

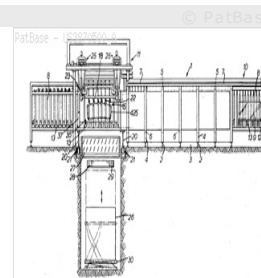
1) Family number: 5223518 (US3870500A)

APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: US3870500A A hot glass sheet cut to shape for use in the manufacture of a vehicle window is supported in a near-vertical position on its lower edge on a carriage as it is heated and moved between co-operating male and female dies. When between the dies lifting fingers mounted on the bottom of at least one of the dies move beneath the supported lower edge of the sheet, and as the dies close the lifting fingers are raised sufficiently to lift the hot glass sheet from the carriage and provide support for the sheet as it is bent.

Probable Assignee: TRIPLEX SAFETY GLASS CO

Earliest Publication Date: 19741128



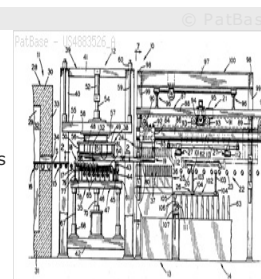
2) Family number: 7263026 (US4883526A)

METHOD AND APPARATUS FOR SHAPING AND CONVEYING GLASS SHEETS

Abstract: Source: US4883526A A process and apparatus for conveying formed, heated glass sheets from a glass forming station, through a glass tempering station, to a Lehr, utilizes a shuttle ring conforming in outline and elevation to the marginal edges of the glass sheet. The shuttle ring receives the glass sheet from the lower shaping mold, by the relative downward vertical movement of the lower shaping mold away from the upper shaping mold. The glass sheet thus deposited on and supported by the shuttle ring is transported through the tempering station to the Lehr.

Probable Assignee: LIBBEY OWENS FORD CO

Earliest Publication Date: 19891128



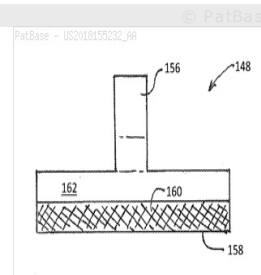
3) Family number: 64167045 (US2018155232A)

METHOD AND APPARATUS FOR SHAPING GLASS SHEETS

Abstract: Source: US2018155232A The invention relates to a method for shaping a glass sheet comprising the steps (i) heating the glass sheet to a temperature suitable for shaping; (ii) depositing the glass sheet on a first bending tool for supporting the glass sheet thereon, the glass sheet being in a first position relative to the first bending tool; (iii) contacting an edge portion of the glass sheet such that the glass sheet is moved to a second position relative to the first bending tool; and (iv) shaping the glass sheet on the first bending tool. Positioning devices for moving a hot glass sheet during the method of the invention are described. A glass shaping line for carrying out the method is also described.

Probable Assignee: PILKINGTON GROUP LTD

Earliest Publication Date: 20161201



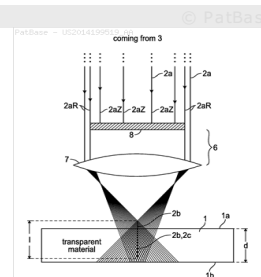
4) Family number: 56889171 (US2014199519A)

METHOD AND DEVICE FOR THE LASER-BASED MACHINING OF SHEET-LIKE SUBSTRATES

Abstract: Source: US2014199519A A method for the laser-based machining of a sheet-like substrate, in order to separate the substrate into multiple portions, in which the laser beam of a laser for machining the substrate is directed onto the latter, is characterized in that, with an optical arrangement positioned in the path of rays of the laser, an extended laser beam focal line, seen along the direction of the beam, is formed on the beam output side of the optical arrangement from the laser beam directed onto the latter, the substrate being positioned in relation to the laser beam focal line such that an induced absorption is produced in the material of the substrate in the interior of the substrate along an extended portion, seen in the direction of the beam, of the laser beam focal line, such that a material modification takes place in the material of the substrate along this extended portion.

Probable Assignee: CORNING INC

Earliest Publication Date: 20140716



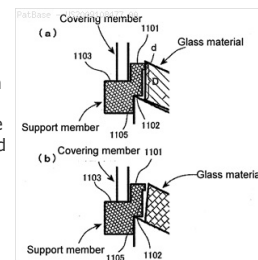
5) Family number: 34493637 (US2009108477A)

METHOD OF MANUFACTURING FORMED ARTICLE, GLASS MATERIAL, AND METHOD OF DETERMINING SHAPE OF GLASS MATERIAL AND MOLD

Abstract: Source: US2009108477A The present invention relates to a method of manufacturing a formed article comprising forming an upper surface of a glass material that has been positioned on a forming surface of a mold to obtain the formed article by heating the glass material to a temperature permitting deformation to bring a lower surface of the glass material into tight contact with the forming surface. Glass having upper and lower surfaces being spherical in shape is employed as the glass material, a mold having a forming surface being a free-form surface other than a spherical surface is employed as the mold, the upper surface of the glass material is formed into a roughly offset surface relative to the forming surface of the mold. The present invention permits the manufacturing of formed articles of desired shape with high precision by hot sag molding method. The present invention also permits the easy and simple determination of the surface shapes of molds and glass materials employed in hot sag molding method.

Probable Assignee: HOYA CORP

Earliest Publication Date: 20070524



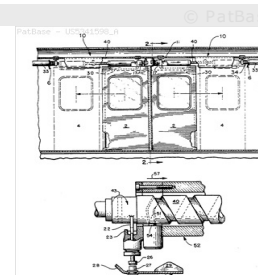
6) Family number: 8408736 (US5341598A)

POWER DOOR DRIVE AND DOOR SUPPORT HAVING MOTOR OPERATED LOCKS

Abstract: Source: US5341598A Rotary locks used on transit vehicle doors when opened and closed by a rotating helical door drive member. In a preferred embodiment, a first lock utilizes a negative thread portion of the helical drive. A second lock utilizes a rotating lock pawl and stop. The drive and lock can be used to operate door systems with and without separate door hangers. Compensation for camber variations in car structure is provided through the use of spherical mounts or drive member journals.

Probable Assignee: SIDNEY UNIV OF

Earliest Publication Date: 19930805



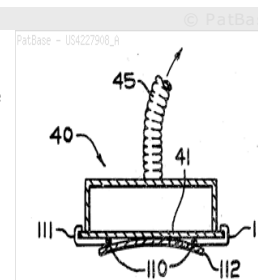
7) Family number: 1378569 (US4227908A)

SHAPING GLASS SHEETS BY DROP FORMING WITH SAG CONTROL MEANS

Abstract: Source: US4227908A Spacer elements affixed to the face of a flat vacuum platen induce a temporary reverse bow in a heat softened glass sheet held on the platen. The bowing is in the opposite direction from that of the final curvature, so that when the glass sheet is subsequently dropped onto a shaping mold the resulting sag in at least one direction is reduced.

Probable Assignee: PPG INDUSTRIES INC

Earliest Publication Date: 19800512



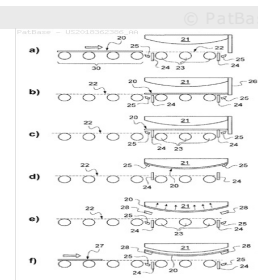
8) Family number: 63716541 (US2018362386A)

DEVICE FOR BENDING SHEETS OF GLASS

Abstract: Source: US2018362386A A device for bending sheets of glass, includes conveying rollers that convey the sheets one after another in a longitudinal direction, carrying them under an upper bending die and onto a receiving surface formed by the upper level of the rollers under the die. The device includes an intermediate support including a contact path for supporting the sheet of glass to be pressed lying under the die. The contact path has, parallel to the edge of the sheet to be pressed, a curvature that is less accentuated than the curvature that is to be imparted by the upper die. The intermediate support can rise above the receiving surface and support the sheet to be pressed until the sheet breaks contact with the rollers. The intermediate support can be lowered down below the receiving surface. A sheet-pressing system can press the periphery of the sheet against the upper bending die.

Probable Assignee: SAINT GOBAIN SA

Earliest Publication Date: 20161006



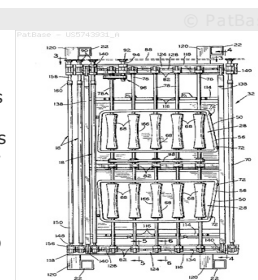
9) Family number: 29367689 (US5743931A)

GLASS SHEET CONVEYING AND BENDING APPARATUS

Abstract: Source: US5743931A A press bending apparatus for shaping heat soften glass sheets between an upper press member and a lower press member is provided. The conveyor system for transferring the sheets of glass in the press bending apparatus includes concave shaped rollers such that the glass sheets tend to sag into conformity with the rolls as the sheets are positioned for bending operations between the upper and lower press members. The lower press member is a continuous press bending ring to prevent improper sagging of the glass sheet around the peripheral edges of the sheet. The concave shape of the rolls mounted inside of the press ring provides maximum support for the formed glass sheet to prevent sagging of the glass. Additional production benefits can be obtained by forming the conveyor system and lower press member as modular unit and the upper press member as a modular unit for each model of bent glass to facilitate changing the press members for production model changes.

Probable Assignee: LIBBEY OWENS FORD CO

Earliest Publication Date: 19970227



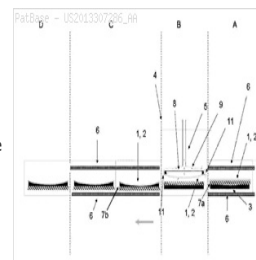
10) Family number: 51281507 (US2013307286A)

METHOD AND DEVICE FOR BENDING SHEETS

Abstract: Source: US2013307286A A method for bending a sheet is described. The method includes the following steps: a) at least one sheet is inserted into a pre-bending ring with a movable bending ring holder, the at least one sheet is heated at least to an approximately softening temperature, and the at least one sheet is prebent in the pre-bending ring to 5 percent to 50 percent of a final edge bending, b) the pre-bent sheet is lifted out of the pre-bending ring by means of a suction device and is bent further, beyond a bending obtained in the pre-bending ring, c) the at least one sheet is laid down by means of the suction device in a final-bending ring on the movable bending ring holder and the at least one sheet is bent to a final bending, and d) the at least one sheet is cooled down in the final-bending ring and the at least one sheet is bent by means of the suction device to 100 percent to 130 percent of an overall final edge bending.

Probable Assignee: SAINT GOBAIN SA

Earliest Publication Date: 20120613



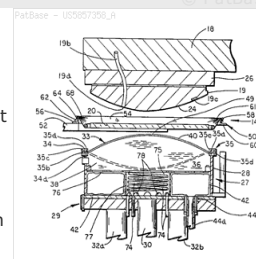
11) Family number: 15734601 (US5857358A)

METHOD AND APPARATUS FOR BENDING GLASS

Abstract: Source: US5857358A A method of and apparatus for bending a sheet of material heated to a formable, state such as glass, resinous polymeric material, viscoelastic material, and thermoplastic material, provides an improved pressing member for pressing the heated sheet against a first rigid mold which reduces the size of the buckles in the bent sheet, eliminates the need for a second rigid mold, reduces the process control steps, reduces the risk of damaging the rigid mold, increases the tolerances for the positioning of the sheet in the apparatus, and increases the range of application. The pressing member includes a flexible diaphragm which rolls the heated sheet against a rigid mold by first applying a pressure to a portion of the heated sheet and then radiating the pressure from that portion to the remaining surface area of the heated sheet in a rolling action. The bending apparatus includes a rigid mold and a flexible diaphragm pressurized into a convex shape for initially pressing on a portion of the heated sheet. A control system moves the pressing member toward the rigid mold and maintains the pressure on the flexible diaphragm so that as the pressing member is moved toward the rigid mold, the flexible member generally conforms to the shape of the rigid mold and rolls the heated sheet onto the rigid mold. To further reduce the size of any buckles, a holder for supporting the heated sheet between the rigid mold and the flexible diaphragm is provided. The holder includes a support surface for supporting the heated sheet generally planar before bending.

Probable Assignee: DONNELLY CORP

Earliest Publication Date: 19980429



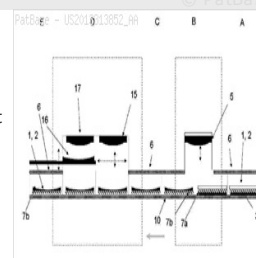
12) Family number: 51281508 (US2013313852A)

METHOD AND DEVICE FOR BENDING SHEETS

Abstract: Source: US2013313852A A method for bending a sheet is described. The method includes the following steps: a) at least one sheet is inserted into a pre-bending ring with a movable bending ring holder, the movable bending ring holder is moved into a furnace and the at least one sheet is heated to softening temperature and is pre-bent to 5 percent to 50 percent of a final edge bending, b) the at least one sheet is lifted by means of a suction device and is bent further, beyond the bending obtained in the pre-bending ring, c) the at least one sheet is laid down by means of the suction device in a final-bending ring on the movable bending ring holder and is bent to the final edge bending, and an area pre-bending of the at least one sheet is performed by means of thermal irradiation, d) the at least one sheet is lifted out of the final-bending ring by means of a second suction device, pressed against an opposing mould and bent, and the at least one sheet is laid down on the final-bending ring and the at least one sheet is cooled down.

Probable Assignee: SAINT GOBAIN SA

Earliest Publication Date: 20120613



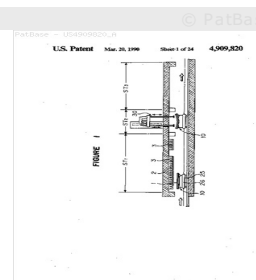
13) Family number: 3531226 (US4909820A)

METHOD OF AND AN APPARATUS FOR BENDING GLASS PLATES FOR A LAMINATED GLASS

Abstract: Source: US4909820A Two glass plates on a bending mold are heated in a heating/bending furnace so that they are subjected to provisional deep-bending operations by their own deadweight, and the provisionally shaped deep-bent portion is pressed by an auxiliary pressing member to thereby form a laminated glass for, for instance, an automobile.

