APPARATUS AND METHOD FOR ROLL FORMING GLASS SHEETS
VORRICHTUNG UND VERFAHREN ZUR FORMUNG VON GLASSCHEIBEN IN ROLLFORM
DISPOSITIF ET PROCEDE DE FORMAGE DE VITRES

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Description

BACKGROUND ART

[0001] As disclosed by United States Patent No. 5,201,928 Dicks et al., heated glass sheets have previously been roll formed by conveyance on a horizontal roll conveyor between whose conveyors forming rolls are moved upwardly to rollingly engage the glass sheet and provide its forming. More specifically, that roll forming of the heated glass sheet is disclosed as utilizing rotatable forming members that rollingly engage the glass sheet from above upon the roll forming to cooperate with the forming rolls. Furthermore, first and second sets of the forming rolls are disclosed located on opposite sides of a centerline of the horizontal conveyor such that there is no upward movement of any roll portion at the centerline and, as such, some glass shapes cannot be roll formed on this type of apparatus.

DISCLOSURE OF INVENTION

[0002] One object of the present invention is to provide improved apparatus for roll forming a heated glass sheet.

[0003] In carrying out the above object, a forming station for forming a heated glass sheet includes a framework and a horizontal conveyor including horizontal rolls spaced from each other on the framework along the direction of conveyance to convey the heated glass sheet therealong at a plane of conveyance, and the horizontal conveyor has opposite lateral sides and a centerline located centrally between its opposite lateral sides. A forming conveyor of the forming station includes forming rolls spaced along the direction of conveyance between the horizontal rolls in an alternating relationship. Each forming roll has opposite ends located on opposite sides of the centerline of the horizontal conveyor and also includes an intermediate portion extending between the ends of the forming rolls across the centerline of the horizontal conveyor. Roll cradles support the opposite ends of each forming roll on the framework on one side of the centerline of the horizontal conveyor. Pivotal supports pivotally mount the roll cradles on the framework at a location below the plane of conveyance of the horizontal conveyor. An actuator includes connections to the roll cradles on the other side of the horizontal conveyor to move the roll cradles and the forming roll supported thereby between a lower position where the forming rolls are located below the plane of conveyance of the horizontal conveyor and an upper position where the forming rolls rollingly engage the heated glass sheet above the plane of conveyance of the horizontal conveyor at the centerline of the horizontal conveyor to form the heated glass sheet. A forming press of the forming station is located above the centerline of the horizontal conveyor and includes rotatable forming members that rollingly engage the heated glass sheet from above upon forming thereof by the forming conveyor.

[0004] The construction of the forming station with the forming conveyor having forming roll whose opposite ends are located on opposite sides of the centerline of the horizontal conveyor and which are pivotally movable upwardly so as to rollingly engage the heated glass sheet above the plane of conveyance of the horizontal conveyor or at its centerline permits forming of heated glass sheets to shapes that have heretofore been possible.

[0005] The forming station also includes a carriage that supports the roll cradles and that is movable on the framework laterally with respect to the direction of conveyance to permit movement of the forming rolls for positioning the opposite ends thereof on the opposite sides or on the same side of the centerline of the horizontal conveyor.

[0006] In addition to the forming station for forming a heated glass sheet, there is also a quench station for quenching the formed glass sheet so as to provide heat strengthening or tempering.

[0007] The forming conveyor of the forming station is also disclosed as including a second set of forming rolls respectively aligned with the first set of forming rolls. Each of the second set of forming rolls has opposite ends located on the same side of the centerline of the horizontal conveyor and also includes an intermediate portion extending between its ends. A second set of roll cradles supports the opposite ends of each of the second set of forming rolls on the framework on the same side of the centerline of the horizontal conveyor. A second actuator moves the second set of roll cradles and the second set of forming rolls supported thereby between a lower position where the second set of forming rolls are located below the plane of conveyance of the horizontal conveyor and an upper position where the second set of forming rolls rollingly engage the heated glass sheet above the plane of conveyance of the horizontal conveyor and cooperate with the first set of forming rolls and the forming press to form the heated glass sheet.

[0008] The forming conveyor of the forming station also includes pivotal supports that pivotally mount the second set of roll cradles on the framework on the side of the centerline of the horizontal conveyor at a location below the plane of conveyance of the horizontal conveyor, and the second actuator includes connections to the second set of roll cradles on the same side of the centerline of the horizontal conveyor as the pivotal supports that pivotally support the second set of roll cradles. In addition, the forming conveyor of the forming station also includes a second carriage that supports the second set of roll cradles and that is movable on the framework laterally with respect to the direction of conveyance to permit lateral movement of the second set of forming rolls.

