife in a hot-dip plating process.

Background Art

[0002] Generally, in a hot-dip plating process, an air knife may be used to maintain a constant thickness of a metal (for example, zinc (Zn) and so on) being plated to a steel sheet, and a baffle apparatus may be used to prevent a vortex generated by a gas (for example, air and so on) from the air knife from adversely affecting a process.

[0003] Plating equipment for a hot-dip plating process is illustrated in FIG. 10. Referring to FIG. 10, an air knife 3 may be mounted such that a pair of air knives 3 is spaced apart from each other by a predetermined distance at a rear end of a plating bath 2 and face each other, and a steel sheet may pass between the pair of air knives 3 after the steel sheet is deposited in a molten metal inside the plating bath 2. The steel sheet may be a plated steel sheet 1 which is deposited in the molten metal and on which the molten metal is attached to a surface thereof, and the pair of air knives 3 may adjust the amount of molten metal attached to the plated steel sheet 1 by jetting gas at high pressure on the plated steel sheet 1 from the front and rear sides of the plated steel sheet 1.

[0004] The baffle apparatus may include a baffle plate (see reference numeral 140 in FIG. 1). In the baffle apparatus, a pair of baffle apparatuses is disposed at left and right sides of the plated steel sheet 1, and the baffle plates perform a blocking action so as to prevent high-pressure gas jetted from the pair of air knives 3 from occurring collision of gas on both sides of the plated steel sheet 1, so that a vortex due to the collision of the high-pressure gas on the both sides of the plated steel sheet 1 may be prevented from being generated.

[0005] In the baffle apparatus according to a conventional technology, a replacement process of a baffle plate is complicated or difficult to be performed, so that there is a problem that much time and labor are required to replace the baffle plate.

[0006] In addition, in the baffle apparatus according to the conventional technology, the baffle plate may be easily swayed by the high-pressure gas from the pair of air knives 3, so that unstable flow of the high-pressure gas may occur. When the high-pressure gas from the pair of air knives 3 unstably flows, a splashing phenomenon in which the molten metal attached to the plated steel sheet 1 is scattered may occur.

[0007] Meanwhile, in the baffle apparatus according to the conventional technology, there is a structural limita-

tion in which a position of a contact roll that is in contact with a side surface of the plated steel sheet 1 cannot be adjusted, and the contact roll may be deformed or damaged since a high-temperature of the plated steel sheet 1 is transferred to the contact roll by heat conduction.

[0008] As related patent documents, KR 10-2004-0056235 A (2004.06.30), KR 10-1008184 B1 (2011.01.14), KR 10-1061905 B1 (2011.09.02), JP 2012-021183 A (2012.02.02), KR 10-2012-0011362 A (2012.02.08), KR 10-2014-0066435 A (2014.06.02), KR 10-2015-0010052 A (2015.01.28), KR 10-1696734 B1 (2017.01.17), and KR 10-1746772 B1 (2017.06.13) may be referred to.

Disclosure

Technical Problem

[0009] An embodiment of the present disclosure is to provide a baffle apparatus capable of realizing an easier application and separation of a baffle plate. In addition, an embodiment of the present disclosure is to provide a baffle apparatus capable of suppressing movement of a baffle plate such as shaking during a process.

[0010] An embodiment of the present disclosure is to provide a baffle apparatus capable of freely adjusting a position of a contact roll with respect to a side surface of a plated steel sheet.

[0011] An embodiment of the present disclosure is to provide a baffle apparatus capable of preventing deformation or damage of a contact roll caused by a high-temperature.

[0012] The technical problems to be solved by the present disclosure are not limited to the above-mentioned problems and other problems which are not mentioned will be clearly understood by those skilled in the art from the following description.

Technical Solution

[0013] According to an embodiment of the present disclosure, there is provided a baffle apparatus including: a baffle plate positioned on a side surface of a plated steel sheet from between a pair of air knives, the plated steel sheet passing between the pair of air knives; and a support assembly supporting the baffle plate. Furthermore, the support assembly may include: a mount head mounted above the baffle plate; an upper support connected to the mount head from below the mount head; and a lower support supporting the baffle plate from above the baffle plate, and the upper support and the lower support may be detachably coupled to each other by a joint.

[0014] The joint may include: a first insertion groove provided at a lower side of the upper support and a second insertion groove provided at an upper side of the upper support; and a first roller and a second roller which are disposed respectively upward and downward of the lower support and which are respectively inserted into

the first insertion groove and the second insertion groove.

[0015] In addition, the joint may include a first position fixing member provided at the upper support. In addition, the joint may include a second position fixing member provided at the lower support, the second position fixing member being in close contact with the first position fixing member when the first roller and the second roller are respectively inserted into the first insertion groove and the second insertion groove, thereby bringing the first roller and the second roller into close contact with the first insertion groove and the second insertion groove.

[0016] The first insertion groove and the second insertion groove may be formed such that the first insertion groove and the second insertion groove have respective upper portions thereof provided with respective entrance openings through which the first roller and the second roller enter. At least any one of the first insertion groove and the second insertion groove may have a shape that has a left and right size reduced from the entrance opening toward a groove bottom side at a lower portion thereof. The first roller and the second roller may be provided at the lower support such that the first roller and the second roller are capable of being rotated around an axis in front and rear directions. The first position fixing member and the second position fixing member may be in close contact with each other from left and right sides thereof.

[0017] One of the first position fixing member and the second position fixing member may have a contact tip which faces other one of the first position fixing member and the second position fixing member and which extends in up and down directions. The other one of the first position fixing member and the second position fixing member may be a rotation member which has an outer circumference thereof in close contact with the contact tip and which is capable of being rotated around an axis in the front and rear directions.

[0018] The rotation member may be provided such that a contact groove in close contact with the contact tip is formed along the outer circumference of the rotation member, the contact groove may be formed in a shape that becomes gradually smaller toward a bottom side thereof, and the contact tip may be formed in a shape corresponding to the shape of the contact groove.

[0019] The baffle apparatus according to an embodiment of the present disclosure may further include a baffle height adjustment unit configured to move the upper support in the up and down directions with respect to the mount head.

[0020] The baffle height adjustment unit may include: a guide rod having an upper portion provided in the mount head such that the guide rod is capable of being moved up and down, the guide rod having a lower end coupled to the upper support; a screw rod provided in the mount head such that the screw rod is capable of being rotated around an axis in the up and down directions, the screw rod having a lower portion screw-coupled to the upper portion of the guide rod; and a handle coupled to an upper end of the screw rod and configured to be operated by a

worker.

[0021] The baffle apparatus according to an embodiment of the present disclosure may further include a roll assembly mounted on the mount head. Furthermore, the roll assembly may include a contact roll in contact with the side surface of the plated steel sheet, and may include a roll position adjustment unit configured to move the contact roll in left and right directions.

[0022] The roll position adjustment unit may include: a housing provided on an upper portion of the mount head; a screw shaft provided inside the housing such that the screw shaft is capable of being rotated around an axis in the front and rear directions, the screw shaft having a first male screw and a second male screw which are respectively provided at both sides of the screw shaft and which have screw directions different from each other; a roll holder holding the contact roll from between the housing and the contact roll such that the contact roll is capable of being rotated around an axis in the front and rear directions; a first nut member and a second nut member that are respectively screw-coupled to the first male screw and the second male screw; and a pair of link members having respective first end portions connected to the first nut member and the second nut member such that the first end portions are capable of being rotated around an axis in up and down directions, the pair of link members having respective second end portions connected to a center portion of the roll holder such that the second end portions are capable of being rotated around an axis in the up and down directions.

[0023] The roll position adjustment unit may further include a knob coupled to a first side end portion of the screw shaft from outside the housing. The knob may be operated by the worker, and the screw shaft may be rotated together with the knob.

[0024] The roll position adjustment unit may further include a rotation angle determination means determining a rotation angle of the knob. The rotation angle determination means may include: locking grooves which are spaced apart from each other and which are provided on a portion in the knob facing the housing along a circumferential direction with respect to a center of rotation of the screw shaft; and a locking protrusion provided outside the housing such that the locking protrusion is capable of being fitted into any one of the locking grooves according to a rotation angle of the knob.

[0025] The roll holder may include a first fork and a second fork, the first fork having a tip split such that a first support groove into which a first shaft among the first shaft and a second shaft that protrude toward opposite sides of a roll of the contact roll is inserted is provided, the second fork having a tip split such that a second support groove into which the second shaft is inserted is provided. In addition, the roll holder may include a lock provided on the first fork, the lock being capable of switching a posture between a separation prevention posture and a separation permission posture with respect to the first shaft inserted into the first support groove. In addition,

tion, the roll holder may include a socket into which the second shaft inserted into the second support groove is fitted. In addition, the roll holder may include a socket support member provided on the second fork and configured to support the socket such that the socket is capable of being moved in a forward direction and a backward direction with respect to the second shaft. In addition, the roll holder may include an elastic member configured to provide an elastic force to the socket in the forward direction of the socket with respect to the second shaft from between the socket and the socket support member.