Probable Assignee: ASAHI GLASS CO LTD

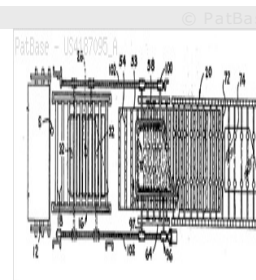
Earliest Publication Date: 19890913



14) Family number: 1429837 (US4187095A)

METHOD AND APPARATUS FOR HANDLING GLASS SHEETS DURING SHAPING AND COOLING

Abstract: Source: US4187095A This invention relates to improvements in handling glass sheets during shaping and cooling. Each glass sheet in turn is heated to its deformation temperature and conveyed into a glass shaping station. The glass is lifted into engagement with an upper vacuum shaping mold while hot and held against the vacuum shaping mold by vacuum as the glass lifting mechanism retracts downward. A transfer and tempering ring-like member having stop means upstream of an outline supporting surface conforming to and slightly inside the periphery of the bent glass sheet is brought into a position where its stop means are slightly misaligned upstream of the trailing edge of the glass sheet. The vacuum on the upper mold is released to deposit the shaped glass sheet on the ring-like member. The latter starts suddenly to displace the bent glass sheet into proper alignment with the ring-like member for movement into a cooling station where the shaped glass sheet is quenched as rapidly as possible to harden the glass surface and then transferred to an unloading conveyor at a transfer station. The ring-like member starts its rapid return from the transfer station to the shaping station before the shaped glass sheet is transferred to a position completely downstream of the ring-like member.



Probable Assignee: PPG IND OHIO INC

Earliest Publication Date: 19800205

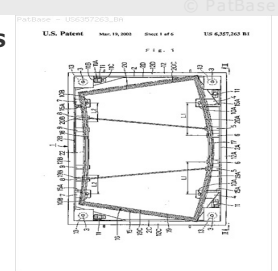
15) Family number: 13101279 (US6357263B)

METHOD FOR BENDING A GLASS SHEET, A RING MOLD FOR BENDING A GLASS SHEET, AND APPARATUS USING THE RING MOLD

Abstract: Source: US6357263B In bending a glass sheet, the load applied to an intermediate glass sheet can be equalized to improve the quality of a final glass sheet. For this purpose, a forming ring 1 comprises a first forming frame 15 and a second forming frame 16, and the swingable center of each of swingable frames 19, 20, which forms right and left portions of a second forming frame 16, is located at an intermediate position apart from a separation position from each of fixed frames 17, 18. By such arrangement, the intermediate glass sheet can be equally supported when the swingable frames 19, 20 are moved along the intermediate glass sheet and the intermediate glass sheet is transferred from the first forming frame 15 onto the second forming frame 16.

Probable Assignee: ASahi GLASS CO LTD

Earliest Publication Date: 19990527



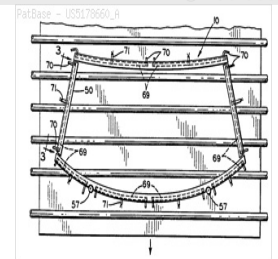
16) Family number: 8340823 (US5178660A)

APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: US5178660A The present invention relates to a female press bending ring for use in the press bending of glass sheets outside of a furnace, and more particularly to a female press bending ring which is suitably heated during the bending cycle to regulate the transfer of heat between the peripheral margin of the glass and the female bending ring with which it is in contact. By so doing, near-edge tension and edge stresses are greatly reduced, thereby reducing chill cracking and glass breakage during and after production. The female ring may be covered by a layer of fiberglass cloth or the like to provide a smooth resilient surface for engaging the glass sheet.

Probable Assignee: LIBBEY OWENS FORD CO

Earliest Publication Date: 19921201



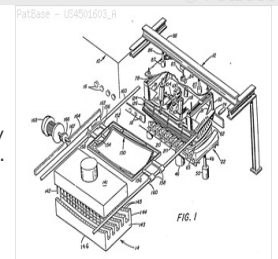
17) Family number: 3623959 (US4501603A)

METHOD AND APPARATUS FOR SHAPING GLASS SHEETS TO COMPLICATED SHAPES

Abstract: Source: US4501603A Bending a glass sheet to a complicated shape that comprises one portion bent sharply relative to a main portion of the sheet involving the use of a vacuum holder, an auxiliary shaping rail and means to correlate the movement of the shaping rail with that of the glass sheet during a bending cycle to insure that the glass sheet is clear of the auxiliary shaping rail except for such time in the glass sheet bending cycle that requires the auxiliary shaping rail to engage the glass sheet portion to be sharply bent against the corresponding portion of the vacuum holder. Another feature incorporated in a preferred embodiment of the present invention facilitates ready removal of glass fragments whenever a flawed glass sheet fractures at or beyond a shaping station outside a furnace where the glass sheet is heated to its deformation temperature.

Probable Assignee: PPG INDUSTRIES INC

Earliest Publication Date: 19841010



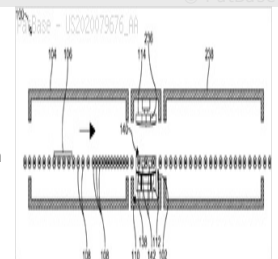
18) Family number: 69907611 (US2020079676A)

METHOD OF SHAPING A GLASS SHEET AND BENDING TOOL UTILIZED THEREIN

Abstract: Source: US2020079676A A method of shaping a glass sheet includes providing a glass sheet. The glass sheet is heated to a temperature suitable for shaping. The glass sheet is deposited on a first bending tool. The glass sheet is disposed over a partial segment of the first bending tool. The first segment at least partially defines a shaping surface of the first bending tool. The first segment of the first bending tool is moved from a first position to a second position to cause contact with a first portion of the glass sheet. The contact with the first portion of the glass sheet adjusts a position of the glass sheet relative to the shaping surface of the first bending tool. The glass sheet is shaped on the first bending tool.

Probable Assignee: PILKINGTON GROUP LTD

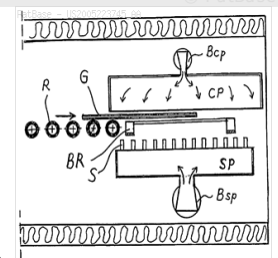
Earliest Publication Date: 20180531



19) Family number: 29176842 (US2005223745A)

METHOD AND EQUIPMENT FOR BENDING AND TEMPERING OF GLASS

Abstract: Source: US2005223745A Method and equipment for glass (G) bending and tempering, in which the glass is first heated in oven in to bending temperature and it is moved over known transfer means, like rotating rollers (R) and after the glass has reached bending temperature it is transferred in to bending section, in which the glass (G) is allowed to bend on special bending ring (BR) and the said transferring the glass onto the bending ring (BR) takes place by moving the glass horizontally by transfer force exerted onto it. When the glass arrives into the location of the bending ring (BR), the supporting the glass from below is changed into air flow directed onto the bottom surface of the glass and the glass elevation plane is maintained by forming planar glass lifting stop means (CP) above the glass and at the location of the bending ring (BR) and blowing air through the lifting stop means so that air film is formed in between the glass and glass lifting stopping means, preventing glass lifting and eliminating touching of the glass with lifting stop means and when the glass has arrived over the mould (BR), the blowing from below the glass is stopped and the glass is allowed to bend.



Probable Assignee: FERACITAS OY

Earliest Publication Date: 20031004

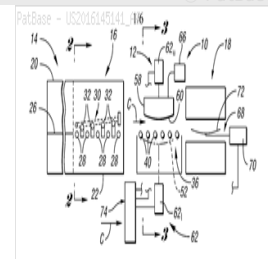
20) Family number: 62457590 (US2016145141A)

GLASS SHEET FORMING AND ANNEALING PROVIDING EDGE STRESS CONTROL

Abstract: Source: US2016145141A Glass sheet forming and annealing disclosed provides control of edge stresses by maintaining a press formed glass sheet on an annealing ring (72) below a heated upper forming mold (58) within a forming station (12) for slow cooling toward the glass strain point temperature.

Probable Assignee: GLASSTECH INC

Earliest Publication Date: 20160526



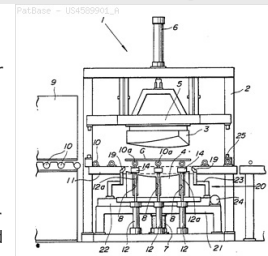
21) Family number: 29120809 (US4589901A)

APPARATUS FOR AND METHOD OF BENDING GLASS SHEETS

Abstract: Source: US4589901A An apparatus for bending a glass sheet has at least a lower mold, a conveyor device for conveying the heated glass sheet to a prescribed position over the lower mold, and a plurality of rolls for supporting the glass sheet in the prescribed position. A method of bending a glass sheet is carried out by utilizing the apparatus. The apparatus also includes a device for lowering the rolls to a position below the shaping surface of the lower mold, and an arrangement in the lower mold for accommodating the rolls which have been lowered. The apparatus may additionally have an upper mold coating with the lower mold. The method comprises the steps of lowering the rolls below the shaping surface of the lower mold, transferring the glass sheet from the rolls onto the shaping surface of the lower mold while the rolls are lowered, and bending the glass sheet into conformity with the shaping surface of the lower mold under gravitational forces. The method may also include the step of lowering the upper mold simultaneously with the downward movement of the rolls, and press bending the glass sheet between the upper and lower molds.

Probable Assignee: NIPPON SHEET GLASS CO LTD

Earliest Publication Date: 19860129



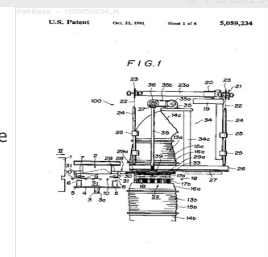
22) Family number: 3718484 (US5059234A)

SHEET GLASS BENDING APPARATUS

Abstract: Source: US5059234A A sheet glass bending apparatus includes a pressing stage disposed downstream of a heating furnace and a quenching stage disposed downstream of the pressing stage. The sheet glass bending apparatus also comprises a lifting/lowering member for vertically moving a ring mold which supports a lower surface of a glass sheet in the pressing stage, and a shuttle reciprocally movable between the pressing stage and the quenching stage while holding the ring mold, the shuttle being operable to receive the ring mold from and transfer the ring mold to the lifting/lowering member.

Probable Assignee: NIPPON SHEET GLASS CO LTD

Earliest Publication Date: 19901111



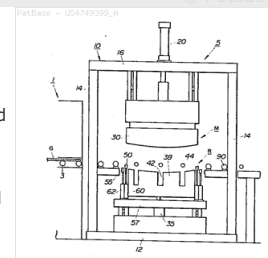
23) Family number: 17385620 (US4749399A)

RING MOLD UNIT FOR SHAPING AND TEMPERING GLASS SHEET

Abstract: Source: US4749399A A ring mold unit for shaping and tempering a glass sheet includes a shaping ring mold for bending a glass sheet heated to a temperature close to the softening point of glass, in association with upper and lower mold members, and a cooling ring mold for supporting the bent glass sheet while the glass sheet is being quenched and tempered by a cooling medium. The shaping ring mold has a thermally insulating member on its upper surface for supporting thereon, in surface-to-surface contact, the glass sheet inwardly of a peripheral edge thereof. The cooling ring mold is disposed outwardly of the shaping ring mold and having a shape complementary to the shape of the peripheral edge of the glass sheet for supporting the peripheral edge of the glass sheet. The cooling ring mold has recesses defined in the upper surface thereof, and is covered with a punched metal.

Probable Assignee: NIPPON SHEET GLASS CO LTD

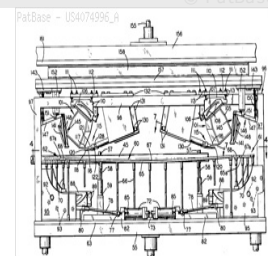
Earliest Publication Date: 19870923



24) Family number: 1277598 (US4074996A)

METHOD OF AND APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: US4074996A A method of and apparatus for bending glass sheets to relatively sharp angles. The apparatus includes a sectionalized primary press bending member having articulated end sections for sharply bending portions of a glass sheet about lines superheated by a radiant energy heat source located above the primary press member. A reciprocal brake bar is extended into engagement with the glass sheet along the heated focal line to assist the articulated press end sections in bending the glass. Clamping devices can be used in lieu of the brake bar to secure the heat-softened glass sheet to the press member shaping surface during bending. A supplemental press member, mounted above the primary press member, is provided with shaping elements having shaping surfaces complementary to the shaping surfaces of the primary press articulated end sections for pressing the glass end portions therebetween into conformity with these shaping surfaces.



Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19771024

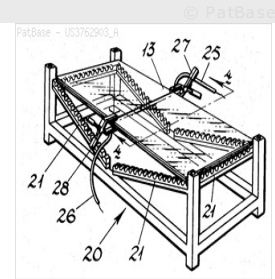
25) Family number: 1064954 (US3762903A)

PROCESS FOR BENDING GLASS TO A RELATIVELY SHARP ANGLE

Abstract: Source: US3762903A A process for bending a glass sheet or a pair of glass sheets to a relatively sharp angle which comprises forming an electrically conducting path on the sheet along a line about which it is desired to bend the sheet, and passing an electric current through the path to heat the sheet adjacent the path to a temperature above the bending point of the glass. The sheet is then caused to be bent along the electrically conducting path to form a generally V-shaped glazing. Claims, 7 Drawing Figures

Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19720712



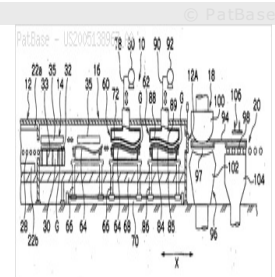
26) Family number: 32029262 (US2005138967A)

METHOD FOR BENDING A GLASS SHEET AND APPARATUS THEREFOR

Abstract: Source: US2005138967A There are a preliminarily bending step for putting heated and softened glass sheet on a preliminarily bending supporting-frame, the glass sheet having an edge portion supported by the preliminarily bending supporting-frame, and for bending the glass sheet into a desired preliminarily bent shape while putting the glass sheet on the preliminarily bending supporting-frame; and a finally bending step for transferring the preliminarily bent glass sheet on a finally bending supporting-frame, the glass sheet having an edge portion supported by the finally bending supporting-frame, and for bending the glass sheet into a final bent shape by pressing the glass sheet against a bending surface of a finally bending mold while putting the glass sheet on the finally bending supporting-frame.