[0009] Another object of the present invention is to provide an improved method for roll forming a heated glass sheet.

[0010] In carrying out the immediately preceding object, the method for roll forming a heated glass sheet is performed by conveying the heated glass sheet onto a
horizontal conveyor on horizontal rolls thereof spaced along a direction of conveyance and extending between opposite lateral sides of the horizontal conveyor with a centerline located centrally therebetween. Forming rolls are moved upwardly between the horizontal rolls on opposite sides of and at the centerline of the horizontal conveyor to rollingly engage and thereby roll form the heated glass sheet above a plane of conveyance of the horizontal conveyor at its centerline. The heated glass sheet is also rollingly engaged from above to cooperate with the forming rolls in roll forming the heated glass sheet.

[0011] In carrying out the roll forming, the forming rolls are moved on roll cradles that are pivotally supported on one side of the centerline of the horizontal conveyor and that are actuated for vertical movement at the other side of the centerline of the horizontal conveyor. The roll forming is also disclosed as utilizing a second set of forming rolls that are moved upwardly between the horizontal rolls of the horizontal conveyor to cooperate with the first set of forming roll and with rolling members that provide the rolling engagement of the heated glass sheet from above. The second set of forming rolls are moved on a second set of roll cradles that are pivotally supported and actuated for vertical movement on the same side of the centerline of the horizontal conveyor.

[0012] In addition to the roll forming of the heated glass sheet, the formed glass sheet is also disclosed as being quenched to provide heat strengthening or tempering.

**BRIEF DESCRIPTION OF DRAWINGS**

[0013]

FIGURE 1 is a side elevational view of a glass sheet processing system that embodies the invention and performs the method thereof to roll form a heated glass sheet.

FIGURE 2 is an enlarged schematic side view of a forming station of the system for roll forming the heated glass sheet.

FIGURE 3 is a cross-sectional view of the forming station taken along the direction of line 3-3 in Figure 2 to illustrate the manner in which forming rolls are moved with respect to a horizontal conveyor to provide roll forming of the heated glass sheet.

FIGURE 4 is an enlarged view of a portion of Figure 3 illustrating a right forming roll of the forming station.

FIGURE 5 is an enlarged portion of Figure 3 illustrating a left forming roll of the forming station.

FIGURE 6 is a broken away perspective view illustrating one type of forming roll that can be utilized with the forming station to provide curved glass shapes.

FIGURE 7 is a view that illustrates a backbone of the forming roll shown in Figure 6.

FIGURE 8 is a sectional view taken along the direction of line 8-8 in Figure 6 to further illustrate the construction of the roll backbone.

FIGURE 9 is a view of another type of forming roll that is utilized with the forming station to provide flat glass shapes.

FIGURES 10a through FIGURES 10g are schematic cross-sectional views taken through the forming station to illustrate operation thereof in one mode where forming rolls are moved upwardly at a lateral centerline of the horizontal conveyor to provide the glass sheet forming to the different shapes illustrated.

FIGURES 11a through FIGURES 11f are schematic views taken through the forming station to illustrate operation thereof in another mode where forming rolls are moved upwardly on opposite lateral sides of the centerline of the horizontal conveyor to provide the glass sheet forming to the different shapes illustrated.

**BEST MODE FOR CARRYING OUT THE INVENTION**

[0014] With reference to Figure 1 of the drawings, a glass sheet processing system generally indicated by 20 embodies the present invention to provide roll forming thereof as is hereinafter more fully described. This glass sheet processing system 20 includes a load station 22 onto which a glass sheet is loaded for the processing, a furnace 24 in which the glass sheet is heated in any conventional manner, a forming station 26 that is constructed in accordance with the present invention to provide roll forming of the heated glass sheet, a quench station 28 that quenches the formed glass sheet to provide heat strengthening or tempering, an after-cooling station 30 that further cools the formed glass sheet to a handling temperature, and an unload station 32 where the cooled, roll formed glass sheet is unloaded. As illustrated, each of the stations has a roll conveyor for conveying the glass sheet; however at certain of the stations other types of conveyors can be used such as gas hearth conveyors, except at the forming station 26 where roll conveyance must be utilized to practice the invention. Furthermore, the construction and method of operation of the forming station 26 will be described in an integrated manner to facilitate an understanding of the different aspects of the invention.