[0026] A cooling gas storage space may be formed inside the roll, a cooling gas transferring path which is in communication with the cooling gas storage space and which extends from a tip of the second shaft may be formed inside the second shaft, the socket may be formed such that the socket has a tubular shape, and a cooling gas supply line may be connected to the socket.

[0027] The technical solutions will be more specifically and clearly described with reference to the embodiments to be described below and the drawings. In addition to the above-mentioned technical solutions, various technical solutions will be additionally provided.

Advantageous Effects

[0028] According to an embodiment of the present disclosure, the baffle plate may be easily applied or separated. In addition, by preventing the baffle plate from being shaken or moved, a production quality of the plated steel sheet may be increased.

[0029] In addition, according to an embodiment of the present disclosure, by appropriately adjusting a contact position of the contact roll with respect to the side surface of the plated steel sheet according to a process condition and so on, the production quality of the plated steel sheet may be prevented from being deteriorated.

[0030] In addition, according to an embodiment of the present disclosure, by cooling the contact roll, a service life of the contact roll may be prevented from being reduced.

[0031] The effects of the present disclosure are not limited to the above-mentioned effects, and other effects which are not mentioned above may be clearly understood by those skilled in the art from the present specification and the accompanying drawings.

Description of Drawings

[0032]

FIG. 1 is a front view illustrating a state in which a baffle apparatus according to an embodiment of the present disclosure is applied in a hot-dip plating process.

FIG. 2 and FIG. 3 are a perspective view and a front

view illustrating the baffle apparatus according to an embodiment of the present disclosure.

FIG. 4 is a perspective view illustrating a state in which a baffle plate is separated from the baffle apparatus according to an embodiment of the present disclosure.

FIG. 5 is a plan view illustrating an A part in FIG. 2.

FIG. 6 is an enlarged view illustrating a B part in FIG. 3.

FIG. 7 and FIG. 8 are a perspective view and a cross-sectional view illustrating a detection unit of the baffle apparatus according to an embodiment of the present disclosure.

FIG. 9 is an enlarged view illustrating a C part in FIG. 8.

FIG. 10 is a schematic view illustrating a typical plating equipment.

25 Mode for Invention

[0033] Hereinafter, an embodiment of the present disclosure will be described with reference to the accompanying drawings.

[0034] In a hot-dip plating process in which a baffle apparatus (see reference numeral 10 in FIG. 1) according to an embodiment of the present disclosure is applied, a plating bath (see reference numeral 2 in FIG. 10) for attaching a molten metal to a surface of a steel sheet and a pair of air knives (see reference numeral 3 in FIG. 1 and FIG. 10) for adjusting the amount of molten metal attached to the steel sheet may be used. Here, the steel sheet may be a plated steel sheet (see reference numeral 1 in FIG. 1 and FIG. 10) that is immersed in the molten metal in the plating bath and the molten metal is attached to the surface of the plated steel sheet, and the plated steel sheet may pass between the pair of air knives. In addition, the pair of air knives may be mounted on a rear end of the plating bath such that the pair of air knives faces each other from a front and rear sides with respect to the plated steel sheet, and may control the amount of plating by jetting high-pressure gas to a front surface and a rear surface of the plated steel sheet.

[0035] In a hot-dip plating process in which a baffle apparatus according to an embodiment of the present disclosure is applied, after a thermal treatment is continuously performed on a steel sheet (coil), the steel sheet is supplied into the plating bath through a snout (see reference numeral 4 in FIG. 10), and a progress direction (see arrows in FIG. 1 and FIG. 10) of the steel sheet may be changed to a space between the pair of air knives by a sink roll (see reference numeral 5 in FIG. 10) inside the plating bath. For example, the molten metal may be zinc.

Accordingly, a process in which the baffle apparatus according to an embodiment of the present disclosure is applied may be a continuous hot-dip galvanizing process.

[0036] A configuration and so on of the baffle apparatus according to an embodiment of the present disclosure is illustrated in FIGS. 1 to 9.

[0037] Referring to FIG. 1, in a pair of air knives 3, a nozzle that jets a high-pressure gas forward may extend in left and right directions. In the pair of air knives 3, a left and right length of the nozzle may be larger than a left and right width of a plated steel sheet 1. The baffle apparatus 10 according to an embodiment of the present disclosure includes a baffle plate 140, and may be selectively applied as a pair to a hot-dip plating process (for example, a continuous hot-dip galvanizing process).

[0038] The baffle apparatus 10 according to an embodiment of the present disclosure may be mounted between the pair of air knives 3, and may be positioned such that the baffle plate 140 is positioned adjacent to a side surface of the plated steel sheet 1. When the baffle apparatus 10 according to an embodiment of the present disclosure is applied as a pair, the baffle device 10 may be mounted symmetrically left and right between the pair of air knives 3 with respect to the plated steel sheet 1, and may be positioned such that the baffle plate 140 is positioned adjacent to left and right side surfaces of the plated steel sheet 1.

[0039] In the baffle apparatus 10 according to an embodiment of the present disclosure, when the baffle apparatus 10 is applied as a pair, a high-pressure gas jetted from the pair of air knives 3 is prevented from occurring collision of gas on the left and right sides of the plated steel sheet 1 by a blocking action of each baffle plate 140. Therefore, occurrence of noise and a vortex generated according to collision of the high-pressure gas on the both sides of the plated steel sheet 1 may be prevented, and an overcoating in which the amount of molten metal attached to left and right edges of the plated steel sheet 1 is larger than that of other portions due to a vortex current may be prevented.

[0040] The baffle plate 140 may be configured appropriately by adopting various shapes and materials capable of preventing the generation of noise and the vortex.

[0041] Referring to FIGS. 2 to 4, the baffle apparatus 10 according to an embodiment of the present disclosure may further include a support assembly (see reference numeral 110, 120, 130, and so on) supporting the baffle plate 140 from an upper side of the baffle plate 140. Although not illustrated, the support assembly may be mounted on an upper frame mounted on an upper side of the pair of air knives 3 such that a left and right position adjustment is capable of being performed by a left and right position adjustment apparatus. According to the left and right position adjustment apparatus, a position of the baffle plate 140 with respect to the side surface of the plated steel sheet 1 may be adjusted by moving the support assembly in the left and right directions according to the left and right width of the plated steel sheet 1. For

reference, the upper frame may be a duct type frame having a flow path transferring a high-pressure gas to be supplied to the pair of air knives 3.

[0042] The support assembly may include a mount head 110 connected to the left and right position adjustment apparatus, an upper support 120 connected to the mount head 110 through a baffle height adjustment unit 111 from a lower side of the mount head 110, and a lower support 130 supporting the baffle plate 140 from the upper side of the baffle plate 140. The upper support 120 and the lower support 130 may be detachably coupled to each other.

[0043] According to the baffle height adjustment unit 111, the upper support 120 may be moved in up and down directions with respect to the mount head 110. Referring to FIG. 3, the baffle height adjustment unit 111 may include a guide rod 111a, a screw rod 111b, and a rod operation handle 111c.

[0044] In the guide rod 111a, an upper portion of the guide rod 111a may be provided such that the upper portion of the guide rod 111a is capable of being moved up and down with respect to the mount head 110, and a lower end of the guide rod 111a may be coupled to the upper support 120. The mount head 110 may be provided with a guide hole 110a penetrating the mount head 110 in the up and down directions, and the upper portion of the guide rod 111a may be inserted into the guide hole 110a. Although not illustrated, a groove may be formed along the up and down directions of an outer circumference of the guide rod 111a, and the mount head 110 may have a protrusion formed in the guide hole 110a, the protrusion being inserted into the groove of the guide rod 111a. Therefore, the guide rod 111a may be moved accurately in the up and down directions without being rotated. For reference, a plurality of guide rods 111a may be provided optionally.

[0045] The screw rod 111b is provided on the mount head 110 such that the screw rod 111b is capable of being rotated with respect to an axis A1 in the up and down directions, and the screw rod 111b may be screw-coupled to an upper portion of the guide rod 111a. The screw rod 111b may be coupled to an upper end portion of the guide hole 110a such that an upper portion of the screw rod 111b is capable of being rotated around the axis A1 in the up and down directions. A male screw may be formed on an outer circumference of the upper portion of the screw rod 111b, and a female screw hole corresponding to the male screw of the screw rod 111b may be formed in the up and down directions in a center of the upper portion of the guide rod 111a.

