

[54] **GUIDE DEVICE FOR THE UPPER EDGES OF VERTICALLY POSITIONED AND HORIZONTALLY MOVED PLATES**

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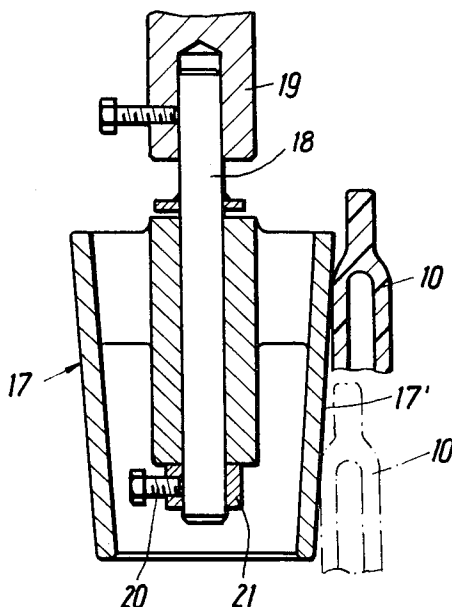
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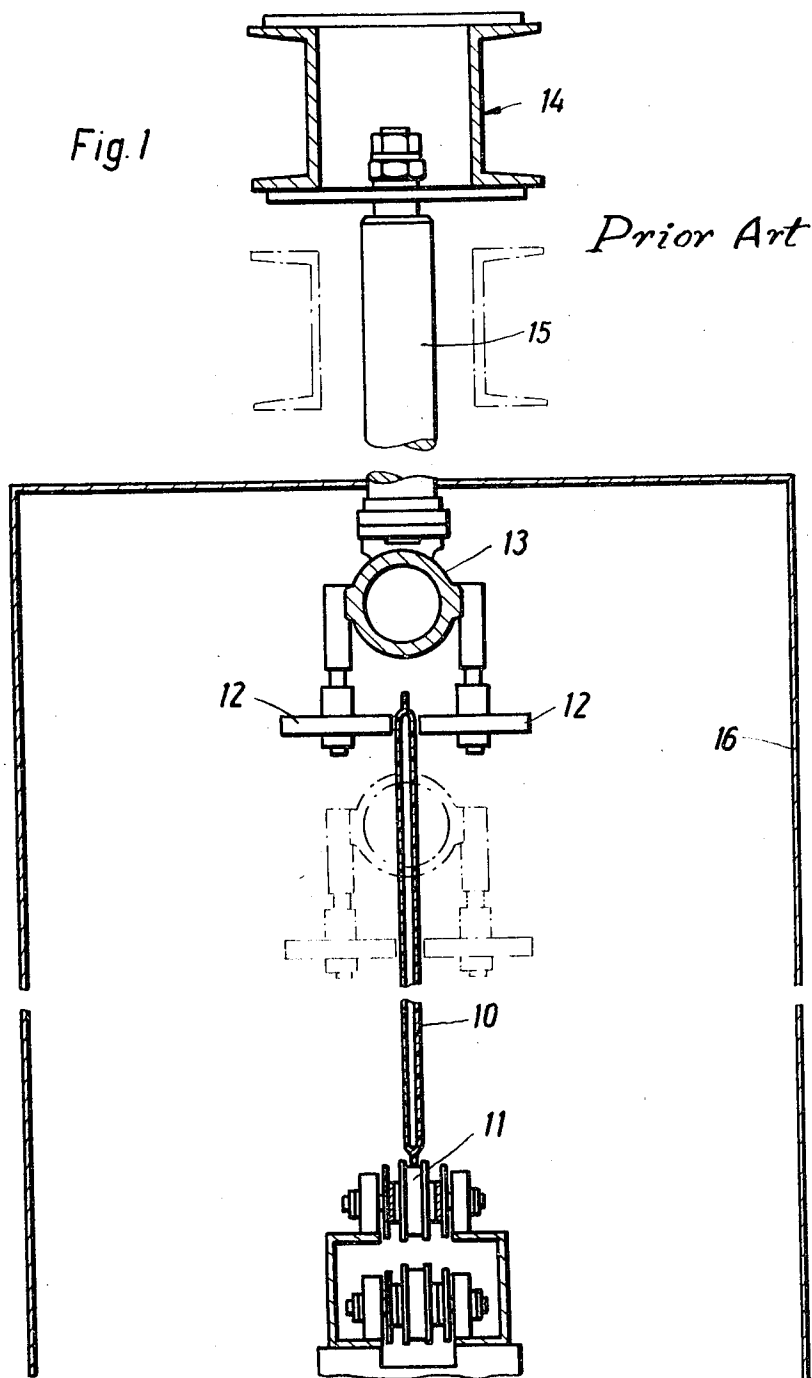
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ABSTRACT