[0015] With reference to Figures 2 and 3, the forming station 26 includes a framework 34 having floor mounted lower beams 36, vertical posts 38, and horizontal upper beams 40 that cooperatively support roll forming apparatus 42 as is hereinafter more fully described.

[0016] Forming station 26 as shown in Figures 2 and
3 includes a horizontal conveyor 44 having horizontal rolls 46 spaced from each other on the framework 34. More specifically, as illustrated in Figure 3, the horizontal conveyor 44 has opposite lateral sides 48 including post supports 50 extending upwardly from the lower beams 36 of the framework 34. Between its opposite lateral sides 48, the horizontal conveyor 44 has post supports 50 extending upwardly from the lower beams 36 of framework 34 as shown in Figure 3 to support opposite ends of the horizontal rolls 46. These horizontal rolls 46 are preferably made from steel and have tubular coverings of a temperature resistant cloth, such as a synthetic organic polymer that can be an aromatic polyamide as sold by DuPont Chemical Company of Wilmington, Delaware, United States of America, under the Trademark KEVLAR. As shown in Figure 4, the right end of each horizontal roll is supported by a rotatable bearing 52 on the associated post support 50 under a spring bias that is releasable by a manual knob 54. As shown in Figure 5, the left end of each horizontal roll is supported by a bearing 52 that is rotatably supported by the adjacent post support 50 and rotatably driven by a drive mechanism 56. An electric drive motor 58 of the drive mechanism 56 is mounted on the lower portion of the adjacent post support 50 and through a drive chain 60 rotatably drives a beveled gear and shaft drive 61 that extends upwardly through the post support and rotatably drives the bearing 52 and the supported horizontal roll 46. The rolls 46 of the horizontal conveyor 44 convey the glass sheet G as shown in Figure 2 along a direction of conveyance A at a plane of conveyance C. As shown in Figure 3, the horizontal conveyor 44 has a centerline C/L located centrally between its opposite lateral sides 48, i.e., there is the same lateral distance between the centerline C/L and each of the lateral sides 48 of the horizontal conveyor.

As illustrated in Figure 2, the forming station 26 also includes a forming conveyor 52 including forming roll assemblies 64 spaced along the direction of conveyance between the horizontal rolls 46 of the horizontal conveyor 44 in an alternating relationship. The forming roll assemblies 64 as illustrated in Figure 3 include a first set of forming rolls 66 and a second set of forming rolls 68 as is hereinafter more fully described. As shown in Figure 4, each of the first set of forming rolls 66 has opposite ends 70 and 72 located on opposite sides of the centerline C/L of the horizontal conveyor 44 and also includes an intermediate portion 74 extending between the ends of the forming rolls across the centerline C/L of the horizontal conveyor. Roll cradles 76 support the opposite ends 70 and 72 of each forming roll 66 on the opposite sides of the centerline C/L of the horizontal conveyor 44. An actuator collectively indicated by 78 moves the roll cradles 76 and the forming rolls 66 supported thereby between a lower position as shown by solid line representation in Figure 3 and an upper position shown by phantom line representation. In the lower position, the forming roll 66 are located below the plane of conveyance C of the horizontal conveyor 44. In the upper position, the forming rolls 66 rollingly engage the heated glass sheet above the plane of conveyance C of the horizontal conveyor 44 at the centerline C/L to roll form the glass sheet.

As illustrated in Figure 2, the forming station 26 also includes a forming press 80 located above the horizontal conveyor and including rotatable forming members 82 that rollingly engage the heated glass sheet G from above upon roll forming thereof by the forming conveyor to thereby cooperate with the forming rolls of the forming conveyor as previously described. The rotatable forming members 82 can be wheels or rolls as necessary to provide the required roll formed shape.

The forming roll assemblies 64 illustrated in Figure 2 as previously mentioned also include a second set of forming rolls 68. Each of the second set of forming rolls 68 as illustrated in Figures 3 and 5 has opposite ends 84 and 86 located on the same side of the centerline C/L of the horizontal conveyor 44 and also has an intermediate portion 88 (Figure 3) extending between its ends. A second set of roll cradles 90 supports the opposite ends 84 and 86 of each of the second set of forming rolls 68 on the framework 34 on the same side of the centerline C/L of the horizontal conveyor 44. A second actuator 92 of the forming conveyor 62 moves the second set of roll cradles 90 and the second set of forming rolls 68 supported thereby between lower and upper positions respectively shown by solid and phantom line representation in Figure 3. In the lower solid line indicated position, the second set of forming rolls 68 are located below the plane of conveyance C of the horizontal conveyor 44. In the phantom line indicated upper position, the second set of forming rolls 68 are located above the plane of conveyance on only one side of the centerline C/L of the horizontal conveyor 44 and rollingly engage the heated glass sheet to cooperate with the first set of rolls 66 and the forming press 68 in roll forming the heated glass sheet.