Probable Assignee: ASAHI GLASS CO LTD

Earliest Publication Date: 20050630



Probable Assignee: PITTSBURGH GLASS WORKS LLC

Earliest Publication Date: 19981216

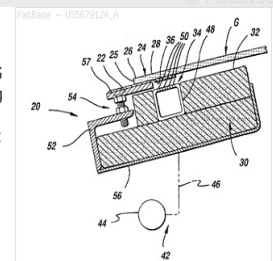
30) Family number: 11998305 (US5679124A)

COOLING RING ASSEMBLY FOR CONTROLLING STRESSES IN A FORMED GLASS SHEET

Abstract: Source: US5679124A A cooling ring assembly (20) and method for controlling stresses in a bent glass sheet G produce a strengthened bent glass sheet after the cooling is completed. The cooling ring assembly includes a cooling ring (22) that supports the glass sheet edge (24), an insulator (30) juxtaposed inboard of the cooling ring to reduce the cooling rate, and a cooler (34) for providing increased cooling to at least one localized area (36,40,58) of the glass sheet edge. The cooler (34) is embodied by a pressurized air supply (42).

Probable Assignee: GLASSTECH INC

Earliest Publication Date: 19970213



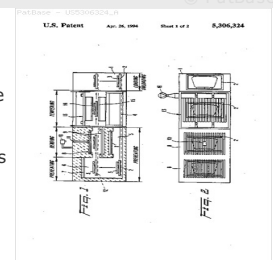
31) Family number: 12047899 (US5306324A)

METHOD AND APPARATUS FOR BENDING AND TEMPERING A GLASS SHEET

Abstract: Source: US5306324A The invention relates to a method and apparatus for bending and tempering a glass sheet. A glass sheet is supported by one and the same ring mould (3) throughout all its working operations. Following the preheating of a glass sheet from a temperature of about 500 degrees C., its heating to a final bending and tempering temperature is effected at a high output and rate of speed. For example, on 4 mm thick glass, this final heating is performed within a period of time of 15-25 s. Therefore, the temperature of bending station is 800 degrees-1000 degrees C. Since rapidly heating glass bends quickly, the bending flexure or temperature of glass is monitored and the glass is advanced to tempering as soon as a predetermined bending flexure or temperature is reached.

Probable Assignee: TAMGLASS ENGINEERING OY

Earliest Publication Date: 19931031



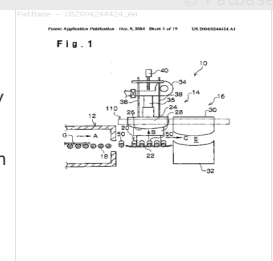
32) Family number: 31379595 (US2004244424A)

BENDING SYSTEM, BENDING METHOD AND CURVED ROLLER FOR A GLASS SHEET

Abstract: Source: US2004244424A A glass sheet G, which has been heated to the bending temperature by a heating furnace 12, is preliminary bent in the course of being conveyed to a bending position by a roller conveyer for preliminary bending 20. When the glass sheet thus preliminary bent is put on a press ring at the bending position, the glass sheet is pressed against the bending surface 26 of a mold 24 by upward movement of the press ring 22 to be bent so as to have a desired radius of curvature. After that, the press ring 22 is moved toward an air-cooling/tempering apparatus 16. When the press ring 22 is introduced into a certain tempering position S, cooling air is ejected from an upper blowing head 30 and a lower blowing head 32 toward the glass sheet G to air cool and temper the glass sheet G.

Probable Assignee: ASAHI GLASS CO LTD

Earliest Publication Date: 20041208



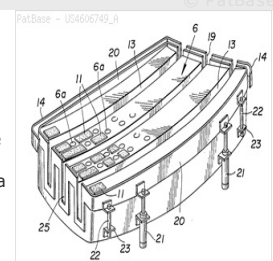
33) Family number: 2045181 (US4606749A)

APPARATUS FOR AND METHOD OF BENDING GLASS SHEETS

Abstract: Source: US4606749A A glass sheet bending apparatus has a lower mold and conveyor rolls for conveying a heated glass sheet horizontally to a position over the lower mold, the lower mold having slots for receiving the conveyor rolls when the lower mold is lifted. The glass sheet bending apparatus has a main ring mold disposed around the outer peripheral surface of the lower mold which has a first shaping surface for shaping the central area of the glass sheet, the main ring mold having a second shaping surface for shaping the peripheral edge of the glass sheet. The glass sheet bending apparatus also has an auxiliary ring mold disposed between the main ring mold and the lower mold and having a substantially horizontal, flat support surface for supporting the glass sheet between the central area and peripheral edge of the glass sheet. The auxiliary ring mold is lifted prior to the upward movement of the lower mold and the main ring mold for raising the glass support off the conveyor rolls with its support surface. There is also disclosed a method of bending a glass sheet.

Probable Assignee: NIPPON SHEET GLASS CO LTD

Earliest Publication Date: 19860327



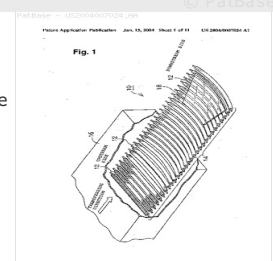
34) Family number: 29169439 (US2004007024A)

ROLLER ASSEMBLY FOR A GLASS SHEET BENDING APPARATUS AND A GLASS SHEET BENDING APPARATUS

Abstract: Source: US2004007024A A roller assembly for a glass sheet bending apparatus has a guide shaft bent to have a predetermined curvature and a plurality of ring rollers fitted rotatably to the guide shaft whereby a glass sheet is bent while the glass sheet is transferred into a predetermined direction by the rotation of the ring rollers, wherein the guide shaft is formed by overlapping a plurality of strip members bendable to have predetermined curvatures and the ring rollers are rotatably fitted to the guide shaft by means of bearings.

Probable Assignee: ASAHI GLASS CO LTD

Earliest Publication Date: 20031029



35) Family number: 1105550 (US3846104A)

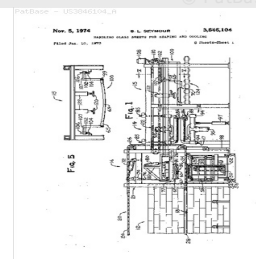
HANDLING GLASS SHEETS FOR SHAPING AND COOLING

Abstract: Source: US3846104A ABSTRACT OF THE DISCLOSURE

Method and apparatus for shaping and cooling glass sheets. Each glass sheet to be treated in turn is heated to its deformation temperature and conveyed by a continuous conveyor through a furnace and then into a glass shaping station, then a cooling station and finally to an unloading station. The glass sheet is stopped in alignment with a lower shaping mold that moves vertically between a recessed position and a raised position in juxtaposition to an upper mold. At the shaping station, the lower shaping mold lifts the glass into pressurized engagement against the upper mold. The upper mold comprises a vacuum chamber that is evacuated to hold the shaped glass sheet thereagainst while the lower mold is retracted downward and a tempering ring having an outline supporting surface conforming to but slightly inside the bent glass sheet periphery is brought into position in alignment between the upper and lower molds. The vacuum on the upper mold is released to deposit the shaped glass sheet on the tempering ring. The latter supports the bent glass sheet near its periphery during movement to and residence at a cooling station where the shaped glass sheet is quenched as rapidly as needed to impart at least a partial temper to the glass. The tempering ring is then unloaded and returned to a position adjacent the shaping station preparatory to repeating the cycle. The present invention is capable of providing a more rapid vacuum forming operation than the prior art in that it makes it possible to cool one glass sheet while supported on the shaped tempering ring while the outline shaping mold and vacuum mold are shaping a succeeding glass sheet in a mass production operation. This was not possible in the prior art vacuum shaping operations where either the outline shaping mold or the vacuum bending mold was used to both shape the glass and transport it to the cooling station. B

Probable Assignee: PPG INDUSTRIES INC

Earliest Publication Date: 19740718



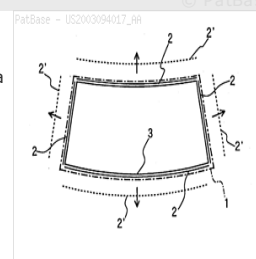
36) Family number: 24114972 (US2003094017A)

METHOD AND AN APPARATUS FOR BENDING A GLASS SHEET

Abstract: Source: US2003094017A In a method for bending a glass sheet, comprising using a first mold for supporting a peripheral portion of a glass sheet and a second mold provided inside the first mold; heating the glass sheet put on the first mold to a temperature to bend the glass sheet by gravity; and then transferring the glass sheet onto the second mold to bend the glass sheet only by the second mold, the glass sheet is transferred from the first mold onto the second mold by moving the first mold in a direction to spread the first mold laterally with respect to the second.

Probable Assignee: ASAHI GLASS CO LTD

Earliest Publication Date: 20021023



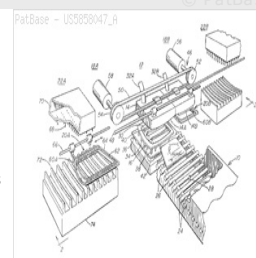
37) Family number: 15222414 (US5858047A)

METHOD AND APPARATUS OF BENDING GLASS SHEETS

Abstract: Source: US5858047A An apparatus for shaping heat softened glass sheets includes a shaping station to receive a heat softened glass sheet to be shaped, first and second transfer stations positioned along opposing sides of the shaping station, and first and second cooling stations positioned adjacent a corresponding transfer station. An upper vacuum mold having first and second downwardly facing, shaped sheet engaging surfaces moves between the transfer stations and within the shaping station. The sheet engaging surfaces of the vacuum mold each have a shaped configuration generally corresponding to a final desired shape of a glass sheet to be shaped. Heat softened glass sheets are positioned within the shaping station and moved into engagement with one of the sheet engaging surfaces to shape the sheet. Vacuum is drawn along the sheet engaging surface to hold the shaped sheet thereagainst. The mold then moves the shaped sheet and engaging surface to one of the transfer stations where the vacuum is discontinued to deposit the shaped sheet on a sheet support. The sheet support then transfers the shaped sheet to one of the cooling stations, where the shaped sheet is controllably cooled.

Probable Assignee: VITRO SAB DE CV

Earliest Publication Date: 19950815



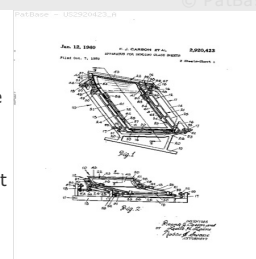
38) Family number: 191994 (US2920423A)

APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: GB818247A 818,247. Glass manufacture. LIBBEYOWENS-FORD GLASS CO. Sept. 26, 1956 [Oct. 7, 1955], No. 29331/56. Class 56. In the bending of glass sheets, more particularly intended for parts of a vehicle body, the sheet is supported above the shaping mould, is heated and one end is twisted out of the original plane of support, the twisted sheet then being deposited on the shaping surface of the mould. As shown, the twisting is effected by arranging the pivot line 54 of the end part 22 of the mould on a skew with reference to the main part 21 of the mould. The glass, two sheets 23 being shown in Fig. 4, rests when flat upon a straight-edged member 43 at the upper end of the mould part 22, and marginally upon blocks 58, and at the lower end, upon the end bar 30 of the mould part 21 and against locating stops 33. Heat shields 36, 45 are positioned within the side members of the parts 21, 22 which members from the moulding surfaces. The shield 45 is stepped to attain continuity of surface with the shield 36 when the mould is in its shaping position. The blocks 58 are retracted by linkage as the mould closes to allow the glass sheets to sag onto the mould, the swinging of the mould part 22 producing, because of the skewed pivot, a lifting of one side of the glass above the other side and thus produces a twist in that end of the glass sheet; or sheets, whilst it is sagging on to the closing mould parts. The sagging and twisting lifts the glass from the straight-edged member 43 so that it is not marked thereby.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19570516



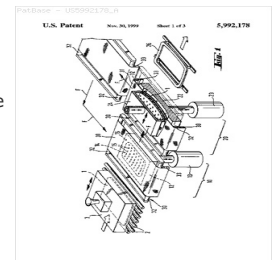
39) Family number: 12345728 (US5992178A)

METHOD FOR STEPWISE BENDING OF GLASS SHEETS

Abstract: Source: US5992178A Glass sheets are bent in stages into the final shape in a horizontal position in two successive bending stations. The glass sheets heated to bending temperature are laid on a fabric carrier arranged resiliently on a rigid support frame. The glass sheets are conveyed stepwise with the fabric carrier and the support frame through the bending system, and are bent together with the fabric carrier which adapts to the shape of the glass sheets.

Probable Assignee: SAINT GOBAIN SA

Earliest Publication Date: 19980506



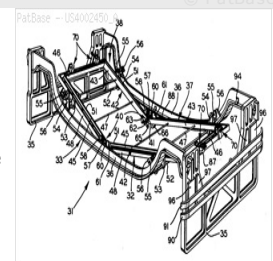
40) Family number: 23470749 (US4002450A)

METHOD OF AND APPARATUS FOR BENDING GLASS SHEETS TO RELATIVELY SHARP ANGLES

Abstract: Source: US4002450A A method of and apparatus for bending a flat sheet of glass to a relatively sharp angle. The apparatus includes a sectionalized, gravity mold structure provided with means for delivering electrical power to electrically conducting lines formed on the sheet supported on the mold apparatus and which lead to an electrically conductive path also formed on the sheet along a line about which it is desired to bend the sheet. Opposed electrical conductors, which also serve as locator stops, are biased into engagement with portions of the conducting lines to assure continuous current flow thereto during the bending and movement of the sheet into its desired configuration.

Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19760701



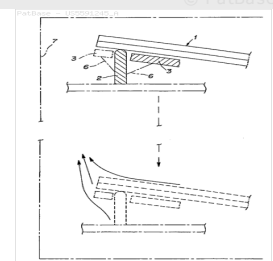
41) Family number: 8997652 (US5591245A)

METHOD AND APPARATUS FOR DEVELOPING AND EDGE STRESS IN A WINDSHIELD IN A WINDSHIELD BENDING FURNACE

Abstract: Source: US5591245A The invention relates to a method and apparatus for developing an edge stress in a windshield bending furnace. Adjacent to a ring mould is located a metallic, flat extra frame in a manner that the lower surface of a bent windshield remains at a small distance from extra frame. The compression stress of glass edge can be adjusted by varying the distance of extra frame from glass and/or by varying its glass-oriented dimension.

Probable Assignee: TAMGLASS ENG OY

Earliest Publication Date: 19920502



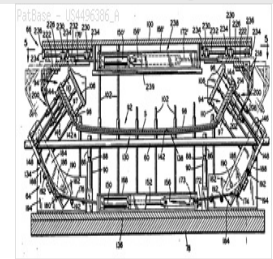
42) Family number: 2141674 (US4496386A)

METHOD OF AND APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: US4496386A A method of and apparatus for press bending sheets into complex shapes wherein the apparatus includes at least one press member of outline or ring-type construction having an array of spaced apart shaping rail elements mounted in a composite array and adapted to pass upwardly between adjacent conveying rolls to contact and support the undersurface of a sheet of heat-softened glass. Another array of shaping rail extensions is disposed above the conveying rolls mounted for movement into and out of association with the spaces between the spaced apart shaping rail elements of the first mentioned array.

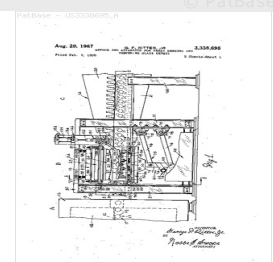
Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19850129



43) Family number: 256263 (US3338695A)

METHOD AND APPARATUS FOR PRESS BENDING AND TEMPERING GLASS SHEETS



Abstract: Source: GB1053753A 1,053,753. Bending and tempering glass sheets. LIBBEY-OWENS-FORD GLASS CO. Sept. 4, 1963 [Sept. 14, 1962], No. 34923/63. Heading C1M [Also in Division B8] In a method of bending and tempering glass sheets the latter are moved along a predetermined path through a zone where they are heated to softening point, then advanced at a set speed to a set location in a bending zone where they are halted and pressure applied to the opposite surfaces to bend the sheet, the bent sheet is moved out of the bending zone and into a chilling zone at a speed relatively greater than the speed of entry into the bending zone, this speed being reduced to the first entry speed when the sheets have entered the chilling zone. A glass sheet 12 is passed on a conveyer 11 through a furnace 16 wherein it is heated to its softening point (Fig. 1, not shown). On leaving the heating zone the sheet is passed into a bending zone by means of entry roller conveyer 27 which is driven at the same speed as conveyer 11. The sheet is then passed on to rollers 91 of the bending zone at the end of which the leading edge of the sheet contacts the stop butt 119 of a device 29 which applies a brake 107 on a two-speed motor 96 driving rollers 91. The device 29 is lowered into position when the sheet is sensed to be approaching by means 28 e.g. photoelectric cell. In this arrested position the sheet is lifted vertically away from the rolls 91 by the complementary shaped lower mould half 25 being brought into contact with the upper mould half 24 and the sheet bent to the desired shape. The lower mould half 25 is raised by the actuation of a magnetic clutch starting a cam 63 which has a follower 73 fixed to a parallel links system attached to the lower mould half carriage 52. The cam 63 also determines the length of time bending pressure is applied. When the now bent sheet has been lowered on to the rollers 91 the motor system 96 is actuated to drive the rolls at a higher speed than the entry speed, the stop device 29 is raised to an inoperative position by piston and cylinder means 134, 135, and the bent sheet is advanced into the chilling zone between blowers 20, 21. The sheet is passed along take out rolls 112 which are driven by the same motor and at the same speed as rolls 91. When the sheet has entered the chilling area upon rolls 22a the driving speed is reduced to that of the entry speed from the heating zone A. The piston and cylinder means 134, 135 are then reversed and the stop device 29 is lowered to start a new sequence.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19640116

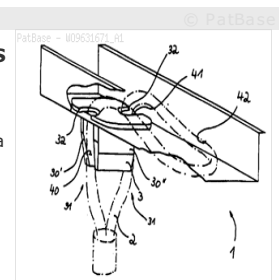
44) Family number: 17815304 (WO9631671A1)

SUPPORT DEVICE FOR AT LEAST ONE ELASTICALLY DEFORMABLE SECURING ELEMENT AND A PROCESS FOR SECTION-CONCRETING USING ELASTICALLY DEFORMABLE SECURING ELEMENTS AS A CONCRETE CONNECTION

Abstract: The invention concerns a support device for at least one elastically deformable securing element (2) such as a wire cable loop, for securing building components such as precast concrete parts, in particular as a concrete connection for section concreting. The device is provided with at least one support box (1) and means for bending the securing element (2) and means for positioning the securing element in relation to the support box. The bending means comprise at least two bending stops (40, 42) and a counter stop (41). In order to simplify handling, specifically the assembly of such a support device, at least one moulded element (3, 3a) is provided which serves as a positioning means and has a bending stop (40). This moulded element is or can be clicked into the support box (1) in a way which makes it angularly rigid. The bending stop (40) of the moulded element counteracts any bending forces which arise, at least parallel to the surface of the component to be secured. The support box can hold one part of the elastically deformable securing element (2) until the component can be stripped of the outer shell.

Probable Assignee: BETOMAX KUNSTSTOFF METALL

Earliest Publication Date: 19960912



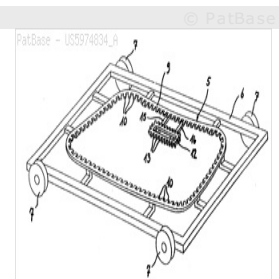
45) Family number: 10221217 (US5974834A)

METHOD FOR BENDING AND/OR TEMPERING SHEET GLASS AND BENDING FRAME THEREFOR

Abstract: Source: US5974834A PCT No. PCT/FR96/02060 Sec. 371 Date Dec. 22, 1997 Sec. 102(e) Date Dec. 22, 1997 PCT Filed Dec. 20, 1996 PCT Pub. No. WO97/23420 PCT Pub. Date Jul. 3, 1997 For a method for bending and tempering glass which has an opening, the glass is bent in the horizontal position using a bending frame (9) and is tempered on the bending frame (9). The bending frame in respect of its contour and of its geometric shape corresponds to the desired shape of the bent glass. During the bending operation and during the tempering operation the glass is supported, in the region around the edge of the opening, by an additional internal bending frame (12).

Probable Assignee: SAINT GOBAIN SA

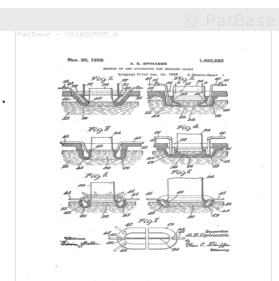
Earliest Publication Date: 19970320



46) Family number: 20608305 (US1692585A)

Abstract: Source: US1692585A 1. The process of d1`ii.\\'11`lg Sheets oi glass CO111P1`1S1Ilg va1~iab1\_y \_lt;om`ro1ling the tc1r1pera- 'mrs thronglzout the drmvuig area at inde~ pemlemt local points t1'2.11svci~suly of The sheet so that the sheet (ITZIVV11 is of s:11bsiZz:nfi:111y uniform ithickness to and including the side mdges f11c]'13()fE.

Earliest Publication Date: 19281120



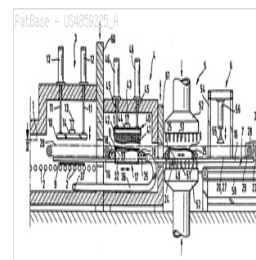
47) Family number: 2893906 (US4859225A)

METHOD AND DEVICE FOR CURVING SHEETS OF GLASS

Abstract: Source: US4859225A A method and installations for curving sheets of glass. The sheets of glass (9) are heated to the curving temperature in a horizontal position in a continuous furnace (1) and are pressed in a curving station (4) which is adjacent to the continuous furnace (1) by means of an annular frame against a solid surface curving form (40). During the pressing between the annular frame and the solid surface curving form (40), the sheets of glass (9) are pressed against said solid surface curving form (40), in the area located inside the annular frame, by the static pressure of a hot gas under pressure, with the static pressure of the gas being produced in a chamber (32) whose upper surface (33) is defined by the annular frame and is closed by the sheet of glass (9) applied in a sealed manner against said annular frame.

Probable Assignee: SAINT GOBAIN SA

Earliest Publication Date: 19881108



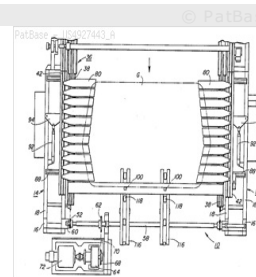
48) Family number: 3453222 (US4927443A)

APPARATUS FOR MANUFACTURING CURVED GLASS SHEETS

Abstract: Source: US4927443A An apparatus for manufacturing a curved glass sheet has a glass sheet conveyor mechanism for conveying a glass sheet heated up to its softening point in a heating furnace, and a mold assembly disposed downstream of the heating station with respect to a direction in which the glass sheet is conveyed by the conveyor mechanism, for curving the glass sheet to prescribed curvature. The glass sheet conveyor mechanism includes a pair of fixed rails extending in the glass sheet conveyance direction, a pair of movable rails disposed outwardly of and extending parallel to the fixed rails, the movable rails being movable transversely of the glass sheet conveyance direction, and traveling assemblies guided by the fixed rails for movement between a "standby position" where the softened glass sheet is received from the heating furnace and a "transfer position" where the glass sheet is transferred into the mold assembly. A plurality of pairs of conveyor plates are supported on the traveling assemblies in engagement with the movable rails. The conveyor plates receive the glass sheet at the "standby position". When the conveyor plates reach the "transfer position", the conveyor plates are moved transversely of the glass sheet conveyance direction to allow the glass sheet to be placed on a mold of the mold mechanism.

Probable Assignee: NIPPON SHEET GLAS CO LTD

Earliest Publication Date: 19881014



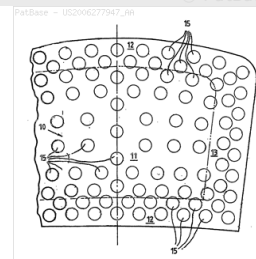
49) Family number: 31029725 (US2006277947A)

DEVICE FOR PRODUCING A GAS CUSHION

Abstract: Source: US2006277947A The gas cushion serves to support a preheated glass sheet and is produced by a chamber, which is connected to a source (21) of compressed gas. The upper wall (10) of the chamber is adapted to the shape of the glass sheet and has a plurality of apertures for the passage of gas in the form of nozzles (14), which comprise an entry bore (22) and, following thereupon, a progressively widening exit hole (16) with a nozzle exit area (15). The upper wall (10) of the chamber has a greater degree of perforation (sum of the nozzle exit areas (15) in relation to the total area of the respective zone) in its edge zone (12, 13) than in its central zone (11). The nozzles ensure that no jet marks can arise. The gas of the gas cushion can also flow out undisturbed at the side, so that no cooling edges are present and the occurrence of cooling shadows is accordingly avoided.

Probable Assignee: PILKINGTON AUTOMOTIVE DEUTSCHLAND GMBH

Earliest Publication Date: 20041007



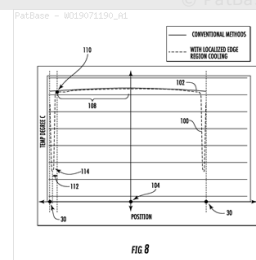
50) Family number: 73932466 (WO19071190A1)

PROCESS AND SYSTEM FOR FORMING CURVED GLASS VIA DIFFERENTIAL HEATING OF EDGE REGION

Abstract: A process and system for forming a curved glass article from a sheet of glass material is provided. The process and system includes supporting a glass sheet on a shaping frame and then heating the sheet of glass material while supported by the shaping frame such that the central region of the sheet of glass material deforms into an open central cavity of the bending frame. The process and/or system are configured such that a steep, localized temperature differential is formed in the region adjacent the outer edge of the glass sheet during the heating stage of the shaping process.

Probable Assignee: CORNING INC

Earliest Publication Date: 20190411

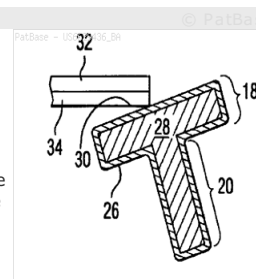


51) Family number: 23124870 (US6629436B)

APPARATUS FOR THERMAL TREATMENT OF GLASS AND METHOD AND THERMALLY TREATED GLASS THEREFROM

Abstract: Source: US6629436B The present invention is directed to an apparatus for thermal treatment of glass and method and thermally treated glass therefrom. The apparatus is capable of supporting the glass during thermal treatment such as tempering, annealing, bending, and/or shaping which can include any cooling or quenching to remove heat or any combination of these. The apparatus is a support member like a ring or outline mold with a horizontal surface suitable for contacting the glass. The support member has at least a surface with or without a coating for contact with the glass of one or more metals having a thermal conductivity such that the glass heated for shaping cools at a rate not much slower than the cooling rate of unsupported sections of the glass. Suitable metals include those with a thermal conductivity of greater than around 16 BTU/(hourxfeetx degrees Fahrenheit). When a coating covers at least a portion of the support, the coating can give the support member more heat resistance and/or anti-corrosiveness and/or abrasion resistance to improve durability. Also the support member can be the shaping rail of a windshield or backlite shaping iron.