[0046] The rod operation handle 111c may be coupled to the upper end of the screw rod 111b. The rod operation handle 111c may be operated by a worker. The screw rod 111b may be rotated in a forward directions and a reverse direction according to an operation of the rod operation handle 111c of the worker. The guide rod 111a may move the upper support 120 upward or downward by being moved upward or downward according to a ro-

tation direction of the screw rod 111b.

[0047] According to the baffle height adjustment unit 111, an up and down position of the baffle plate 140 with respect to the pair of air knives 3 may be adjusted to a required position according to a process condition and so on. Meanwhile, the baffle height adjustment unit 111 may include a motor instead of the rod operation handle 111c, thereby being capable of rotating the screw rod 111b in the forward direction or the reverse direction by the motor.

[0048] The upper end of the upper support 120 may be coupled to the guide rod 111a, and a lower end of the lower support 130 may be connected to the baffle plate 140. The upper support 120 and the lower support 130 may be positioned left and right. The upper support 120 may be positioned between the plated steel sheet 1 and the lower support 130.

[0049] The upper support 120 may be provided with a first insertion groove 121, a second insertion groove 122, and a first position fixing member 123. Furthermore, the lower support 130 may be provided with a first roller 131, a second roller 132, and a second position fixing member 133. The first insertion groove 121, the second insertion groove 122, the first position fixing member 123, the first roller 131, the second roller 132, and the second position fixing member 133 constitute a joint. The upper support 120 and the lower support 130 may be detachably coupled to each other by such a joint.

[0050] Referring to FIG. 4, the first insertion groove 121 and the second insertion groove 122 may be positioned vertically. The first insertion groove 121 may be provided at a relatively lower side of the upper support 120, and the second insertion groove 122 may be provided at a relatively upper side of the upper support 120. The first roller 131 and the second roller 132 may be positioned vertically at a distance corresponding to a vertical arrangement distance between the first insertion groove 121 and the second insertion groove 122. The first roller 131 may be provided at a relatively lower side of the lower support 130, and may be inserted into the first insertion groove 121. The second roller 132 may be provided at a relatively upper side of the lower support 130, and may be inserted into the second insertion groove 122. FIG. 2 and FIG. 3 show a state in which the lower support 130 is coupled to the upper support 120 by respectively inserting the first roller 131 and the second roller 132 into the first insertion groove 121 and the second insertion groove 122. FIG. 4 shows a state in which the lower support 130 is separated from the upper support 120. The lower support 130 may be separated from the upper support 120 by respectively separating the first roller 131 and the second roller 132 from the first insertion groove 121 and the second insertion groove 122.

[0051] Referring to FIG. 6, the first insertion groove 121 and the second insertion groove 122 may be formed such that the first insertion groove 121 and the second insertion groove 122 have respective upper portions

thereof provided with entrance openings G11 through which the first roller 131 and the second roller 132 enter. The first roller 131 and the second roller 132 may be inserted into the first insertion groove 121 and the second insertion groove 122 from upper sides to lower sides of the first and second insertion grooves 121 and 122, and a state in which the lower support 130 is coupled to the upper support 120 by the first insertion groove 121, the second insertion groove 122, the first roller 131, and the second roller 132 may be maintained by weight of the lower support 130 and the baffle plate 140 connected to the lower support 130.

[0052] The first roller 131 and the second roller 132 may be provided at the lower support 130 such that the first roller 131 and the second roller 132 are capable of being rotated around an axis A2 in front and rear directions. Accordingly, in a process of inserting the first roller 131 and the second roller 132 into the first insertion groove 121 and the second insertion groove 122 from the upper sides to the lower sides of the first insertion groove 121 and the second insertion groove 122 or separating the inserted first and second rollers 131 and 132, the first roller 131 and the second roller 132 may be rotated by being in contact with a wall surface of the first insertion groove 121 and a wall surface of the second insertion groove 122. This may reduce a contact friction. Therefore, an operation of coupling or separating the lower support 130 with the upper support 120 may be more easily performed.

[0053] Referring to FIGS. 4 to 6, when the first roller 131 and the second roller 132 are inserted into the first insertion groove 121 and the second insertion groove 122, the first position fixing member 123 and the second position fixing member 133 are in close contact with each other so as to realize a stable coupling of the upper support 120 and the lower support 130. The first position fixing member 123 may be in close contact with the second position fixing member 133 from left and right sides thereof. The second position fixing member 133 may be positioned at a level corresponding to a level of the second roller 132, and may be disposed such that the second position fixing member 133 is positioned between the first position fixing member 123 and the second roller 132 when the second position fixing member 133 is in close contact with the first position fixing member 123.

[0054] The second insertion groove 122 may be formed such that a left and right size of the second insertion groove 122 is gradually reduced from the upper entrance opening G11 toward a lower groove bottom G12, and may be formed such that an inclined wall surface W1 guiding a movement of the second roller 132 in a direction in which the second position fixing member 133 is in close contact with the first position fixing member 123 is provided. When the second roller 132 is inserted into the second insertion groove 122, the second roller 132 may be positioned between the inclined wall surface W1 and the second position fixing member 133. Accordingly, during a process of coupling the lower support 130

to the upper support 120, since the second roller 132 is obliquely inserted from the upper side to the lower side into the second insertion groove 122 according to the guide of the inclined wall surface W1, the second position fixing member 133 may be in close contact with the first position fixing member 123 by moving the lower support 130 and the second position fixing member 133 toward the first position fixing member 123.

[0055] Meanwhile, according to an implementation condition and so on, the first insertion groove 121 may be formed identical to or similar to the second insertion groove 122 such that a left and right size of the first insertion groove 121 is gradually reduced from the upper entrance opening toward a lower groove bottom, and may be formed such that a inclined wall surface guiding a movement of the first roller 131 in a direction in which the second position fixing member 133 is in close contact with the first position fixing member 123 is provided.

[0056] An adhesion force between the first position fixing member 123 and the second position fixing member 133 may increase as the second roller 132 is inserted into the second insertion groove 122. The first position fixing member 123 and the second position fixing member 133 that are in close contact with each other may bring the second roller 132 into close contact with the inclined wall surface W1 of the second insertion groove 122. Accordingly, when the second roller 132 is brought into close contact with the inclined wall surface W1 of the second insertion groove 122, a gap between the second insertion groove 122 and the second roller 132 may be removed, and the lower support 130 may be prevented from moving due to the gap between the second insertion groove 122 and the second roller 132. Therefore, the baffle plate 140 may be prevented from being swayed by a high-pressure gas from the pair of air knives 3 during a process.

[0057] Referring to FIG. 5 and FIG. 6, the second position fixing member 133 may have a contact tip 133c which faces toward the first position fixing member 123 and which extends in the up and down directions, and the first position fixing member 123 may be a rotation member such as a roller which has an outer circumference in close contact with the contact tip 133c and which is capable of being rotated around an axis A3 in the front and rear directions. Conversely, the first position fixing member 123 may have a contact tip and the second position fixing member 133 may be a rotation member. According to such a configuration, when the lower support 130 is coupled to the upper support 120, the adhesion force between the first position fixing member 123 and the second position fixing member 133 may be easily secured. In addition, when the lower support 130 is separated from the upper support 120, the operation may be easily performed by reducing contact friction.

[0058] The rotation member (the first position fixing member 123) may be provided such that a contact groove 123c in close contact with the contact tip 133c is formed along an outer circumference of the rotation member, the

contact groove 123c may be formed in a shape that becomes gradually smaller and sharper toward a bottom, and the contact tip 133c may be formed in a shape corresponding to the shape of the contact groove 123c.

Here, the contact groove 123c may induce an accurate close contact between the first position fixing member 123 and the second position fixing member 133, and may expand a contact area between the first position fixing member 123 and the second position fixing member 133.

[0059] Referring to FIGS. 2 to 4, the baffle device 10 according to an embodiment of the present disclosure may further include a roll assembly 150 mounted on the mount head 110. The roll assembly 150 may include a contact roll 158 that is in contact with a side surface of the plated steel sheet 1, and may include a roll position adjustment unit that moves the contact roll 158 in the left and right directions. According to the roll position adjustment unit, the position of the contact roll 158 with respect to the side surface of the plated steel sheet 1 may be adjusted.

[0060] Referring to FIGS. 7 and 8, the roll position adjustment unit may include a housing 151, a screw shaft 153, a roll holder 155, a first nut member N1, a second nut member N2, and a link member 154.