Before proceeding with the description of the forming station and the rest of the processing system, reference to Figures 6 through 8 and to Figure 9 illustrates two different types of forming rolls that can be utilized to provide the roll forming of the glass sheet. More specifically, the forming roll 66 illustrated in Figures 6 through 8 can be utilized to provide roll forming of a curved cylindrical shape as illustrated in Figures 3 and 4 in connection with the first set of forming rolls, while the forming roll 68 illustrated in Figure 9 can be utilized to provide roll forming of a flat shape as previously described in connection with the second set of forming rolls illustrated in Figures 3 and 4.

As illustrated in Figures 6 through 8, the forming roll 66 includes a backbone 94 having a tensioning member 96 extending between a cradle attachment 98 at the one roll and 70 and a cradle nut connection 100 at the other roll end 72. Backbone 94 also includes support members 102 through which the tensioning member 96 extends between the opposite roll ends. As shown in Fig-
In order to provide the roll forming, the forming roll 66 illustrated in Figures 6 through 8 is positioned against a template of the required shape with the nut connection 100 loosened so that rotation can take place between the support members 102 to the proper position with respect to each other. After such template positioning of the roll 66 to the required shape, the nut connection 100 is tightened to tension the forming roll member 96 and thereby fix the location of the support members 102 with respect to each other so that the backbone stays in the same shape during the roll forming. During such roll forming, the helical spring 110 and its cloth sleeve 112 rotate over the backbone 94 under the driving operation of the roll tube 106 and the drive gear 108 as driven by the drive chain 114. This forming roll 66 is thus capable of providing roll forming of curved cylindrical shapes.

With reference to Figure 9, the forming roll 68 illustrated includes a straight roll tube 116 of steel that extends to the roll end 84 for rotational support by a bearing 118 on a cradle attachment 120 for attaching to cradle 90. At the other roll end 86, the roll tube 116 is rotatably supported by the cradle 90 and has a drive gear 122 that is rotatively driven by a drive chain 124. Roll tube 116 is made of steel and is covered by a high temperature cloth sleeve 112 such as of KEVLAR. This forming roll 68 thus provides roll forming of flat shapes as previously described in connection with the second set of forming rolls 66 illustrated in Figures 3 and 5.

With reference to Figures 3 and 4, the forming conveyor 62 includes pivotal supports 128 that pivotally mount the second set of roll cradles 90 on the same side of the horizontal conveyor centerline C/L as the pivotal supports 120 that pivotally support the first set of roll cradles 76. These pivotal supports 128 provide support of the associated set of roll cradles at a location below the plane of conveyance C of the horizontal conveyor 44. The second actuator 92 includes connections 144 to the second set of roll cradles 90 on the same side of the horizontal conveyor centerline C/L as the pivotal supports 128. A connection member 146 extends between the connections 144 to the second set of roll cradles 90 and is connected to a pair of curved end connectors 148 (only one shown) by pivotal connections 150 in the same manner previously described in connection with the first actuator. Actuating chains 152 extend upwardly from the curved end connectors 148 as illustrated in Figure 3 to an associated drive motor 152.

As previously mentioned in connection with Figure 1, the glass sheet processing system 20 also includes a quench station 24 for rapidly quenching the formed glass sheet to provide heat strengthening or tempering thereof after the roll forming in the manner previously described.

The construction of the forming station 26 as previously described provides the capability of providing bent shapes that have not previously been possible by roll forming. Such shapes are illustrated by Figures 10a through 10g. More specifically, different shapes of rolled glass sheets Ga through Gg are illustrated with straight and curved shapes wherein roll forming takes place for a greater lateral distance of one shape than one-half of the lateral width of the horizontal conveyor 44 which is permitted by virtue of the forming conveyor construction previously described.