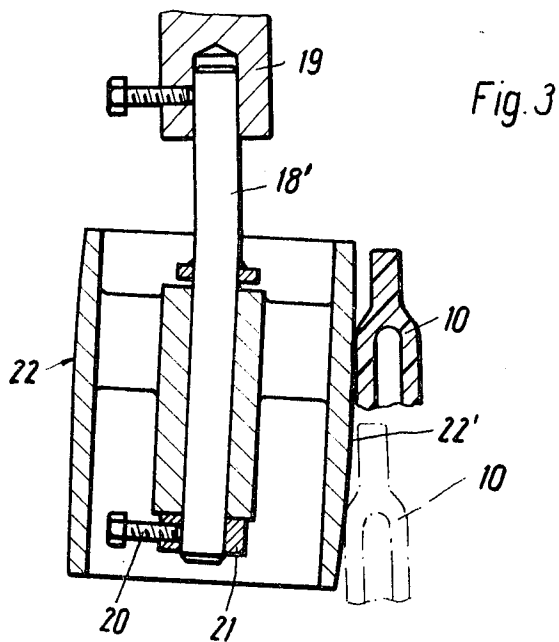
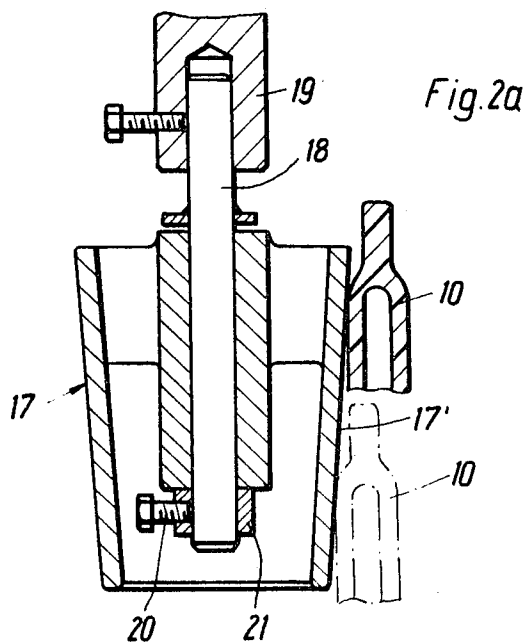
A guide device for engaging the upper horizontal edge of vertically disposed glass plates when the same are conveyed in an upright position through an annealing oven. The guide device comprises a relatively wide roller rotatable about a substantially vertical axis, either cylindrically or conically formed or provided with a spherically curved circumference and arranged in such a position that only a narrow, almost a line-like area of their circumference comes into engagement with the marginal edge portion of the plane surface of the glass plate. The guide device may also consist of one or more resiliently or pivotally mounted stationary strips covered with a friction-reducing coating along which the glass plates slide during their movement through the annealing oven.

4 Claims, 7 Drawing Figures

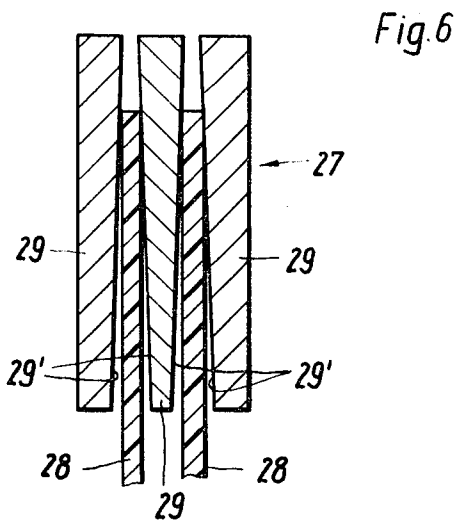
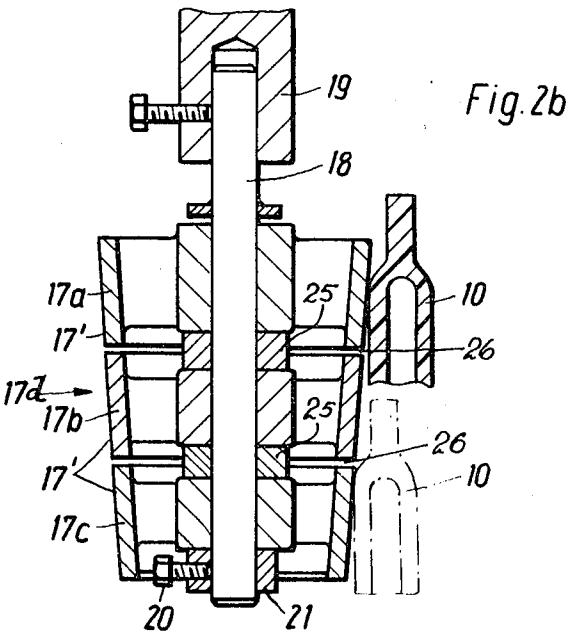