Probable Assignee: PPG IND OHIO INC



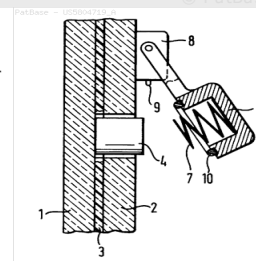
52) Family number: 11132852 (US5804719A)

LAMINATED PLATE GLASS EQUIPPED WITH A SENSOR

Abstract: Source: US5804719A Laminated plate glass including at least one rigid sheet of glass (1, 2), at least one layer of plastic material (3), and a sensor (4) for the presence of foreign bodies on the outside of the plate glass. Its sensing side is held in close contact with the internal side of the external plate of glass (1). The sensor (4) is located in a space formed within the sheets (2) or layers (3) of the window other than the said external plate of glass (1). The said space is closed in a detachable manner by means of a cover (5) and/or lid (6) which exerts the desired force on the sensor (4); process for fabrication of this plate glass; convex laminated plate glass equipped with a sensor; sensor that can be used for making this plate glass.

Probable Assignee: SAINT GOBAIN SA

Earliest Publication Date: 19980130



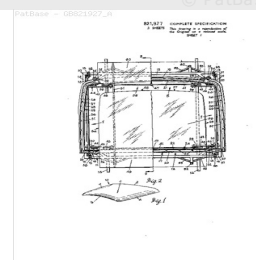
53) Family number: 20597839 (GB821927A)

METHOD AND APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: GB821927A 821,927. Bending glass sheets. LIBBEYOWENS-FORD GLASS CO. Aug. 7, 1956 [Aug. 11, 1955], No. 24121/56. Class 56. To bend a glass sheet, particularly for the tops of cars and requiring three sharply bent edges on a substantially rectangular sheet, the sheet is supported along the undersurface of substantially the whole of one marginal edge area as well as a further area to balance the same, heated until the edge area softens and then a portion intermediate opposite ends is simultaneously supported and bent by engaging and lifting the portion first with a substantially flat support and then with a curved support while simultaneously continuing to support the bent portion and other portions of the marginal edge. The bending mould 12 is supported on a rack 11 comprising parallel side and end rails 13, 14, uprights 15 and guide rails 16 to engage flanges on the rolls of a conveyer used in the furnace. The mould 12 comprises end sections 18 hinged to a centre section 17, the section 17 comprising side bars 19, 20 supporting shaping rails 21, 22 with shallow concave shaping surfaces 24, the bar 19 and rail 21 being also curved inwardly at each end. Each section 18 comprises a side bar 25 aligned with and pivoted to bar 20 and end bar 26 joined to bar 25 and curved at its other end to meet bar 19, the bars 26, 19 being pivoted together by means of outwardly extending parts 33, 35. The shaping rail 28 carried by section 18 comprises a part 30 aligned with rail 22 and a part 31 joined thereto and gradually and then steeply curved to meet rail 21. The mould sections 18 are supported on uprights 15 for movement from an open, Fig. 6, to a closed position, Figs. 2, 3, by a transverse rod 36 secured to the under surface of rails 28 and side bars 25, the ends of the rod being joined by links 37 and pins 38 on the uprights. A glass sheet 40 is supported on the outer edge e of the surface 29 of rails 28, the edge e giving flat linear support in the open position. The sheet 40 is further supported in this position by blocks 39, inwardly of the rails 21 22, carried at each end of rods 41 movable vertically downwards as the rails 28 are moved upwards to closed position. Each rod 41 is steadied by a rod 48 passing through a ring 47 on the rail 21 or 22 and has a slot 42 under each block 39 in which slides one end of a lever 43 pivoted at 44 to a plate 45 on rail 21 or 22 and with its other end freely bearing on the underside of support rod 36 and guided between angle plates 46. As the sheet softens and sags, the end sections 18 rotate about the links 37 so that their outer edges rise and inner ends move downwardly carrying the centre section 17 therewith. At the same time, pressure on the levers 43 is reduced and they pivot to lower the blocks 39 to below the level of surfaces 24, the glass sheet then resting solely on the arcuate shaping surfaces 24, 29. Heat shields 49, 50 above the mould removably supported on rods 51 carried by struts 52 and a lower shield 56 on rails 16 shade from radiant heat all but the three areas f, g, f adjacent the edges of the glass sheet 40 where greatest curvature is required. The shields are of material of higher specific heat than glass and they also act to withdraw heat from the glass in the shaded areas. Specifications 727,200 and 745,992 are referred to.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19591014



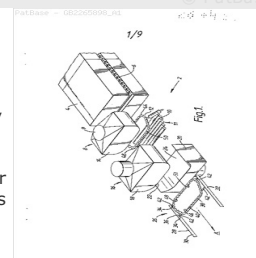
54) Family number: 7210507 (GB2265898A)

BENDING GLASS SHEETS

Abstract: Source: GB2265898A Apparatus for press bending a glass sheet, the apparatus including a shaping ring of a female die, the shaping ring having a shaped upper surface which, in co-operation with a complementary male die, is contoured to bend a glass sheet to a desired shape, and a shuttle ring which is arranged to fit around the outer periphery of the shaping ring and to lift a shaped glass sheet from the shaping ring. There is also disclosed a method of press bending a glass sheet, the method comprising the steps of:- (a) receiving a glass sheet to be bent on a shaping ring of a female die, the shaping ring having a shaped upper surface; (b) press bending the glass sheet between the shaped upper surface of the shaping ring and a complementary male die; (c) supporting the bent glass sheet on a shuttle ring which fits around the outer periphery of the shaping ring; and (d) moving the shuttle ring carrying the bent glass sheet from between the shaping ring and the male die.

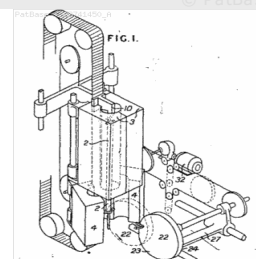
Probable Assignee: BLINDEX VIDROS DE SEGURANCA LT

Earliest Publication Date: 19931013



55) Family number: 20144305 (GB741450A)

IMPROVEMENTS IN OR RELATING TO METHODS OF AND APPARATUS FOR BENDING GLASS TUBING



Abstract: Source: GB741450A 741,450. Bending glass tubing. GENERAL ELECTRIC CO., Ltd., and HAINES, E. M. July 22. 1954 [July 23, 1953], No. 20500/53. Class 56 For bending into arcuate or circular shape a length of glass tubing, particularly the envelope of a tubular electric discharge lamp, the tubing 2 is heated in ovens 3, 4, to a plastic condition and its elongation sets into operation an electric motor 32 which causes a carriage 27 to advance so that two axially-separable discs 23, 24 forming a drum 22 come into the path of the lower end of the tubing. The tubing becomes automatically latched to both discs in the annular peripheral groove formed between them. The drum is now rotated about a stationary axis and the holder 10 for the upper end of the tubing is simultaneously lowered, by mechanism operated by the same motor, so that the tubing wraps itself -round the drum. During this action inert gas at increased pressure is fed into the tubing to maintain its circular cross-section. When the drum has rotated through nearly 360 degrees the top end of the tubing becomes released from the holder 10 and becomes automatically locked to both discs of the drum which is now thereupon retracted from the ovens. The bent tubing is now unlatched from the disc 24 and is carried solely by the disc 23 which is now removed from its carriage. The bent tubing is finally released from the disc 23 which is then repositioned on the carriage for the next operation.

Probable Assignee: ERNEST MARTIN HAINES

Earliest Publication Date: 19551207

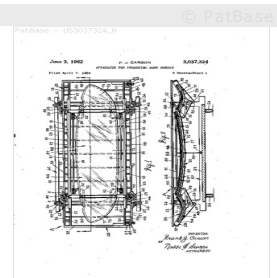
56) Family number: 19631215 (US3037324A)

APPARATUS FOR PRODUCING BENT SHEETS

Abstract: Source: GB764448A 764,448. Windscreens. LIBBEY-OWENSFORD GLASS CO. Jan. 24, 1955 [April 7, 1954], No. 2014/55. Class 56 In the bending, annealing and subsequent pattern-cutting of curved windscreens, a blank of flat glass is bent and annealed on an outline type bending mould comprising - a rail portion which acts as a thermal barrier and results in a marginal region T of tension being formed in the bent annealed blank. A second thermal barrier which may comprise a frame supporting a thin membrane is carried by the mould and is so positioned and spaced from the rail portion of the mould as to leave an endless "corridor" of glass in compression C between the marginal region T and the central region of tension T¹ formed by the second barrier, the barriers being shaped so that the compression C is the shape of the desired perimeter of the windscreen. The bent blank is then scored along the central line 64 of the compression zone to form the finished screen. '

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19560101



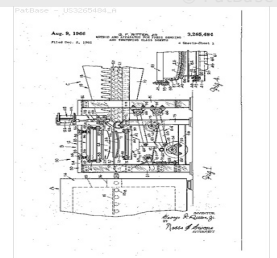
57) Family number: 221603 (US3265484A)

METHOD AND APPARATUS FOR PRESS BENDING AND TEMPERING GLASS SHEETS

Abstract: Source: GB1052473A 1,052,473. Bending glass sheets. LIBBEYOWENS-FORD GLASS CO. Nov. 27, 1963 [Dec. 3, 1962], No. 46839/63. Heading C1M. Glass sheets moved along a predetermined path from a heating area, through a bending area, where the glass is pressed to desired shape, to a chilling area, are subjected, after bending but before moving on to the chilling area, to streams of cooling fluid directed against opposite surfaces to set the sheet and prevent deformation on moving. The sheet 11 is received from the heating section on to the horizontal run of a conveyer 27 which may be in the form of a wide flexible belt or a series of narrow bands, the belt or bands being held taut by a spring-pressed idler roller 77¹ and being driven by a roller 74¹. The sheet is conveyed between the upper and lower mould parts 24, 25 and positioned against stops 112. The lower mould part 25 which is of open - ring type, is raised by the cam 53 to press the sheet against the part 24. If a wide belt 27 is used, it is stopped during the pressing operation; alternatively, if narrow bands are used, the surface of the part 25 is slotted. During the lowering of the part 25, cooling air is discharged against the sheet, to set it sufficiently to prevent sagging, from pipes 104 beneath the sheet and from a pipe 107 carried by an arm 108 and traversed across the upper face of the sheet. When the belt returns to normal position or the sheet is deposited on the bands, the conveyer and the first rolls 20 of the tempering section are speeded up, the stops 112 having been withdrawn, to deliver the sheet rapidly, after which they are decelerated and the parts returned to their positions to receive another sheet.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19640301



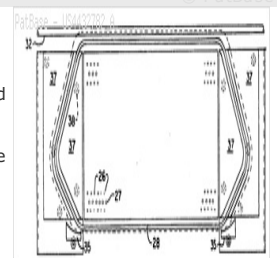
58) Family number: 2282687 (US4432782A)

SUPPORT FOR HOT GLASS SHEETS OF NON-RECTANGULAR OUTLINE PRIOR TO BENDING

Abstract: Source: US4432782A A flat glass sheet of a given outline configuration is supported in a shaping station by a combination of a gas hearth bed portion and readily replaceable flat plate means comprising spaced plates having spaced edges of conforming shape that define an elongated slot conforming to the outline shape of at least a portion of the periphery of the flat glass sheet. The gas support bed portion provides hot gas under pressure to float the flat glass, and the flat plate means is located in close proximity to an end of the gas hearth bed portion to provide a narrow space at the level of the gas hearth bed portion for escaping gas between the flat plate means and the extending glass sheet portion to limit sag of the extending glass sheet portion. The flat plate means may be covered by material that does not mar hot glass, such as boron nitride, in case the glass sheet portion sags a limited distance to slide in contact with the flat plate means before it is lifted on a shaped, ring-like member.

Probable Assignee: PPG IND OHIO INC

Earliest Publication Date: 19831216



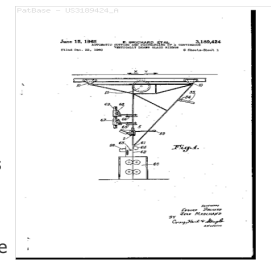
59) Family number: 31379159 (US3189424A)

AUTOMATIC CUTTING AND DISCHARGING OF A CONTINUOUS VERTICALLY DRAWN GLASS RIBBON

Abstract: Source: GB912008A 912,008. Cutting glass. GLOVERBEL S.A. Nov. 1, 1960 [March 23, 1960], No. 37523/60. Class 56. A strip of glass emerging upwardly from a vertical drawing-machine is cut by gripping it at the top, bending it slightly one way to engage a device for scoring it then bending it the other way to break it and finally carrying away the severed portion in a vertical position. In the form shown in Fig. 1 the upper edge 61 of a sheet 62 emerging from a drawing-machine 60 is secured in a clamp 1, shown in detail in Fig. 4. The clamp comprises a fixed jaw 2 and a movable jaw 3 operated by a piston 23 in an air cylinder controlled by an electromagnetic valve 27. Both jaws carry shock-absorbing members comprising steel tubes 29 covered with rubber tubes 31, which may be inflated. The whole clamp is carried on a rod 4 supported between members 5 slidable on rods 7 forming part of a frame 9 suspended from carriages 10 on rails 11. The clamp is suspended from cables on drums 15 driven by an electric motor and reduction gearing, not shown. The frame 9 can be reciprocated along the rails 11 by a crank driven by a motor and reduction gearing, not shown, and coupled to the frame through a link 33. The crank-shaft has a brake operated by an air cylinder to stop the framework 9 when required. Starting from the position shown in Fig. 1, the clamp 1 is operated to engage the upper edge of the glass and is then carried upwards at a speed appropriate to the drawing speed, by applying the appropriate motor torque to the drums 15. As the leading edge of the glass passes a first abutment 65 a switch is operated to move the frame 9 to the left to engage the glass with the cutting device 63, which may be as described in Specification 690,262. When it passes the abutment 66 the cutting device is operated. The abutments are adjustable in accordance with the size of cut sheet required, as described in Specification 847,892. The frame is then moved to the right, while the lifting is slightly accelerated, to break the scored sheet against the abutment 64 and carry it to a conveyer (Fig. 6). The sheet is placed first on a ledge 76 forming part of a table 70 pivoted at 74 and composed of parallel girders 71. It is detached from the clamp 1 and the table lowered about its pivot by a motor 82 driving through reduction gearing 81 a crank 79 coupled to the table through a link 78. The table is lowered until the girders 71 pass down between a number of spaced, continuously running belts 84, driven by a motor 97, to which the sheet is thus transferred. While on these belts the sheet may be scored longitudinally by means described in Specifications 606,481, 606,479, and 606,452. The various parts return to their original positions and the cycle is repeated. Switches operated by parts of the mechanism control movements of other parts in correct sequence, the whole electrical system being described in detail in the Specification.