Forming station 26 as illustrated in Figure 3 also includes first and second carriages 154 and 156 that respectively support the first and second sets of roll cradles 76 and 90 for movement on the framework 38 laterally with respect to the direction of conveyance between the position shown by solid line representation and the position partially shown by phantom line representation. Each of these carriages 154 and 156 includes lower beams 158 and 160 that are supported by associated slideways 162 and 164 on the floor beams 36. Vertical half posts 166 and 168 respectively extend upwardly from the lower beams 158 and 160 to mount the pivotal supports 128 and 142 on which the first and second sets of roll cradles 76 and 90 are pivotally mounted as previously described.
A forming station (26) for roll forming a heated glass sheet (G), comprising:

- a framework (34);
- a horizontal conveyor (44) including horizontal rolls (46) spaced from each other on the framework (34) along a direction of conveyance (A) to convey the heated glass sheet (G) therealong at a plane of conveyance (C), and the horizontal conveyor (44) having opposite lateral sides (48) and a centerline (C/L) located centrally between its opposite lateral sides (48);

characterised by:

- a forming conveyor (62) including forming rolls (66) spaced along the direction of conveyance (A) between the horizontal rolls (46) in an alternating relationship, each forming roll (66) having opposite ends (70, 72) located on opposite sides (48) of the centerline (C/L) of the horizontal conveyor (44) and also including an intermediate portion (74) extending between the ends (70, 72) of the forming rolls (66) across the centerline (C/L) of the horizontal conveyor (44) roll cradles (76) supporting the opposite ends (70, 72) of each forming roll (66) on the framework (34) on the opposite sides (48) of the centerline (C/L) of the horizontal conveyor (44), pivotal supports (128) that pivotally mount the roll cradles (76) on the framework (34) on one side (48) of the centerline (C/L) of the horizontal conveyor (44) at a location below the plane of conveyance (C) of the horizontal conveyor (44), an actuator (78) including connections (130) to the roll cradles (76) on the other side (48) of conveyor (44), an actuator (78) including connections (130) to the roll cradles (76) on the other side (48) of the centerline (C/L) of the horizontal conveyor (44) to move the roll cradles (76) and the forming rolls (66) supported thereby between a lower position where the forming rolls (66) are located below the plane of conveyance (C) of the horizontal conveyor (44) and an upper position where the forming rolls (66) rollingly engage the heated glass sheet (G) above the plane of conveyance (C) of the horizontal conveyor (44) at the centerline (C/L) of the horizontal conveyor (44) to roll form the heated glass sheet (G); and a forming press (80) located above the horizontal conveyor (44) and including rotatable forming members (82) that rollingly engage the heated glass sheet (G) from above upon roll forming thereof by the forming conveyor (62).

2. A forming station (26) for roll forming a heated glass sheet (G) as in claim 1 wherein the forming station (26) includes a carriage (154) that supports the roll cradles (76) and that is movable on the framework (34) laterally with respect to the direction of conveyance (A) to permit movement of the forming rolls (66) for positioning the opposite ends (70, 72) thereof on the opposite sides (48) or on the same side (49) of the centerline (C/L) of the horizontal conveyor (44).

3. A forming station (26) for roll forming a heated glass sheet (G) as in claim 1 or 2 and further including a quench station (28) for quenching the formed glass sheet (G).

4. A forming station (26) for roll forming a heated glass sheet (G) as in claim 1 or 2 wherein the forming conveyor (62) further includes a second set of forming rolls (68) respectively aligned with the first mentioned forming rolls (66), each of the second set of forming rolls (68) having opposite ends (84, 86) located on the same side (48) of the centerline (C/L) of the horizontal conveyor (44) and also including an intermediate portion (88) extending between its ends (84, 86), a second set of roll cradles (90) supporting the opposite ends (84, 86) of each of the second set of forming rolls (68) on the framework (34) on the same
1. Formstation (26) zum Rollformen einer erhitzten Glasscheibe (G), umfassend:

- einen Rahmen (34);
- einen horizontalen Förderer (44) mit voneinander auf dem Rahmen (34) entlang einer Förderrichtung (A) beabstandeten horizontalen Rollen (46), um die erhitze Glasscheibe (G) entlang dieser in einer Förderebene (C/L) zu fördern, wobei der horizontale Förderer (44) gegenüberliegende laterale Seiten (48) sowie eine zentral zwischen seinen gegenüberliegenden lateralen Seiten (48) angeordnete Mittelachse (C/L) aufweist;

gekennzeichnet durch:

- einen Formförderer (62) mit Formrollen (66), die entlang der Förderrichtung (A) in einer abwechselnden Beziehung zwischen den horizontalen Rollen (46) voneinander beabstandet angeordnet sind, wobei jede Formrolle (62) gegenüberliegende Enden (70, 72), die auf gegenüberliegenden Seiten (48) der Mittelachse (C/L) des horizontalen Förderers (44) angeordnet sind, sowie einen Zwischenbereich (74), der sich über die Mittelachse (C/L) des horizontalen Förderers (44) zwischen den Enden (70, 72) der Formrollen (66) erstreckt, aufweist, Rollengestellen (76), die die gegenüberliegenden Enden (70, 72) jeder Formrolle (66) auf dem Rahmen (34) auf den gegenüberliegenden Seiten (48) der Mittelachse (C/L) des horizontalen Förderers (44) lagern, Schwenklagern (128), die die Rollengestelle (76) auf einer Seite (48) der Mittelachse (C/L) des horizontalen Förderers (44) in einer Position unterhalb der Förderebene (C) des horizontalen Förderers (44) an dem Rahmen (34) schwenkbar lagern, einem Betätigungselement (78) mit Verbindungen (130) an die Rollengestelle (76) auf der anderen Seite (48) der Mittelachse (C/L) des horizontalen Förderers (44), um die Rollengestelle (76) und die von diesen gelagerten Formrollen (66) zwischen einer unteren Stellung, in der die Formrollen (66) unterhalb der Förderebene (C) des horizontalen Förderers (44) angeordnet sind und einer oberen Stellung, in der die Formrollen (66) oberhalb der Förderebene (C) des horizontalen Förderers (44) an der Mittelachse (C/L) des horizontalen Förderers (44) rollend an der erhitzen Glasscheibe (G) angreifen, um die erhitze Glasscheibe (G) zu Rollformen zu bewegen; und
- eine Formpresse (80), die oberhalb des horizontalen Förderers (44) angeordnet ist und rotierbare Formelemente (82) umfasst, die beim Rollformen der erhitzen Glasscheibe (G) durch den Formförderer (62) von oben rollend an der erhitzen Glasscheibe (G) angreifen.

Patentansprüche

1. Formstation (26) zum Rollformen einer erhitzen Glasscheibe (G), umfassend:

5. A forming station (26) for roll forming a heated glass sheet (G) as in claim 4 further wherein the forming conveyor (62) includes pivotal supports (142) that pivotally mount the second set of roll cradles (90) on the framework (34) on one side (48) of the centerline (C/L) of the horizontal conveyor (44) at a location below the plane of conveyance (C) of the horizontal conveyor (44) the second actuator (92) including connections (144) to the second set of roll cradles (90) on the same side (48) of the centerline (C/L) of the horizontal conveyor (34) as the pivotal supports (142) that pivotally support the second set of roll cradles (90).

6. A forming station (26) for roll forming a heated glass sheet (G) as in claim 5 wherein the forming conveyor (62) includes a second carriage (156) that supports the second set of roll cradles (90) and that is movable on the framework (34) laterally with respect to the direction of conveyance (A) to permit lateral movement of the second set of forming rolls (68).

7. A forming station (26) for roll forming a heated glass sheet (G) as in any of claims 4 through 6 and further including a quench station for quenching the formed glass sheet.

8. A method for roll forming a heated glass sheet using the forming station (26) of any of claims 1 to 7.

2. Formstation (26) zum Rollformen einer erhitzen Glasscheibe (G) gemäß Anspruch 1, wobei die Formstation (26) einen Laufwagen (154) umfasst, der die Rollengestelle (76) trägt und der auf dem Rahmen (34) lateral bezüglich der Förderrichtung (A) bewegbar ist, um zur Positionierung der gegenüberliegenden Enden (70, 72) der Formrollen (66) auf den gegenüberliegenden Seiten (48) oder auf derselben Seite (48) der Mittelachse (C/L) des
Formstation (26) zum Rollformen einer erhitzten Glasscheibe (G) gemäß Anspruch 1 oder 2, weiterhin umfassend eine Abschreckstation (28) zum Abschrecken der geformten Glasscheibe (G).

3. Formstation (26) zum Rollformen einer erhitzten Glasscheibe (G) gemäß Anspruch 1 oder 2, wobei der Formförderer (62) weiterhin einen zweiten Satz an Formrollen (68), die jeweils zu den ersten erwähnten Formrollen (66) ausgerichtet sind, wobei jede der Formrollen (68) des zweiten Satzes gegenüberliegende Enden (84, 86) hat, auf derselben Seite (48) der Mittelachse (C/L) des horizontalen Förderers (44) angeordnet sind, sowie einen Zwischenbereich (88) hat, der sich zwischen deren Enden (84, 86) erstreckt, einen zweiten Satz an Rollgestellen (90), die die gegenüberliegenden Enden (84, 86) jedes der Formrollen (68) des zweiten Satzes auf derselben Seite (48) der Mittelachse (C/L) des horizontalen Förderers (44) auf dem Rahmen (34) umfasst, der den zweiten Satz an Rollrollen (68) zwischen einer unteren Stellung, in der der zweite Satz an Formrollen (68) unterhalb der Förderebene (C) des horizontalen Förderers (44) angeordnet ist, und einer oberen Stellung, in der der zweite Satz an Formrollen (68) oberhalb der Förderebene (C) des horizontalen Förderers (44) rollend an der Förderebene (C) des horizontalen Förderers (44) rollend an der erhitzten Glasscheibe (G) angreift und mit den ersten erwähnten Formrollen (66) und der Formpresse (80) zusammenwirkt, um die erhitzte Glasscheibe (G) zu Rollformen.