[0061] The housing 151 may be provided at the upper portion of the mount head 110. The screw shaft 153 may be provided inside the housing 151 such that the screw shaft 153 is capable of being rotated around an axis A4 in the front and rear directions. A first male screw 153a and a second male screw 153b having different screw directions may be provided in both sides of a longitudinal direction of the screw shaft 153. For example, the first male screw 153a may be a right-handed screw, and the second male screw 153b may be a left-handed screw. The roll holder 155 may hold the contact roll 158 between the housing 151 and the contact roll 158 so that the contact roll 158 is capable of being rotated around the axis A5 in the front and rear directions. The housing 151 is formed such that a portion facing the roll holder 155 has an open structure, so that a portion of the roll holder 155 may be accommodated inside the housing 151 according to a position of the roll holder 155.

[0062] The first nut member N1 may be screw-coupled to the first male screw 153a, and the second nut member N2 may be screw-coupled to the second male screw 153b. The link member 154 may be provided as a pair. A pair of link members 154 may be provided with a first end portion 154a and a second end portion 154b that are respectively positioned at both sides thereof in a longitudinal direction. The first end portions 154a may be connected to the first nut member N1 and the second nut member N2 such that the first end portions 154a are capable of being rotated around an axis in the up and down directions. The second end portions 154b may be connected to a center portion of the roll holder 155 such that the second end portions 154b are capable of being rotated around an axis A6 in the up and down directions parallel to a center of rotation of the first end portions

154a.

[0063] When the screw shaft 153 is rotated, the first nut member N1 and the second nut member N2 may be moved. Since a screw direction of the first male screw 153a and a screw direction of the second male screw 153b are different from each other, the first nut member N1 and the second nut member N2 may be spaced apart or approached from each other by being moved in opposite directions according to the rotation direction of the screw shaft 153. Accordingly, in the pair of link members 154, the first end portion 154a may be converged or splayed. Furthermore, by moving the roll holder 155 in the left and right directions according to an operation described above, the contact roll 158 may be moved in a position where the contact roll 158 is in accurately contact with the side surface of the plated steel sheet 1.

[0064] The roll position adjustment unit may further include a shaft operation knob K1 that is used by the worker to rotate the screw shaft 153. The shaft operation knob K1 may be coupled to a first end portion of the screw shaft 153 from outside the housing 151. Accordingly, the screw shaft 153 may be rotated in the forward and reverse directions according to an operation of the shaft operation knob K1 by the worker.

[0065] Referring to FIG. 8, the roll position adjustment unit may further include a rotation angle determination means (see reference numerals P11 and P12) provided with a plurality of locking grooves P11 and a single locking protrusion P12. The rotation angle determination means may induce the shaft operation knob K1 to be rotated in a predetermined angle unit that is preset, and may prevent the shaft operation knob K1 from being unintentionally rotated. The rotation angle determination means may be provided between the housing 151 and the shaft operation knob K1.

[0066] The locking grooves P11 of the rotation angle determination means may be provided at a portion of the shaft operation knob K1 facing the housing 151 and may be provided in a set angle unit that is spaced apart from each other along a circumferential direction with respect to the center of rotation of the screw shaft 153 (see reference numeral A4). The locking protrusion P12 of the rotation angle determination means may be provided at a portion of the outside of the housing 151 facing the shaft operation knob K1 such that the locking protrusion P12 is capable of being fitted into any one of the locking grooves P11 according to the rotation angle of the shaft operation knob K1.

[0067] The locking protrusion P12 may include a ball plunger. The ball plunger may include a ball at a tip and a spring that provides an elastic force to the ball toward the tip. The ball of the ball plunger may be maintained in a state of being fitted into any one of the locking grooves P11 by the spring. In this state, when the worker rotates the shaft operation knob K1, the ball of the ball plunger may be pushed to the corresponding locking groove P11 and retracted while compressing the spring, and may be separated from the corresponding locking groove P11.

[0068] Referring to FIGS. 7 to 9, the contact roll 158 may be provided with a roll 158r and with a first shaft 158a and a second shaft 158b that protrude both sides of the roll 158r. The roll holder 155 may be configured to have a first fork F1, a second fork F2, a lock 156, a socket 157s, a socket support member 157m, and an elastic member 159 so that the contact roll 158 is capable of being easily replaced. As an example, the first shaft 158a and the second shaft 158b may be integrated with each other, and may be provided such that the first and second shafts 158a and 158b pass through a center of the roll 158r.

[0069] The first fork F1 may be configured to provide a first support groove S1 into which the first shaft 158a is inserted, and the second fork F2 may be configured to provide a second support groove S2 into which the second shaft 158b is inserted. The first fork F1 and the second fork F2 may be positioned such that the first fork F1 and the second fork F2 are spaced apart from each other in the front and rear directions and are facing each other. The first fork F1 and the second fork F2 may be respectively formed in a shape in which a tip is split vertically such that the first fork f1 and the second fork F2 respectively provide the first support groove S1 and the second support groove S2. The first support groove S1 may support the first shaft 158a such that the first shaft 158a is capable of being rotated, and the second support groove S2 may support the second shaft 158b such that the second shaft 158b is capable of being rotated.

[0070] The first fork F1 and the second fork F2 may have respective inner sides facing each other and may have respective opposite outer sides. The first shaft 158a may have a length that protrudes to the outer side of the first fork F1, and the second shaft 158b may have a length that protrudes to the outer side of the second fork F2.

[0071] The lock 156 may be provided on the outer side of the first fork F1 and may restrain a position of the first shaft 158a or release the position of the first shaft 158a by switching a posture between a separation prevention posture and a separation permission posture with respect to the first shaft 158a inserted into the first support groove S1.

[0072] The lock 156 may be provided with a first end portion and a second end portion. The first end portion of the lock 156 may be mounted on the outer side of the first fork F1 at the first support groove S1 such that the first end portion of the lock 156 is capable of being rotated around an axis in the front and rear directions parallel to the center of rotation (see reference numeral A5) of the contact roll 158. The lock 156 may be switched to the separation prevention posture or the separation permission posture according to the rotation angle. In the separation prevention posture, the lock 156 may surround the first shaft 158a inserted into the first support groove S1 from an opposite side of a bottom of the first support groove S1. In this state, the second end portion of the lock 156 may be fastened to the first fork F1 with a bolt or the like, thereby being capable of maintaining the lock

156 in the separation prevention posture.

[0073] The second shaft 158b inserted into the second support groove S2 may be fitted into the socket 157s. The socket support member 157m may be provided at the second fork F2. The socket support member 157m may support the socket 157s such that the socket 157s is capable of being moved in a forward direction in which the socket 157s is fitted into the second shaft 158b and in a backward direction in which the socket 157s is separated from the second shaft 158b.

[0074] The elastic member 159 may be a spring or the like. The elastic member 159 may be provided between the socket 157s and the socket support member 157m. The elastic member 159 may provide an elastic force to the socket 157s in the forward direction of the socket 157s with respect to the second shaft 158b. According to the elastic force of the elastic member 159, the socket 157s may be in close contact with the second shaft 158b.

[0075] Referring to FIGS. 8 and 9, a cooling gas storage space 158d may be formed inside the roll 158r, and a cooling gas transferring path 158c in communication with the cooling gas storage space 158d may be formed inside the second shaft 158b. The cooling gas transferring path 158c may extend from a tip inside the second shaft 158b to the cooling gas storage space 158d.

[0076] The socket 157s may be formed such that the socket 157s has a tubular structure. The second shaft 158b may be fitted into the socket 157s and may be in close contact with the socket 157s. Although not illustrated, a sealing member for maintaining airtightness may be interposed between the socket 157s and the second shaft 158b. The reference numeral 160 is a cooling gas supply line for supplying cooling gas from a cooling gas supplying source. A cooling gas supply line 160 is connected to the socket 157s and may supply the cooling gas.

[0077] The cooling gas from the cooling gas supply line 160 may be introduced into the cooling gas storage space 158d via the socket 157s and the cooling gas transferring path 158c. The cooling gas introduced into the cooling gas storage space 158d may cool the roll 158r of the contact roll 158 and so on. Therefore, a situation in which a high-temperature of the plated steel sheet 1 is transferred to the contact roll 158 and the roll 158r and so on of the contact roll 158 is deformed or damaged may be prevented.

[0078] Meanwhile, reference numeral 134 which is not described is a handle provided with the lower support 130, and the handle may be used by the worker to handle the baffle plate 140 together with the lower support 130. In addition, reference numeral 152 which is not described is a sensor that detects a side surface position of the plated steel sheet 1 in a non-contact manner.

[0079] While the present disclosure has been described above, the present disclosure is not limited to the disclosed embodiment and the accompanying drawings, and those skilled in the art may variously modify the present disclosure without departing from the technical

features of the present disclosure.