Probable Assignee: UNION DES VERRERIES MECANIQUES

Earliest Publication Date: 19460930



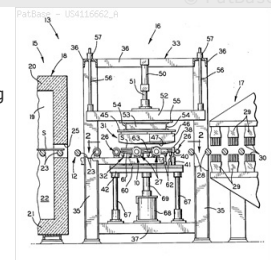
60) Family number: 1359932 (US4116662A)

GLASS SHEET SUPPORTING AND CONVEYING APPARATUS

Abstract: Source: US4116662A An apparatus for supporting and conveying glass sheets in a bending apparatus on a series of uniquely shaped conveyor rolls between narrow and/or irregularly shaped press members in a manner avoiding contact with the lower press member upon vertical displacement thereof. Each conveyor roll is formed of two sections rigidly interconnected to form a solid, unitary structure, each section having a load carrying, rotatable sleeve individually driven to convey the glass sheets thereon.

Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19780926



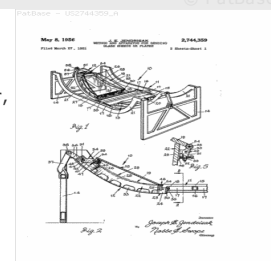
61) Family number: 22190079 (US2744359A)

METHOD AND APPARATUS FOR BENDING GLASS SHEETS OR PLATES

Abstract: Source: US2744359A (Claim 1) 1. In apparatus for bendin.- sheets or plates of glass, a mold of ring type having a shaping surface of the desired outline, said mold being oriented so that one end is 4,3 elevated above the other, stationary means at the lower end of the mold engageable by an edge of a sheet to be bent to locate the lower end of 'Ljje sheet with respect to said shaping surface, and means movably mounted at the upper end of the mold engageable by and supporting the upper end of the sheet in spaced relation above said mold and operable to lower the sheet onto the shaping surface of the mold during the bending of said sheet.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19560508



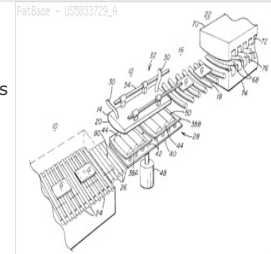
62) Family number: 30165093 (US5833729A)

METHOD AND APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: US5833729A The present invention provides an arrangement for shaping multiple sheets of heat softenable material which includes a shaping station and a conveying system to deliver a plurality of heat softened sheets into the shaping station. The shaping station includes an upper vacuum mold having a plurality of downwardly facing sheet shaping surfaces each generally conforming to a desired shape of a sheet to be shaped and a plurality of stops positioned below the upper mold such that each of the sheets is aligned below a corresponding one of the upper mold sheet shaping surfaces when the sheet contacts selected stops. Lower molds are positioned below the upper mold sheet shaping surfaces to lift and press the aligned sheets against the upper mold sheet shaping surfaces to shape the sheets. A vacuum is drawn along the upper mold sheet shaping surfaces to secure the sheets to the upper mold and shape the sheets. The upper mold and shaped sheets are moved to a transfer station having a conveying surface generally corresponding to the desired shape of the sheets and the vacuum in the upper mold is released to deposit the shaped sheets from the upper mold onto the conveying surface. The stops are selectively movable within the shaping station to allow the sheets to be conveyed into the shaping station either in a side-by-side or serially aligned orientation and positioned below the upper vacuum mold.

Probable Assignee: PPG IND OHIO INC

Earliest Publication Date: 19980616



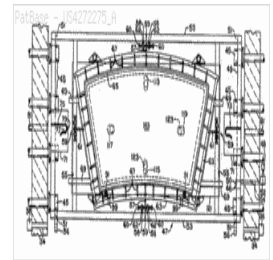
63) Family number: 8258686 (US4272275A)

ALIGNING GLASS SHEETS ON AN OUTLINE MOLD PRIOR TO TRANSFER TO SHAPING MOLD

Abstract: Source: US4272275A In bending glass sheets to a complicated shape by a combination of gravity sagging the glass to a longitudinal component of bend while supported on an upward facing shaping surface of an outline mold and then lifting the glass so shaped off the outline mold onto a solid shaping mold of continuous extent to impress a complicated transverse component of bend, glass edge engaging members are provided closely adjacent to said outline mold to the outside thereof, means is provided to support said glass edge engaging members so that the upper edges thereof are located in position to abut the edge of one or more glass sheets as the latter sag toward said outline mold and to remove said glass edge engaging members suddenly and automatically from the vicinity of the edge of the supported glass sheets just before the glass sheets are lifted from said outline mold to said solid shaping mold to reduce edge distortion of the mold supported glass sheets.

Probable Assignee: PPG INDUSTRIES INC

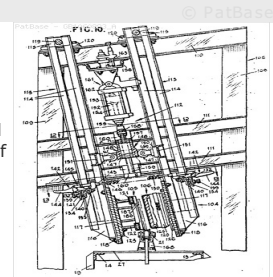
Earliest Publication Date: 19810609



64) Family number: 22609029 (GB1060893A)

METHOD AND APPARATUS FOR BENDING AND TEMPERING GLASS SHEETS

Abstract: Source: GB1060893A A method of bending and tempering glass sheets as they are moved along a predetermined path through successive heating, bending and chilling areas, the sheets being supported on heated gases during movement through said heating area where they are brought to their softening temperature and on relatively cool gases during movement through said chilling area to temper the sheets, is characterized in that the forward movement of the sheets is interrupted in said bending area and while maintained stationary the sheets are pressed into the desired curvature between complementary shaping surfaces before they are passed into the chilling area. Glass sheets S (Fig. 2, not shown) are fed into a heating area B on a conveyer 20. The heating area comprises a set of seven heating boxes 46 in side-by-side relationship. Hot gases are burnt within opposed chambers 52 (Fig. 7, not shown) of the boxes, the gases issuing through orifices 58 in the opposed faces 48 of the boxes. The faces 48 are made of a refractory material, e.g. 99.8 percent fused silica and have the orifices arranged in upwardly inclined rows separated by grooves by which the gases exhaust, with a greater density for orifices at the bottom than at the top. Preferably the heating boxes are tilted at about 10 degrees from the vertical, the glass sheets being prevented from contacting the faces 48 by maintaining a sufficient gas pressure to form a gas cushion between sheet and face. By having a series of individual heating boxes 46 greater temperature control of the sheet can be achieved. The heating boxes are so mounted as to be adjustable in the horizontal or vertical directions. The glass sheets are then moved on to another conveyer 21 which brings them into the bending area C. A photo-electric cell senses the arrival of a glass sheet and commences a sequence which halts the forward movement of the sheet when between complementary shaping mould halves 105, 106 (Fig. 10), operates bending means whilst the sheet is stationary and then conveys the sheet away at an accelerated speed. A piston cylinder 152 then operates to move a cam 148 downwardly. Followers 147, attached to pivotal arms 113 on which the mould halves are mounted, then cause the mould halves to swing together under the action of a spring 130 thus pressing the glass sheet positioned there-between. The mould half 105 is of the concave open ring-type and mould half 106 solid convex. Both halves are covered with glass cloth. The piston cylinder 152 then retracts, against the action of a checking piston 163, to open the mould halves. The now bent sheet is conveyed to the tempering section at an accelerated speed until it passes another photo-electric cell whence the conveyer reverts to its original speed and the sheet is then transferred to a further conveyer 22. The tempering section D comprises opposed chilling boxes 190 (Fig. 4, not shown) the faces of which are provided with a multiplicity of geometrically arranged tubes 204, four to six inches long, 0.314 to 0.365 inch internal diameter and set on 0.6 to 1 inch centres. Cold air at up to 30 inch w.g. pressure is fed through the tubes to both temper the glass sheet and also to support the sheet from touching the faces of the boxes 190. The tempered sheets then pass to a take-out section G. Thin wires 186 (Fig. 10) in the bending section and 243 (Fig. 2) in the take-out section support the sheets S.



Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19670308

65) Family number: 420277 (US3677733A)

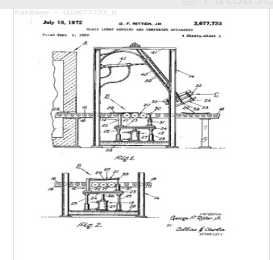
GLASS SHEET BENDING AND TEMPERING APPARATUS

Abstract: Source: US3677733A ABSTRACT OF THE DISCLOSURE

A bending and tempering apparatus particularly adapted for treating thin glass sheets. The bending apparatus is of the inertia-gravity type and utilizes a canti- , _ lever mounted shaping rail. Upper and lower cooling blastheads are swung over the unsupported end of the shaping rail to apply tempering air immediately after bending, before excessive heat is lost by the thin glass.

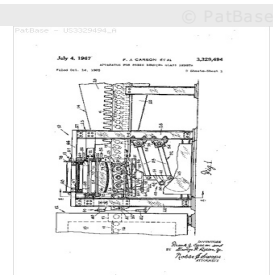
Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19701201



66) Family number: 768811 (US3329494A)

APPARATUS FOR PRESS BENDING GLASS SHEETS



Abstract: Source: GB1054980A 1,054,980. Bending glass sheets. LIBBEY-OWENS-FORD GLASS CO. Dec. 3, 1964, No. 49178/64. Heading C1M. Apparatus for bonding glass sheets 11 as they are moved by a conveyer along a predetermined substantially horizontal path extending between opposed complemental shaping surfaces 24, one formed on an upper mould part 22 disposed above the path and the other on a lower mould part 23 movable relative to the path toward and away from the upper mould part 22 thereby to press the sheets between the shaping surfaces, is characterized by the lower mould part 23 being pivoted about a fulcrum 58 on a carriage 31 disposed below the path to rock about an axis transverse to the path between a first position wherein the mould part 23 is inclined relative to and intersects the path and a second position wherein the lower mould part is disposed above and parallel to the path. A shoot 11 is conveyed from a heating zone A into a bending zone B and passes through the beam 41 of a sensing device. The leading edge of the sheet engages the downwardly inclined surface of the open ring type lower mould part 23. When the sheet is fully on the said mould part the mould part 23 is rocked about the fulcrum 58 into a horizontal position supporting the sheet 11 parallel to but above the conveyer 33. A solenoid operated actuator 62 may be eased to rock to mould part about the fulcrum. A cam disc 45 is then rotated and by means of a follower 43 attached to a parallel bars linkage the carriage 31 supporting the lower mould 23 is raised into pressing engagement with the stationary upper mould part 22. The lower mould with the bent sheet is then lowered to a position below the conveyer 33 so that it can be removed to a tempering section C. The shaping surface of the upper mould part 22 is substantially continuous and for protection is covered by a material 73, e.g. glass fibre, with a more resilient backing material 76. These I materials extend across the shaping surface. each from a substantially continuous supply and may be selectively drawn from said supplies across the shaping surface.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19650705

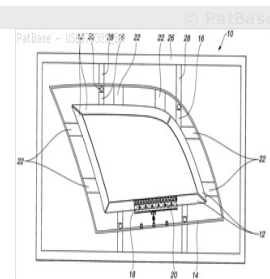
67) Family number: 13157685 (US6578385B)

FRAME FOR SUPPORTING GLASS PLATE DURING TEMPERING

Abstract: Source: US6578385B The invention relates to a frame for supporting a glass plate during a quenching of the glass plate. This frame includes a supporting ring for supporting thereon the glass plate, and a heat-resistant fabric tensioned and covering a top surface of the supporting ring to allow the glass plate to rest on the heat-resistant woven fabric. The supporting ring has a shape substantially conforming to a contour of the glass plate. A quenching air of the tempering is allowed to pass smoothly by tensioning the heat-resistant fabric.