5. Formstation (26) zum Rollformen einer erhitzten Glasscheibe (G) gemäß Anspruch 4, wobei der Formförderer (62) weiterhin Schwenkkläger (142) umfasst, die den zweiten Satz an Rollengestellen (90) auf einer Seite (48) der Mittelachse (C/L) des horizontalen Förderers (44) in einer Position unterhalb der Förderebene (C) des horizontalen Förderers (44) an dem Rahmen (34) schwenkbar lagern, und wobei das zweite Betätigungselement (92) auf derselben Seite (48) der Mittelachse (C/L) des horizontalen Förderers (34), auf der die Schwenkkläger (142), die den zweiten Satz an Rollengestellen (90) schwenkbar lagern, angeordnet sind, Verbindungen an den zweiten Satz an Rollengestellen (90) umfasst.

6. Formstation (26) zum Rollformen einer erhitzten Glasscheibe (G) gemäß Anspruch 5, wobei der Formförderer (62) einen zweiten Laufwagen (156) umfasst, der den zweiten Satz an Rollengestellen (90) trägt und der auf dem Rahmen (34) lateral bezüglich der Förderrichtung (A) bewegbar ist, um eine laterale Bewegung des zweiten Satzes an Rollformen (68) zu ermöglichen.

7. Formstation (26) zum Rollformen einer erhitzten Glasscheibe (G) gemäß einem beliebigen der Ansprüche 4 bis 6, weiterhin umfassend eine Abschreckstation zum Abschrecken der geformten Glasscheibe.

8. Verfahren zum Rollformen einer erhitzten Glasscheibe (G) unter Verwendung der Formstation (26) gemäß einem beliebigen der Ansprüche 1 bis 7.

**Revendications**

1. Poste de formage (26) destiné à former à l'aide de rouleaux une vitre chauffée (G), comprenant :
   - un châssis (34) ;
   - un transporteur horizontal (44) comprenant des rouleaux horizontaux (46) espacés les uns des autres sur le châssis (34) le long d'une direction de transport (A) pour transporter la vitre chauffée (G) le long de celle-ci sur un plan de transport (C) ;
   - un transporteur horizontal (44) ayant des faces latérales opposées (48) et un axe central (C/L) entre ses faces latérales opposées (48) ;

   caractérisé par
   un transporteur de formage (62) comprenant des rouleaux de formage (66) espacés le long de la direction de transport (A) entre les rouleaux horizontaux (46) dans une relation alternée, chaque rouleau de formage (62) ayant des extrémités opposées (70, 72) situées sur les faces opposées (48) de l'axe central (C/L) du transporteur horizontal (44) et comprenant également une partie intermédiaire (74) s'étendant entre les extrémités (70, 72) des rouleaux de formage (66) à travers l'axe central (C/L) du transporteur horizontal (44), des bascules à rouleaux (76) supportant les extrémités opposées (70, 72) de chaque rouleau de formage (66) sur le châssis (34) sur les faces opposées (48) de l'axe central (C/L) du transporteur horizontal (44), des supports pivotants (128) qui montent en pivotement les bascules à rouleaux (76) sur le châssis (34) sur une face (48) de l'axe central (C/L) du transporteur horizontal (44) en un emplacement situé en dessous du plan de transport (C) du transporteur horizontal (44) ; un actionneur (78) comprenant des liaisons (130) avec les bascules à rouleaux (76) sur l'autre face (48) de l'axe central (C/L) du transporteur horizontal (44) pour déplacer les bascules à rouleaux (76) et les rouleaux de formage (66) supportés par celles-ci entre une position inférieure où les rouleaux de formage (66)
sont situés en dessous du plan de transport (C) du transporteur horizontal (44) et une position supérieure où les rouleaux de formage (66) engagent par roulement la vitre chauffée (G) au-dessus du plan de transport (C) du transporteur horizontal (44) au niveau de l’axe central (C/L) du transporteur horizontal (44) pour former la vitre chauffée (G) à l’aide des rouleaux ; et une presse de formage (80) située au-dessus du transporteur horizontal (44) et comprenant des éléments de formage rotatifs (82) qui engagent par roulement la vitre chauffée (G) par le dessus lors du formage de celle-ci à l’aide des rouleaux par le transporteur de formage (62).