Claims

1. A baffle apparatus comprising:

a baffle plate (140) positioned on a side surface of a plated steel sheet (1) between a pair of air knives (3), the plated steel sheet (1) passing between the pair of air knives (3); and a support assembly supporting the baffle plate (140),

wherein the support assembly comprises:

a mount head (110) mounted above the baffle plate (140);

an upper support (120) connected to the mount head (110) from below the mount head (110); and

a lower support (130) supporting the baffle plate (140) from above the baffle plate (140),

the upper support (120) and the lower support (130) are detachably coupled to each other by a joint, and

the joint comprises:

a first insertion groove (121) provided at a lower side of the upper support (120) and a second insertion groove (122) provided at an upper side of the upper support (120); and

a first roller (131) and a second roller (132) which are disposed respectively upward and downward of the lower support (130) and which are respectively inserted into the first insertion groove (121) and the second insertion groove (122).

2. The baffle apparatus of claim 1, wherein the joint comprises:

a first position fixing member (123) provided at the upper support (120); and

a second position fixing member (133) provided at the lower support (130), the second position fixing member (133) being in close contact with the first position fixing member (123) when the first roller (131) and the second roller (132) are respectively inserted into the first insertion groove (121) and the second insertion groove (122), thereby bringing the first roller (131) and the second roller (132) into close contact with the first insertion groove (121) and the second insertion groove (122).

3. The baffle apparatus of claim 2, wherein the first insertion groove (121) and the second insertion groove (122) are formed such that the first insertion groove (121) and the second insertion groove (122) have respective upper portions thereof provided with re-

spective entrance openings (G11) through which the first roller (131) and the second roller (132) enter,

the first roller (131) and the second roller (132) are provided at the lower support (130) such that the first roller (131) and the second roller (132) are capable of being rotated around an axis (A2) in front and rear directions,

the first position fixing member (123) and the second position fixing member (133) are in close contact with each other from left and right sides thereof, and

the first insertion groove (121) or the second insertion groove (122) is formed such that the first insertion groove (121) or the second insertion groove (122) is provided with an inclined wall surface (W1), the inclined wall surface (W1) reducing a left and right size of the first insertion groove (121) or the second insertion groove (122) from the entrance opening (G11) to a groove bottom (G12) at a lower portion of the first insertion groove (121) or the second insertion groove (122), and the inclined wall surface (W1) inducing the first roller (131) or the second roller (132) to be moved in a direction in which the second position fixing member (133) and the first position fixing member (123) are in close contact with each other.

4. The baffle apparatus of claim 3, wherein one of the first position fixing member (123) and the second position fixing member (133) has a contact tip (133c) which faces other one of the first position fixing member (123) and the second position fixing member (133) and which extends in up and down directions, and
- the other one of the first position fixing member (123) and the second position fixing member (133) is a rotation member which has an outer circumference thereof in close contact with the contact tip (133c) and which is capable of being rotated around an axis (A3) in the front and rear directions.
5. The baffle apparatus of claim 4, wherein a contact groove (123c) that is in close contact with the contact tip (133c) is provided along the outer circumference of the rotation member,

the contact groove (123c) is formed in a shape that is reduced toward a bottom side thereof, and the contact tip (133c) is formed in a shape corresponding to the shape of the contact groove (123c).

6. The baffle apparatus of claim 1, further comprising a baffle height adjustment unit (111) configured to move the upper support (120) in up and down directions with respect to the mount head (110).

7. The baffle apparatus of claim 6, wherein the baffle height adjustment unit (111) comprises:

a guide rod (111a) having an upper portion provided in the mount head (110) such that the guide rod (111a) is capable of being moved up and down, the guide rod (111a) having a lower end coupled to the upper support (120); and

a screw rod (111b) provided in the mount head (110) such that the screw rod (111b) is capable of being rotated around an axis (A1) in the up and down directions, the screw rod (111b) having a lower portion screw-coupled to the upper portion of the guide rod (111a).

8. The baffle apparatus of claim 1, further comprising a roll assembly (150) mounted on the mount head (110), the roll assembly (150) having a contact roll (158) in contact with the side surface of the plated steel sheet (1) and having a roll position adjustment unit configured to move the contact roll (158) in left and right directions, wherein the roll position adjustment unit comprises:

a housing (151) provided on an upper portion of the mount head (110);

a screw shaft (153) provided inside the housing (151) such that the screw shaft (153) is capable of being rotated around an axis (A4) in front and rear directions, the screw shaft (153) having a first male screw (153a) and a second male screw (153b) which are respectively provided at both sides of the screw shaft (153) and which have screw directions different from each other;

a roll holder (155) holding the contact roll (158) from between the housing (151) and the contact roll (158) such that the contact roll (158) is capable of being rotated around an axis (A5) in the front and rear directions;

a first nut member (N1) and a second nut member (N2) that are respectively screw-coupled to the first male screw (153a) and the second male screw (153b); and

a pair of link members (154) having respective first end portions (154a) connected to the first nut member (N1) and the second nut member (N2) such that the first end portions (154a) are capable of being rotated around an axis in up and down directions, the pair of link members (154) having respective second end portions (154b) connected to a center portion of the roll holder (155) such that the second end portions (154b) are capable of being rotated around an

axis (A6) in the up and down directions.

9. The baffle apparatus of claim 8, wherein a shaft operation knob (K1) is coupled to a first side end portion of the screw shaft (153) from outside the housing (151),

locking grooves (P11) spaced apart from each other are provided on a portion in the shaft operation knob (K1) facing the housing (151) along a circumferential direction with respect to a center of rotation of the screw shaft (153), and a locking protrusion (P12) is provided outside the housing (151) such that the locking protrusion (P12) is capable of being fitted into any one of the locking grooves (P11) according to a rotation angle of the shaft operation knob (K1).

10. The baffle apparatus of claim 8, wherein the roll holder (155) comprises:

a first fork (F1) and a second fork (F2), the first fork (F1) having a tip split such that a first support groove (S1) into which a first shaft (158a) among the first shaft (158a) and a second shaft (158b) that protrude toward opposite sides of a roll (158r) of the contact roll (158) is inserted is provided, the second fork (F2) having a tip split such that a second support groove (S2) into which the second shaft (158b) is inserted is provided; a lock (156) provided on the first fork (F1), the lock (156) being capable of switching a posture between a separation prevention posture and a separation permission posture with respect to the first shaft (158a) inserted into the first support groove (S1), a socket (157s) into which the second shaft (158b) inserted into the second support groove (S2) is fitted, a socket support member (157m) provided on the second fork (F2) and configured to support the socket (157s) such that the socket (157s) is capable of being moved in a forward direction and a backward direction with respect to the second shaft (158b), and an elastic member (159) configured to provide an elastic force to the socket (157s) in the forward direction of the socket (157s) with respect to the second shaft (158b) from between the socket (157s) and the socket support member (157m).

11. The baffle apparatus of claim 10, wherein a cooling gas storage space (158d) is formed inside the roll (158r),

a cooling gas transferring path (158c) which is in communication with the cooling gas storage

space (158d) and which extends from a tip of the second shaft (158b) is formed inside the second shaft (158b), and the socket (157s) is formed such that the socket (157s) has a tubular shape, and a cooling gas supply line (160) is connected to the socket (157s).