Probable Assignee: CENTRAL GLASS CO LTD

Earliest Publication Date: 20010220



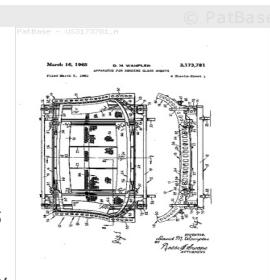
68) Family number: 245629 (US3173781A)

APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: GB946380A A glass bending mould comprises a plurality of mould sections disposed end to end and joined together by hinges, said hinges having first and second members fixed to the adjacent ends of adjoining mould sections, the hinge members being provided with means coacting with one another to limit the relative movement of the sections between pre-set open and closed positions. A skeleton mould 11 (Figs. 1, 2) comprises a centre section 13 and end sections 14 and 15 joined by hinges 37, each end section 14 and 15 being mounted on a rod 66 supported by links 22 on stub shafts 65 (Fig. 5) fixed by brackets 73 to uprights 21 extending from the side rails 19 of a supporting frame. To retard heating and subsequent cooling of various sections of the glass sheet to be bent, a strain bar 34 and shields 35 are included. Each hinge 37 (Fig. 11) comprises two members 39 and 40, welded to the ends of adjoining rails, e.g. rails 25 and 28, and pivotally joined by a pin 49 through holes 48 bored in each. Member 39 has bosses 50 to engage the inner surface of a bifurcated portion 43 of the member 40. The open and closed positions of the mould are determined by the abutment of a finger 51 with the opposed ends of pre-set bolts 52 and 53. Rails 31 of both end sections 14 and 15 are bowed downwards towards their corners of the mould 11 and are hence out of contact with the glass sheet when the mould is open, and means 59 are provided (Figs. 1 and 5) to support the glass sheet at these corners. Each means 59 is adjustable and is fixed by means of a lever 60 to the centre section 13. Additional support means 55 for the glass sheet each comprise a block 56 mounted on an L-shaped lever 57, the opposite end of which is fixed to an end section by a bracket 58. To adjust the closing speed of the mould the point of suspension of the end sections 14 and 15 from the links 22 is made adjustable by providing brackets 67, fixed to the shaping rails 28 and 29, with a series of alternative holes for housing the rods 66. Further closing speed adjustment is obtainable through the medium of a series of mounting holes 78 in the bracket 73.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19620616



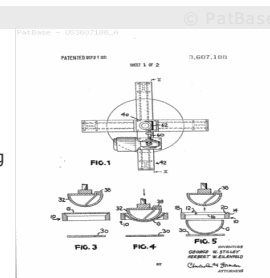
69) Family number: 970464 (US3607188A)

METHOD AND APPARATUS FOR BENDING GLASS SHEETS

Abstract: Source: US3607188A (Claim 1) 1. Apparatus for shaping a heat-softened glass sheet into a spherical portion comprising a circular support ring for initially supporting said glass sheet for shaping, a plunger having a downwardly facing spherical wall for contacting the upper surface of said glass sheet, and having a diameter less than the support ring by approximately twice the thickness of said glass sheet, a support pad disposed below said support ring for receiving said glass sheet after shaping, and means for moving said plunger from a position above said support ring to a position below said support ring and in spaced relation above said support pad to extrude said

Probable Assignee: PPG INDUSTRIES INC

Earliest Publication Date: 19710921



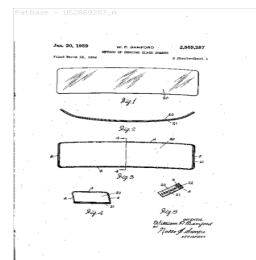
70) Family number: 19894392 (US2869287A)

METHOD OF BENDING GLASS SHEETS

Abstract: Source: GB765430A 765,430. Bending glass sheets. LIBBEYOWENS-FORD GLASS CO. March 7, 1955' [March 15, 1954], No. 6562/55. Drawings to Specification. Class 56. A pattern-cut flat glass sheet is placed across a concave outline-type bending mould which is of such dimensions relatively to those of the sheet after bending that, as the sheet sags on to the mould during heating, its peripheral edge at all times lies outside the frame of the mould so that the peripheral edge of the bent sheet is in compression after the sheet is annealed.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19551216



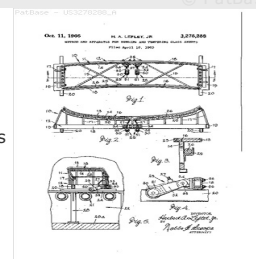
71) Family number: 51936 (US3278288A)

METHOD AND APPARATUS FOR BENDING AND TEMPERING GLASS SHEETS

Abstract: Source: GB1132790A 1,132,790. Bending and annealing glass sheets. LIBBY-OWENS-FORD GLASS CO. 24 Aug., 1966, No. 37870/66. Heading C1M. In a method for bending and annealing glass sheets on a skeleton mould to produce a preselected stress pattern in the glass sheets, heating means applied directly to the shaping rail is operable to heat preselected areas of the sheet during engagement of the bent sheet with the shaping surface. A mould 11 comprises a relatively narrow continuous shaping rail 14, arranged in a closed configuration conforming in outline to the glass sheets and braced by rods 15 extending across the mould. The shaping rail is supported by posts 17 upstanding from a rack 12 and guide rails 20 are secured to the underside of the rack to guide the latter for movement over a roller type conveyer 21 through a tunnel furnace. One shaping rail is electrically heated, with power supplied by busbars 24 which extend through the desired zones of the furnace, the power being conducted to the shaping rail by coupling means 25. Electrical heating elements 26 of the resistance type are mounted on the shaping rail and connected by flexible conductors 27 to the two coupling means 25. Each coupling means 25 comprises a wheel 30 having an outwardly opening groove 31 in its outer periphery which groove receives the bus-bar (24). The wheel is journaled on one arm of a bifurcated arm 32 having its opposite end pivoted on a pin 33 received in a clevis bracket 34 secured as by bolts 35 below the mould, to the leading side rail 18 of the rack. The arm 32 projects backwardly towards the trailing side of the rack and is adapted to swing up and down about the pin 33 as an axis permitting the wheel to swing toward or away from the underside of the mould. Preferably supplementary heating begins when the mould is in or closely adjacent to the bending zone of the furnace, and is discontinued at the point within the annealing zone of the furnace whereat the remainder of the sheet has cooled to a temperature below 900° F. Supplementary heating of the shaping rail produces areas of tension and compression in the sheet so that the peripheral edge of the cut bent sheet is in compression and therefore stronger. Other means of supplementary heating include directing flames on to the shaping rail or passing hot fluid through a conduit attached thereto.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19661011



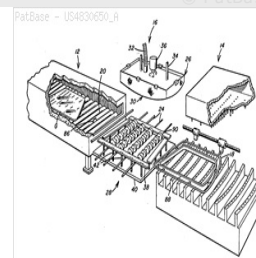
72) Family number: 2793422 (US4830650A)

FLEXIBLE RING MOLD AND METHOD OF USE

Abstract: Source: US4830650A A heat softened glass sheet is shaped between a contoured upper mold and a flexible lower ring mold. The flexible shaping surface of the lower mold has a generally flat surface configuration as it initially contacts and lifts the peripheral portions of the glass sheet off a series of conveying rolls. The lower mold continues to bias the glass sheet against the upper mold and deforms to substantially compliment a corresponding peripheral portion of the contoured upper mold.

Probable Assignee: PITTSBURGH GLASS WORKS LLC

Earliest Publication Date: 19890516



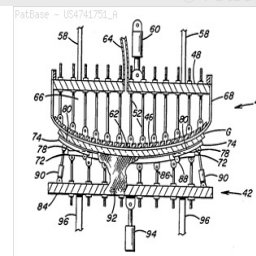
73) Family number: 3770878 (US4741751A)

EXTENDED SURFACE PRESSING MOLD AND METHOD OF SHEET SHAPING

Abstract: Source: US4741751A An extended surface pressing mold for a horizontal press bending arrangement. The lower mold provides a glass sheet engaging surface having a first portion which complements and generally parallels a first portion of an upper sheet engaging surface of an aligned upper mold, a wing portion which extends from the first portion of lower mold and is nonparallel to a corresponding second aligned portion of the sheet engaging surface of the upper mold, and a ring portion positioned outwardly from the wing portion and generally complementing a third aligned portion of the upper sheet engaging surface of the upper mold near a portion of the perimeter of the glass sheet. The ring portion moves from the first position wherein the ring portion is in a non-engaging position relative to the heat softened glass sheet to a second position wherein the ring portion contacts and engages a perimeter portion of the heat softened glass sheet to press the perimeter portion against the third portion of the upper mold.

Probable Assignee: PPG IND OHIO INC

Earliest Publication Date: 19880503



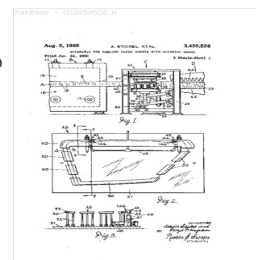
74) Family number: 2164646 (US3459526A)

APPARATUS FOR BENDING GLASS SHEETS WITH ALIGNING MEANS

Abstract: Source: GB1101237A In a continuously fed glass-bending machine C having a heating zone A a two-speed conveyor 20 and a tempering zone D; the glass sheet is fed between mould surfaces 25, 28 and aligned by two stops 43 that retract to allow the bent sheet to proceed to the tempering zone and the invention relates to having at least one stop adjustable in a direction parallel to the path of the glass sheets so that varying sizes of sheet can be bent without stopping the process. To this end, the adjustment is by a screw revolved by a spur wheel, the latter being driven by a rack. An electronic circuit for delisting the sheet, timing and changing the speed of the conveyors is disclosed.

Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19670724



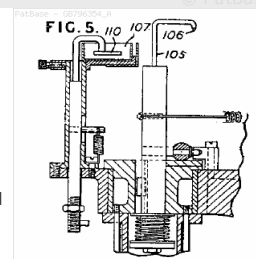
75) Family number: 19814752 (GB796354A)

IMPROVEMENTS IN OR RELATING TO GLASS WORKING MACHINERY

Abstract: Source: GB796354A 796,354. Glass ampoules. SHAW, G. S. July 27, 1956 [July 28, 1955], No. 21789/55. Class 56. In an apparatus for making ampoules wherein a previously formed neck is scored and visual marking material is applied to the score or to a definite position relative thereto, the scoring and application of the marking-material take place at the same station. The apparatus is generally similar to that described with reference to Figs. 6 and 7 of Specification 744,202 except that in that case the scoring and application of the marking-material take place at successive stations. The complete apparatus includes a trimmer for cutting the neck, flame polishers for treating the severed edge, coolers followed by the neck scorer and marking applicator, a heater for drying the marking-material, and gauges for the finished ampoules. The marking- material applicator 106 is lowered into and raised out of contact with the scored neck automatically by cam-controlled mechanism which also controls rotation of the applicator rod 105, when raised, through roughly 180 degrees to bring the applicator 106 over a plate 110 in a reservoir 107 of marking-material, the plate 110 being automatically raised and lowered by the cam-controlled mechanism. Specification 762,857 [Group VI] also is referred to.

Probable Assignee: GEORGE STANLEY SHAW

Earliest Publication Date: 19580611



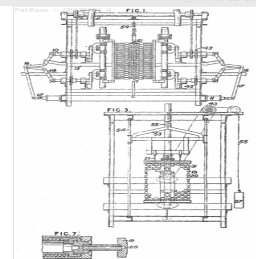
76) Family number: 20008268 (GB625070A)

IMPROVEMENTS IN OR RELATING TO THE ART OF BENDING AND TEMPERING SHEETS OF GLASS

Abstract: Source: GB625070A 625,070. Bending and tempering glass sheets. PILKINGTON BROS., Ltd., BIRD, G. W. T., and DENNETT, J. Nov. 26, 1946, No. 35050. [Class 56] [Also in Group XXIX] Apparatus for bending and tempering sheet glass 1 heated to near its softening temperature has two sets of tempering structures each having means to shape the glass placed between the structures and being movable towards and away from each other respectively for the bending and quenching operations, the glass remaining in the same position for both operations. The construction of the nozzles and nozzle mountings and of the construction of the carriers and the means for imparting a circuitous movement to the carriers is substantially the same as that described in Specification 625,069, except that the nozzles may alternate with or be replaced by shapers of similar construction but with pads 19 apertured at 20 instead of the nozzles 31. Additionally the carriers are moved to and from the glass by means of the cylinders 11, piston rods 12, lever 17 pivoted at 18, links 16, and levers 13 which are pivoted at 14 and connected to the shafts 10 so as to permit rotation of the shafts. Sprockets 43 permit axial movement of the shafts 10. The glass is supported between the carriers by tongs 51 which are suspended from a frame 53 movable on guides 54 by the balance weight 57 and cable 55. The carriers are first moved inwardly to shape the glass, and then moved outwardly and given a circuitous motion when jets from the nozzles temper the glass.

Probable Assignee: PILKINGTON BROTHERS LTD

Earliest Publication Date: 19490621



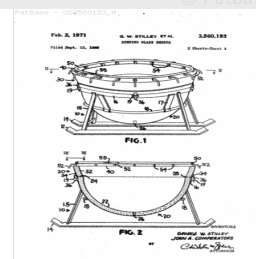
77) Family number: 941378 (US3560183A)

BENDING GLASS SHEETS

Abstract: Source: US3560183A ABSTRACT OF THE DISCLOSURE Bending thick glass into hemispherical shapes comprising using a mold of concave elevation of material having less thermal expansivity than glass, said mold comprising a ring of rigid material having greater thermal expansivity than glass and sufficiently smaller in diameter than the mold at glass loading temperature to support the glass over said mold at the temperature at which the mold is loaded and capable of expanding sufficiently more rapidly than the mold to deposit the glass onto the mold after the glass has attained a sufficiently high temperature to deform in response to external stresses.