2. **Poste de formage (26) destiné à former à l’aide de rouleaux une vitre chauffée (G) selon la revendication 1, dans lequel le poste de formage (26) comprend un chariot (154) qui supporte les bascules à rouleaux (76) et qui peut se déplacer sur le châssis (34) latéralement par rapport à la direction de transport (A) pour permettre le mouvement des rouleaux de formage (66) dans le but de positionner les extrémités opposées (70, 72) de ceux-ci sur les faces opposées (48) ou sur la même face (49) de l’axe central (C/L) du transporteur horizontal (44).

3. **Poste de formage (26) destiné à former à l’aide de rouleaux une vitre chauffée (G) selon la revendication 1 ou 2 et comprenant en outre un poste de trempe (28) destiné à refroidir rapidement la vitre formée (G).

4. **Poste de formage (26) destiné à former à l’aide de rouleaux une vitre chauffée (6) selon la revendication 1 ou 2, dans lequel le transporteur de formage (62) comprend en outre un deuxième ensemble de rouleaux de formage (68) respectivement alignés avec les premiers rouleaux de formage mentionnés (66), chaque rouleau du deuxième ensemble de rouleaux de formage (68) ayant des extrémités opposées (84, 86) situées sur la même face (48) de l’axe central (C/L) du transporteur horizontal (44) et comprenant également une partie intermédiaire (88) s’étendant entre ses extrémités (84, 86), un deuxième ensemble de bascules à rouleaux (90) supportant les extrémités opposées (84, 86) de chaque rouleau du deuxième ensemble de rouleaux de formage (68) sur le châssis (34) sur la même face (48) de l’axe central (C/L) du transporteur horizontal (44), et un deuxième actionneur (92) qui déplace le deuxième ensemble de bascules à rouleaux (90) et le deuxième ensemble de rouleaux de formage (68) supportés par celles-ci entre une position inférieure où le deuxième ensemble de rouleaux de formage (68) est situé en dessous du plan de transport (C) du transporteur horizontal (44) et une position supérieure où le deuxième ensemble de rouleaux de formage (68) engage par roulement la vitre chauffée (G) au-dessus du plan de transport (C) du transporteur horizontal (44) et coopère avec les premiers rouleaux de formage mentionnés (66) et la presse de formage (80) pour former la vitre chauffée (G) à l’aide des rouleaux.

5. **Poste de formage (26) destiné à former à l’aide de rouleaux une vitre chauffée (G) selon la revendication 4, dans lequel le transporteur de formage (62) comprend en outre des supports pivotants (142) qui montent en pivote ment le deuxième ensemble de bascules à rouleaux (90) sur le châssis (34) sur une face (48) de l’axe central (C/L) du transporteur horizontal (44) en un emplacement situé en dessous du plan de transport (C) du transporteur horizontal (44), le deuxième actionneur (92) comprenant des liaisons (144) avec le deuxième ensemble de bascules à rouleaux (90) sur la même face (48) de l’axe central (C/L) du transporteur horizontal (44) que les supports pivotants (142) qui supportent en pivotement le deuxième ensemble de bascules à rouleaux (90).

6. **Poste de formage (26) destiné à former à l’aide de rouleaux une vitre chauffée (G) selon la revendication 5, dans lequel le transporteur de formage (62) comprend un deuxième chariot (156) qui supporte le deuxième ensemble de bascules à rouleaux (90) et qui peut se déplacer sur le châssis (34) latéralement par rapport à la direction de transport (A) pour permettre le mouvement latéral du deuxième ensemble de rouleaux de formage (68).

7. **Poste de formage (26) destiné à former à l’aide de rouleaux une vitre chauffée (G) selon une quelconque des revendications 4 à 6, et comprenant en outre un poste de trempe destiné à refroidir rapidement la vitre formée.

8. **Procédé destiné à former à l’aide de rouleaux une vitre chauffée à l’aide du poste de formage (26) selon l’une des revendications 1 à 7.
REFERENCES CITED IN THE DESCRIPTION

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