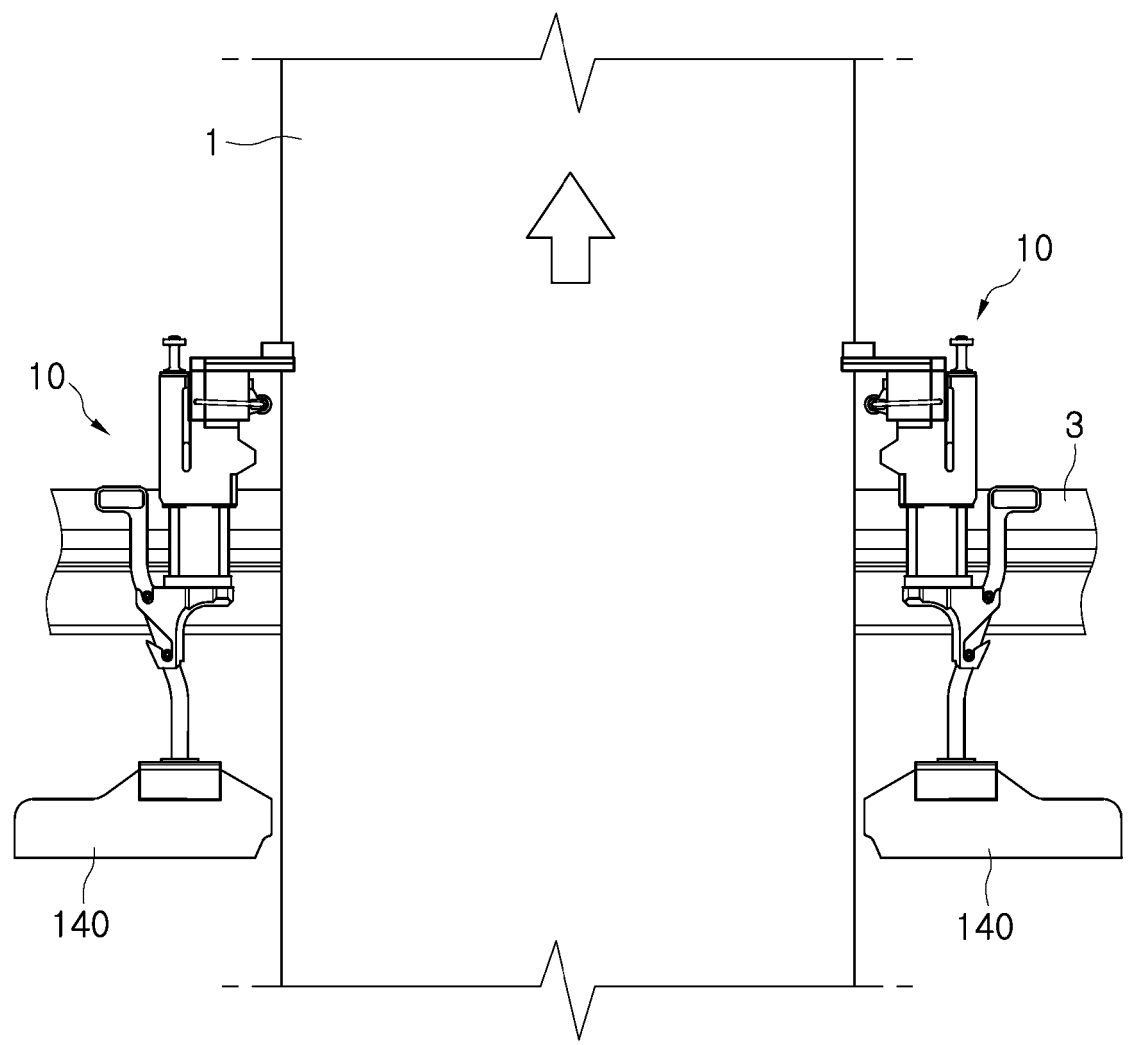


FIG. 1

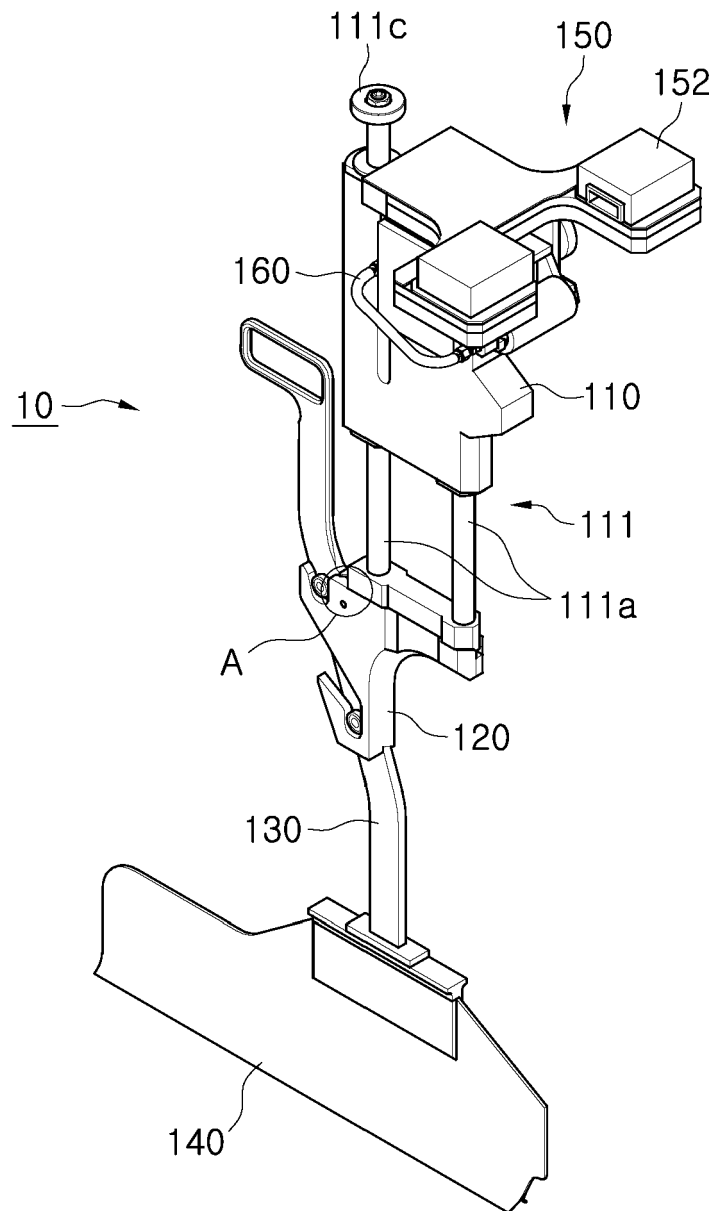


FIG. 2

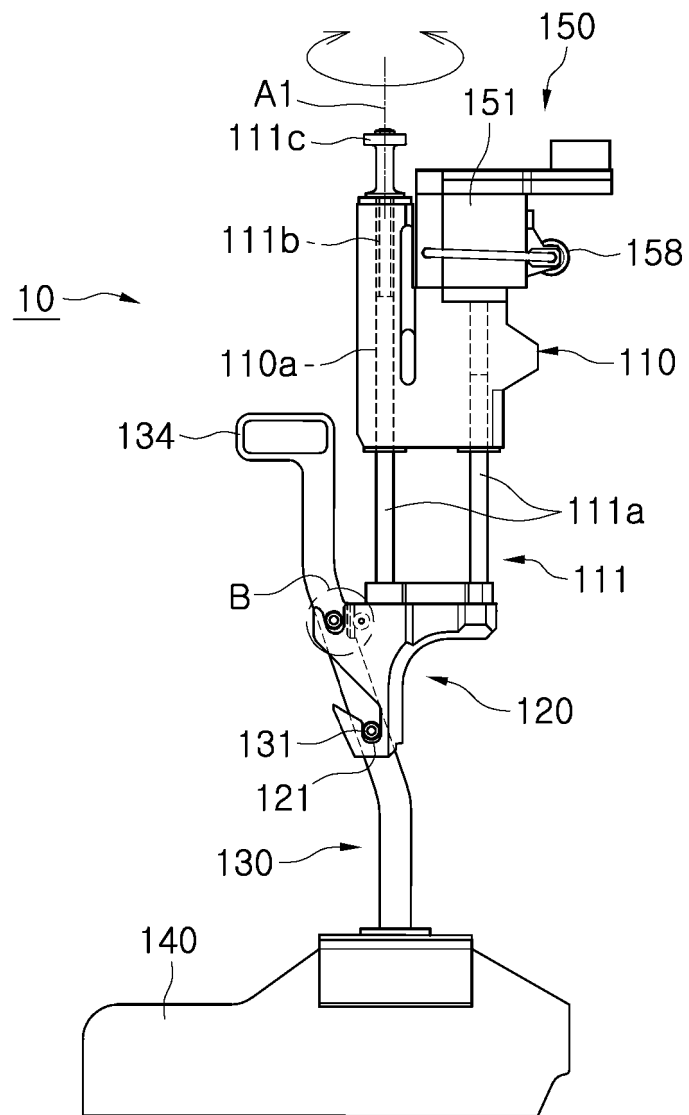


FIG. 3

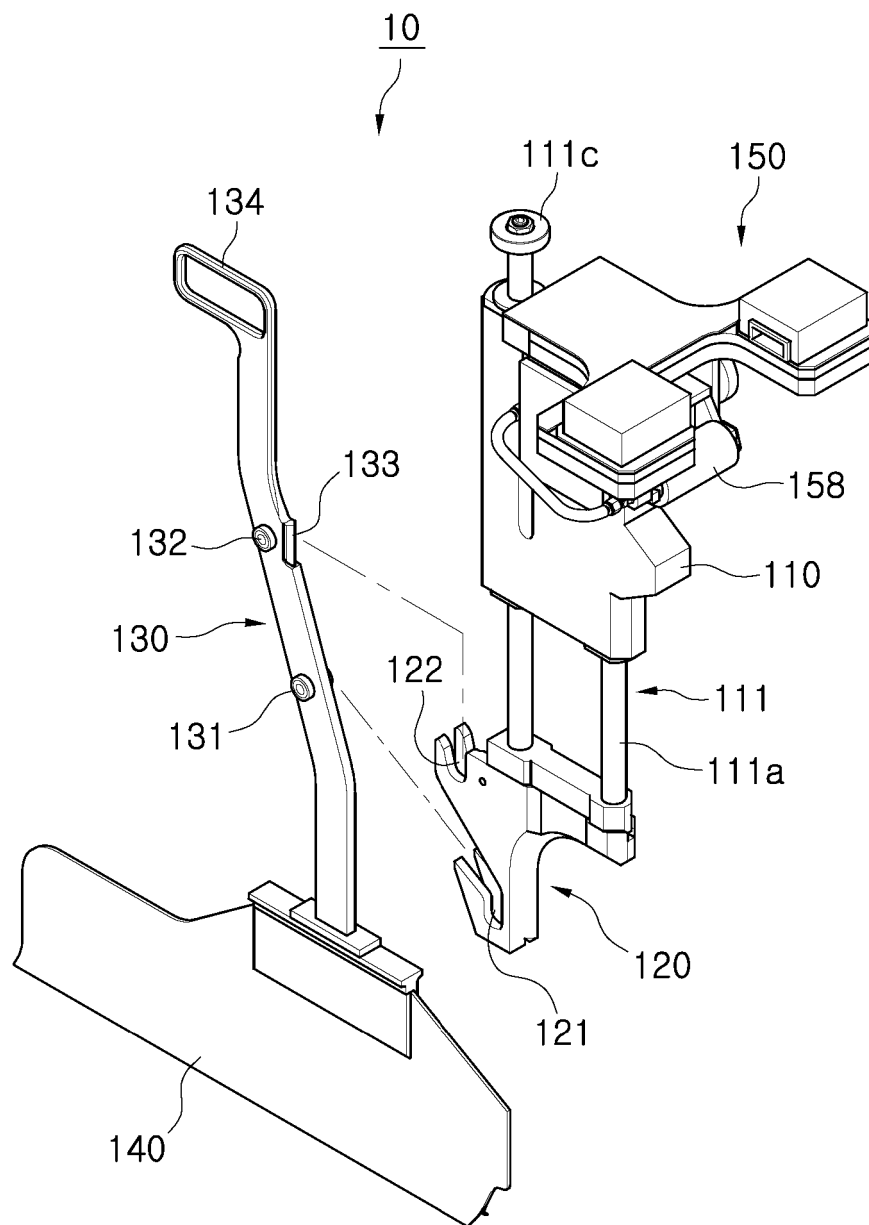


FIG. 4

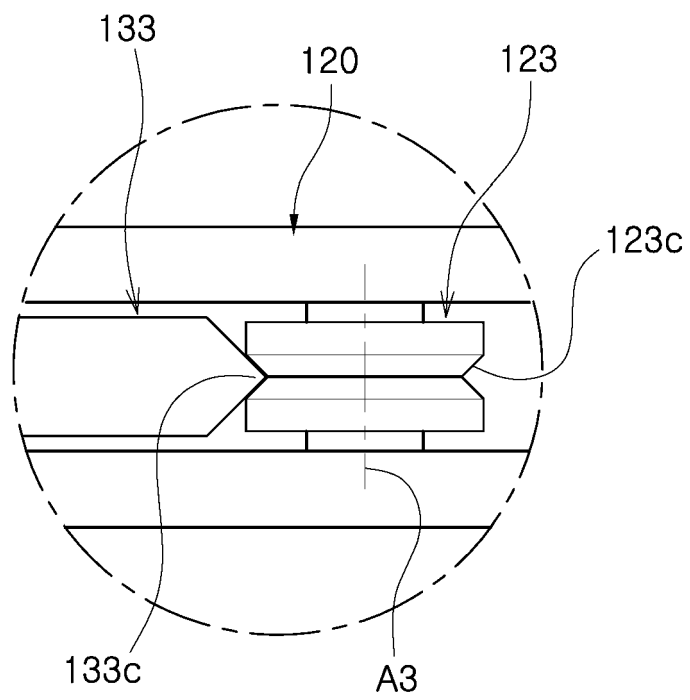


FIG. 5

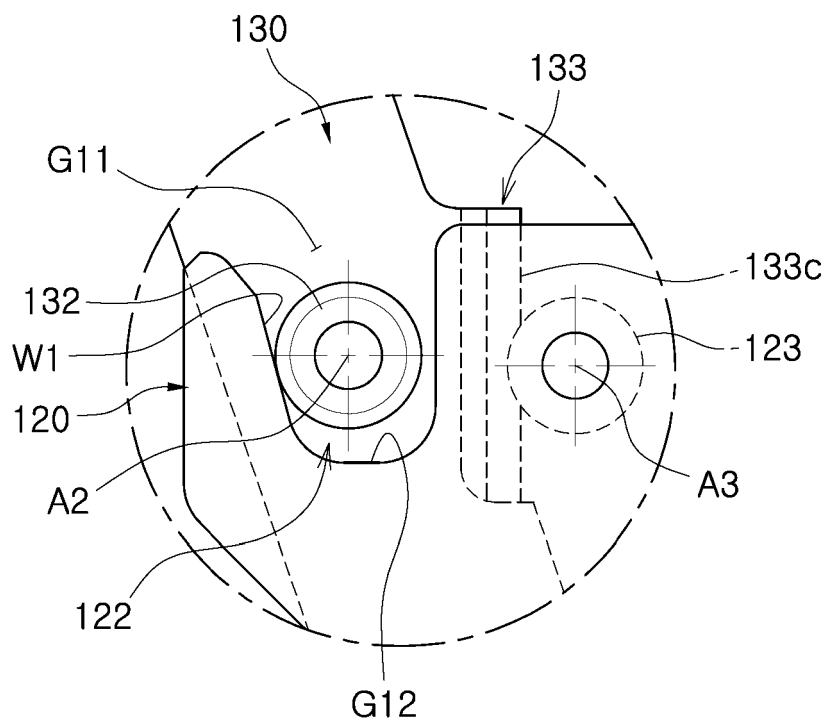


FIG. 6

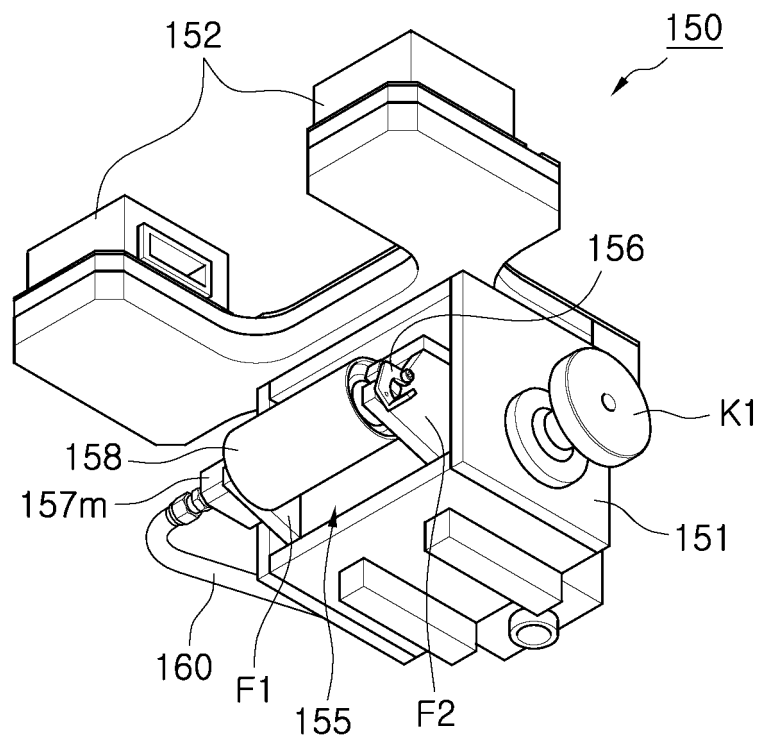


FIG. 7

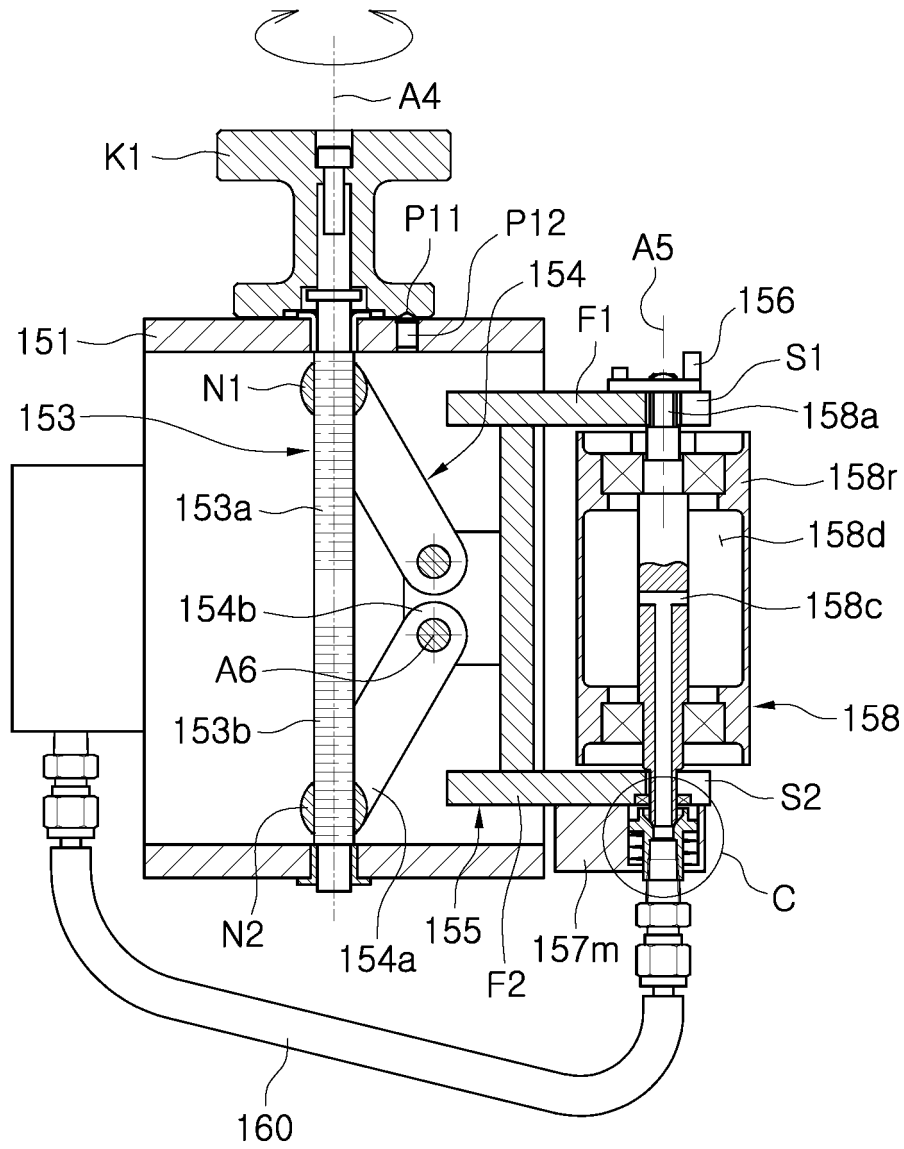


FIG. 8

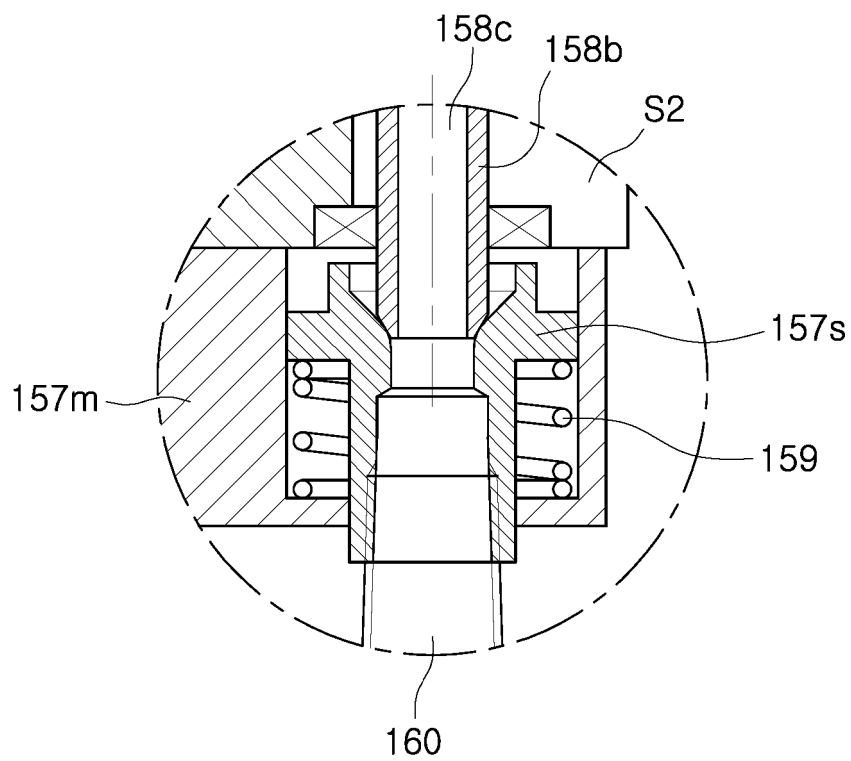


FIG. 9

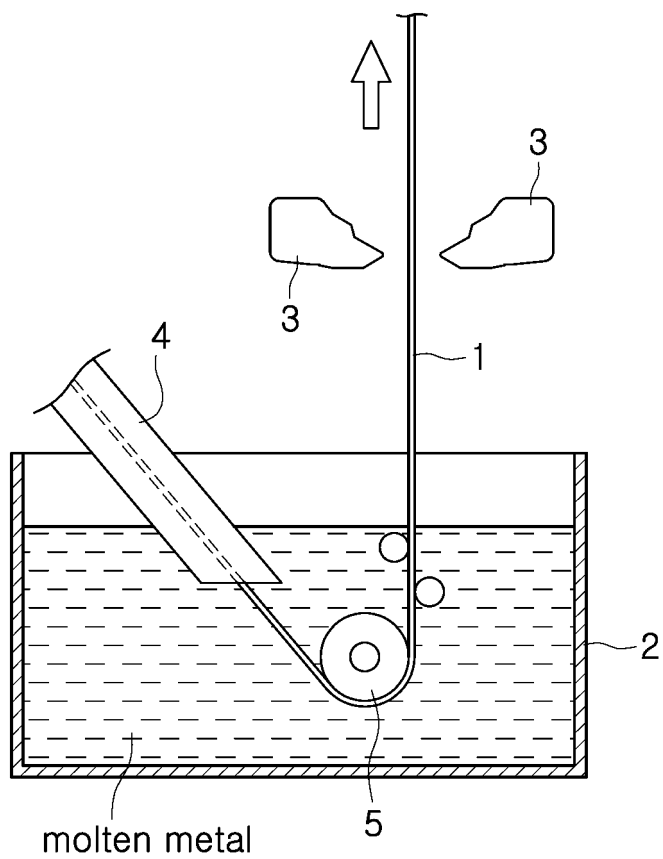


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2022/019759

A. CLASSIFICATION OF SUBJECT MATTER

C23C 2/20(2006.01)i; C23C 2/00(2006.01)i; C23C 2/28(2006.01)i; C23C 2/06(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C23C 2/20(2006.01); C23C 2/06(2006.01); C23C 2/16(2006.01); C23C 2/40(2006.01)

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