Probable Assignee: PPG INDUSTRIES INC

Earliest Publication Date: 19710202



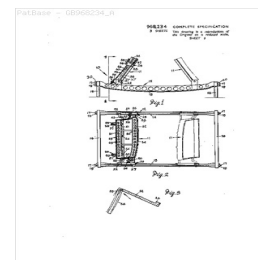
78) Family number: 21137830 (GB968234A)

METHOD AND APPARATUS FOR BENDING AND TEMPERING GLASS

Abstract: Source: GB968234A In the bending and tempering by blasts of air of glass sheets on skeleton moulds, the mould during tempering is supported in an inclined position and the amount of air directed against opposite surfaces of the sheet is controlled so as to move at least one edge of the sheet away from the shaping surface to permit passage of air between the edge and the shaping surface. As shown in Figs. 2 and 5, moulds 11 are mounted on racks 12 for passage through a heating chamber for sagging the sheet on to the mould and then through a tempering chamber 56 having inclined passageways 57 with opposed nozzles 58 along each side to direct air from the chamber 56 against the bent sheets 38 on the moulds 11. Each mould 11 is supported at its lower end on a rod 21 fixed by pins 24 to the mould and by offset ends 23 to plates 22 on the side rails 13 of rack 12 and at its upper end by rods 28 each side of the mould 11 fixed to support members 25 of angle iron mounted on plates 22 to give the required inclination to the mould 11. As shown in Fig. 7, each mould 40 is mounted on angle-irons 43 extending at the required inclination from the side rails 44 of the rack 41, so that during bending of the sheet, the mould is horizontal and it is then pivoted downwardly to the dotdash position for tempering. The upper end of mould 40 is pivoted on rods 45 journaled in the angle irons 43, the opposite end of the mould being supported on a rod 46 sliding at each end in a slot 49 in a plate 48 secured to the mould 40 and having off-set ends 47 journaled in the angle-irons 43. The mould 40 is held in the upper position by an extension 51 of the end 47 engaging a hook 52 pivoted on angle-iron 43, the hook 52 being removed automatically as the mould 40 passes from the bending furnace to the tempering chamber. The moulds 11 and 40 are of box-like formation and this is stated to control the amount of air so as to move the sheet away from the mould surface, as shown in Fig. 5, but the blasts of air may be controlled so as to effect cooling of the opposite surfaces at different rates. Specification 968,233 is referred to.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19620516



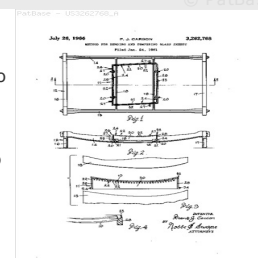
79) Family number: 756177 (US3262768A)

METHOD FOR BENDING AND TEMPERING GLASS SHEETS

Abstract: Source: GB968233A In bending and tempering glass sheets in which the sheet is heated to soften and sag into conformity with a bending mould and then tempered by rapidly reducing the temperature, the opposite surfaces are reduced at different rates of cooling to cause at least one edge of the sheet to move away from and out of contact with the shaping surface. Pressure of air blasts may be different on opposite surfaces to give different rates of cooling. Alternatively, the side rails 28, 29 and end rails 30 of the bending mould may be of substantial depth and this is stated to restrict the flow of air from blowers 13 past the lower surface. The side rails 30 and end rail 29 are notched at 32 while the end rail 28 is inclined upwardly at 33 so that the corner only of the sheet 10 contacts the rail. The sheet 10 is shown in the tempered position, raised for rail 28, in dot-dash lines. Specification 968,234 is referred to.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19620501



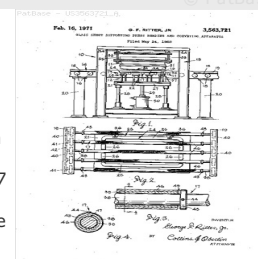
80) Family number: 92017 (US3563721A)

GLASS SHEET SUPPORTING PRESS BENDING AND CONVEYING APPARATUS

Abstract: Source: GB1241118A 1,241,118. Bending and conveying glass sheets. LIBBEY-OWENS-FORD CO. 16 May, 1969 [24 May, 1968], No. 25063/69. Heading C1M. Apparatus for bending glass sheet, e.g. to form vehicle windscreens, comprising an upper, stationary mould member 11 and a movable, lower mould member 12, e.g. of the ring type, in which a glass sheet is bent by raising the lower mould member by means of the ram 29 and guide members 28 so that a heat-softened glass sheet resting on conveyer rolls 17 against the stop 36 is raised and bent partially by sagging under its own weight and partially under the influence of the upper mould member, is characterized by having conveyer rolls 17 constructed with an outer sleeve 39 with a cover 46 (asbestos or fibre glass) which fits loosely over the driving shaft 38 in which it is in single line contact only so that, when a glass sheet abuts against the stop 36, slippage occurs between the roll and the driving shaft, thus reducing the distorting forces as exerted on the glass sheet.

Probable Assignee: LOF GLASS INC

Earliest Publication Date: 19690829



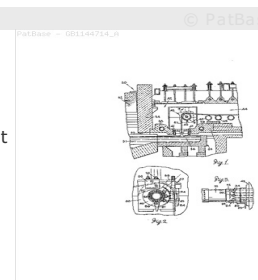
81) Family number: 20872845 (GB1144714A)

PRODUCING SHEET GLASS

Abstract: Source: GB1144714A 1,144,714. Drawing glass sheet. LIBBEYOWENS-FORD GLASS CO. 18 Feb., 1967, No. 7840/67. Heading C1M. In a machine for drawing glass vertically from a melt, the roller usually used for deflecting the glass into the horizontal is replaced by a stationary "roller" over which a film of fluid is maintained from a longitudinal slot 57. This prevents the glass actually contacting the roller save for the sides of the sheet which engage knurled rotatable members. The radius of curvature of that part of the roller subtended by the sheet varies continuously from engaging tangent to leaving tangent in order to give uniform lift to the sheet. The roller is rotated initially in conventional manner to establish the sheet flow. The fluid (air) helps to cool the "roller".

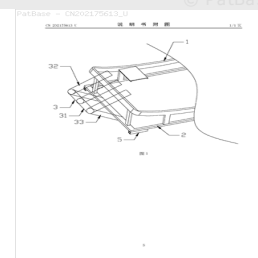
Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19690305



82) Family number: 50864389 (CN202175613U)

THERMALLY-BENDING AND FORMING MOULD FOR PREVENTING AUTOMOBILE GLASS FROM WARPING



Abstract: Source: CN202175613U The utility model relates to a thermally-bending and forming mould for preventing automobile glass from warping. The thermally-bending and forming mould for preventing the automobile glass from warping comprises a forming ring and a mould support for supporting the forming ring, wherein the forming ring is arranged on the mould support; and a pressing rod device which is overlapped and placed on the edge of the automobile glass on the forming ring in the thermally-bending and forming process is further arranged on the mould support. Through the adoption of the structure that the pressing rod device is additionally arranged on the thermally-bending and forming mould, the edge of the automobile glass which is subjected to the thermally-bending and forming process can be overlapped; and when the automobile glass is bent by heating, the edge of the automobile glass can be pressed by a pressing rod, so that the defect that the automobile glass warps is effectively solved, and the situations that a corner part of the automobile glass has whitening ink, sticking damage, sticking breakage and the like can be prevented.

Probable Assignee: SHENZHEN BENSON AUTOMOBILE GLASS CO LTD

Earliest Publication Date: 20120328

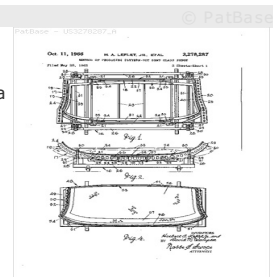
83) Family number: 29710 (US3278287A)

METHOD OF PRODUCING PATTERN-CUT BENT GLASS SHEET

Abstract: Source: GB1040492A In the production of pattern-cut bent glass sheets the cut bent sheet is supported upon a shaped ring-type mould of a smaller size but of substantially similar outline, re-heated and then cooled whilst contact is maintained between the mould surfaces and a portion of the sheet spaced inwardly of its edge such that on cooling the marginal edge portions of the sheet are placed in compression. Initially a block-size sheet is bent in a conventional manner such that an area of the sheet, having an outline equivalent to that of the cut sheet, is placed in compression, so that on cooling the bent sheet may be cut, the cut being made through the centre of the compression zone. The pattern-cut bent sheet is then placed on the ring mould surfaces 53 (Figs. 4 and 5, not shown) and placed in a furnace for reheating. The edges of the sheet 54 overhang the mould such that on cooling an area of compression d is formed. The sheets are reheated to a temperature above 940 DEG F. (500 DEG C.) to relieve all stress therein but not sufficient to cause further bending. A predetermined gradient of tension may be created in the area of the sheet within the support surfaces 53 by using different thicknesses 56, 57, 58 of a perforated shield which extend between surfaces 53 below the glass, thus giving rise to different rates of cooling.

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19640901



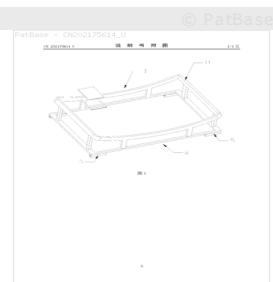
84) Family number: 50865450 (CN202175614U)

THERMALLY-BENDING AND FORMING MOULD FOR LOWERING KETTLE RETURNING RATE OF AUTOMOBILE INTERLAYER GLASS

Abstract: Source: CN202175614U The utility model relates to a thermally-bending and forming mould for lowering the kettle returning rate of automobile interlayer glass. The thermally-bending and forming mould for lowering the kettle returning rate of the automobile interlayer glass comprises a forming ring and a mould support for supporting the forming ring, wherein the forming ring is arranged on the mould support; and the width of the edge of the forming ring is 10 to 15 mm. By increasing the width of the edge of the forming ring, the edge reserving amount of the automobile interlayer glass when the automobile interlayer glass is placed on the thermally-bending and forming mould can be effectively reduced, and a clearance and the warping generated after the automobile interlayer glass is poured into the mould are effectively avoided, so that the kettle returning rate of the automobile interlayer glass is lowered to a certain extent and the automobile interlayer glass discharging cycle is shortened.

Probable Assignee: SHENZHEN BENSON AUTOMOBILE GLASS CO LTD

Earliest Publication Date: 20120328



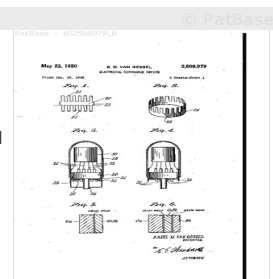
85) Family number: 30990785 (US2508979A)

ELECTRICAL DISCHARGE DEVICE

Abstract: Source: GB638020A 638,020. Aerials; aerial coupling arrangements. STANDARD TELEPHONES and CABLES, Ltd. June 4, 1947, No. 14769. Convention date, May 15, 1946. [Classes 40 (v) and 40 (vii)] An antenna radiating vertically polarized waves in a uniform horizontal pattern comprises a hollow conductive body of cylindrical shape formed in two parts 1, 2 separated by a gap and energized by a feeder 8, 9 at a point 6 diametrically opposite to a bar 7 shortcircuiting the gap; a standing voltage wave occurs along the gap which then acts as a transmission line to feed upper and lower groups of vertical quarter-wave radiators 10- 17 in equal and opposite phase relation. Tube 5 conductively joins the two parts at points of low R.F. potential and permits the antenna to be mounted on a conductive mast 18 with minimum current flow into the mast. The line formed by the gap is loaded by compensating reactances presented by the radiators and hollow body, and, over a broad band of frequencies, maintains a constant propagation velocity and match with a 50# feeder. The hollow body may be constructed of solid or perforated sheet metal, a plastic conductively coated or wire netting. An insulating material may seal the gap. An array of such antennas may be stacked vertically on a mast. Typical dimensions for the several parts of the antenna may be as follows: D=.32#, d=.032#, H=.072#, g=.0048#, L=.236#. The cylinder may have a circular, elliptical or square cross section.

Probable Assignee: PHILIPS LAB INC

Earliest Publication Date: 19471116



86) Family number: 19963100 (US2194338A)

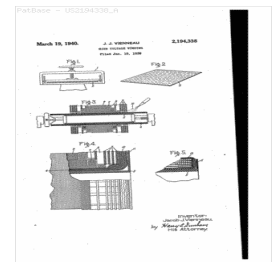
HIGH VOLTAGE WINDING

Abstract: Source: US2194338A 1. The method of forming a Banged member of crepe paper for supporting and insulating a high voltage winding which comprises initially compressing a sheet of said paper to reduce its thickness, bending the compressed sheet into cylindrical form with the line of the corrugations of the paper extending axially, moistening an end portion of the cylinder thereby restoring the paper substantially to its original thickness and turning the moistened portion outwardly to form a flange. -

Probable Assignee: ANCHOR HOCKING GLASS CORP



Earliest Publication Date: 19391107



87) Family number: 21287007 (FR1403548A)

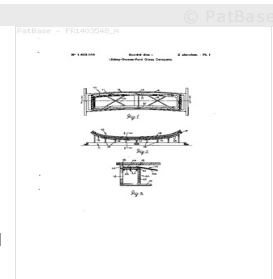
**APPAREIL POUR CINTRER DES FEUILLES DE VERRE
APPARATUS FOR BENDING GLASS SHEETS (MACHINE TRANSLATION)**

Abstract: Source: FR1403548A (Claim 1) 1. II presente un element de conservation de la chaleur dispose au voisinage immediat du rail de conformation et, s'etendant a.J'interieur de ce dernier et qui est.espace au-dessous de sa surface de conformation pour se trouver sous une partie d'une surface principale d'une feuille de verre supportee par le moule, et un moyen pour monter le moyen de conservation de 'la chaleur dans la position susmentionnee par rapport au.rail de conformation;

Machine translation: (Claim 1) 1. II presents an element of heat conservation features in the immediate vicinity of rail and conformation, extending a.J inside of it and who est.espace below its surface conformation to be under a part of a main surface of a glass sheet supported by the mold, and means for mounting the holding means, the heat in the aforementioned position relative au.rail conformation;

Probable Assignee: LIBBEY OWENS FORD GLASS CO

Earliest Publication Date: 19650618



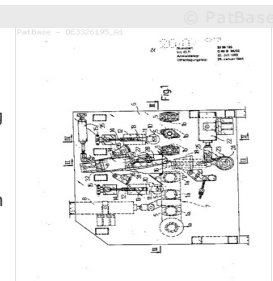
88) Family number: 3290201 (DE3326195A1)

**APPARATUS FOR CUTTING FLAT PANES OF GLASS FOR INTRODUCTION INTO A LINE CUTTING PANES
OF GLASS TO SIZE**

Abstract: Source: DE3326195A1 The apparatus for cutting up a flat pane of glass into individual glass pane pieces along incision lines made on the pane comprises a series of supporting rollers (1a, 1b) for supporting the pane, two back-up rollers (10), which can support the upper side of the pane, and a cutting roller (16), which can exert predetermined pressure on the underside of the pane. Furthermore, the apparatus comprises a thrust element (27), which can be brought into contact with the upper side of the pane in order to cut off the first and the last edge piece of the pane, which are removed while the pane is being worked.

Probable Assignee: NUOVA BOTTERO SPA

Earliest Publication Date: 19840126



89) Family number: 5051801 (US4596592A)

STOP MEMBERS FOR GLASS SHEET SHAPING MOLDS

Abstract: Source: US4596592A A stop assembly for positioning glass sheets that are pressed between upper and lower shaping molds. The stop member is pivoted into a sheet engaging position as the sheet is heated and conveyed onto a gas hearth. As a lifting ring which surrounds the gas hearth moves vertically, lifting the sheet off the gas hearth and towards the upper mold face, the stop assembly rotates to a position outside the pressing surface of the upper and lower molds.

Probable Assignee: PPG INDUSTRIES INC

Earliest Publication Date: 19860624