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 배플(baffle), 용융도금(hot dipping), 에어 나이프(air knife), 서포트(support), 롤러(roller)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2006-0003447 A (PARK, Chang Sik) 11 January 2006 (2006-01-11) See paragraphs [0039], [0042], [0044] and [0047]-[0049] and figures 3 and 7.	1,6
Y		7
A		2-5,8-11
Y	KR 10-1008184 B1 (SAM WOO) 14 January 2011 (2011-01-14) See paragraph [0031] and figure 2.	7
A	JP 2021-042413 A (NIPPON STEEL CORP.) 18 March 2021 (2021-03-18) See paragraph [0039], claims 1-3 and figure 2.	1-11
A	CN 205954090 U (TIANJIN NERIED TECH CO., LTD.) 15 February 2017 (2017-02-15) See claim 1 and figures 1-3.	1-11

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

* Special categories of cited documents:

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

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

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

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

“&” document member of the same patent family

Date of the actual completion of the international search

08 June 2023

Date of mailing of the international search report

08 June 2023

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2022/019759

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2015-0010052 A (POSCO) 28 January 2015 (2015-01-28) See paragraphs [0021]-[0027], claims 1-2 and figures 5-7.	1-11

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2022/019759

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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KR	10-1008184	B1	14 January 2011	None			
JP	2021-042413	A	18 March 2021	None			
CN	205954090	U	15 February 2017	None			
KR	10-2015-0010052	A	28 January 2015	None			

REFERENCES CITED IN THE DESCRIPTION

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- KR 1020120011362 A [0008]
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- KR 101696734 B1 [0008]
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