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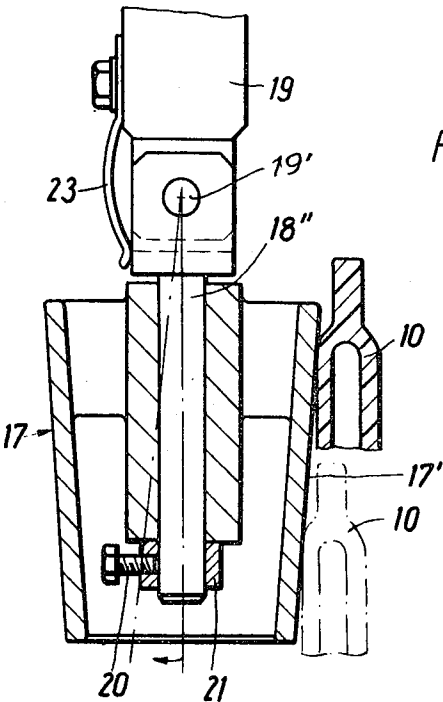


Fig. 4

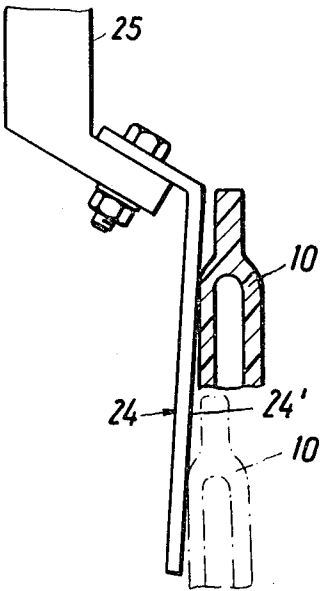


Fig. 5

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GUIDE DEVICE FOR THE UPPER EDGES OF VERTICALLY POSITIONED AND HORIZONTALLY MOVED PLATES

The invention relates to a guide device for the upper horizontal edge of upright plate-like material moved in horizontal direction.

For the transporting of material disposed upright, for example of sheet metal plates covered with a plating or of lacquered plates or the like, guide devices are known, which for the prevention of damages of the actual plate or sheet-surface engage solely in the direct vicinity of the upper horizontal edge. Guide devices of this type are also employed for the guiding of double— or multiple-glass—plates, which after the welding of their edges are guided standing upright through a cooling or annealing oven or lehr.

The guide devices previously used in transporting upright glass plates or sheets on a roller conveyor in an annealing furnace consist of cylindrically constructed guide rolls with vertical axis of rotation. The rolls are in this connection constructed relatively narrowly, so that they may damage the surface during their rolling along the edges while the latter are still soft from the welding, solely at a relatively small point. In this manner, it is possible to limit any scratches and the like to a part of the pane which disappears at the later glazing in frames.

This previously known construction has the substantial disadvantage that the height of the guide rolls must be accurately adjusted, and upon each transportation of panes of different height, a new adjustment of all guide rolls is necessary. On account of this adjustment of the entire oven, long periods of shut-down have to be taken into consideration, which substantially increases the cost of production of panes of different height.

It is an object of the invention to eliminate these disadvantages by providing the guide device with a guide surface, which in vertical direction is appreciably wider than the range of the plate-shaped material, on which it engages, and that the guide surface is inclined to the flat side of the plate-shaped material in such manner, that the areas of the guide surface and of the plate-shaped material located below the common installation area diverge downwardly. In this manner it is possible, to transport into the annealing oven individual panes or smaller series of panes, whose height differs solely to a relatively slight extent from the standard height of the double glass panes produced in greater series, without requiring an adjustment of the guide devices.

In accordance with a preferred embodiment of the invention, the guide surface consists of the circumferential surface of a guide roll constructed correspondingly wide. The circumferential surface of the guide rolls having a vertical axis of rotation in accordance with the invention is tapered conically downwardly, -- with guide rolls with axis of rotation inclined to the plane of the plate or sheet, to the contrary, constructed cylindrically. For reducing the area of the bearing surface of the guide rolls on the plate or sheet it is recommended to construct the circumferential surface of the guide rolls spherically.

In order to adapt the guide device to varying thicknesses of the sheets or plates moved forward on the roller path, the axis of the guide rolls may be arranged to be swingable. In this connection, it is recommended to limit the swivel movement by a stop-member and to provide a spring in order to guide the swung-out rolls back into the vertical position.

According to a further embodiment of the invention, the guide surface consists of the flat side of a stationary plate-shaped structural part, along which the plate-shaped material slides. The plate-shaped structural part consists preferably of resilient piece of sheet metal or the like, which opposite the plate-shaped material may be provided with a coating which with respect to the heated glass has a particularly low coefficient of friction.

The invention is illustrated in the drawings by way of example, in several embodiments.

In the drawings:

FIG. 1 shows a partial vertical section of an annealing oven for the cooling off of double glass panes produced in a preceding welding station, with a known guide device for the upper horizontal edges of the double glass panes;

FIG. 2a shows an embodiment of the device according to the invention, in which the guide surface for the double glass pane is formed by the peripheral surface of a conical roller.

FIG. 2b shows a guide roll similar to the guide roll of FIG. 2a composed of several independently supported roller sections;

FIG. 3 shows a guide roller similar to FIG. 2a with a substantially cylindrical, slightly spherical peripheral surface;

FIG. 4 shows a guide roll corresponding to the guide roll of FIG. 2a, however, swingably supported;

FIG. 5 shows a guide device consisting of a rigidly mounted plate-shaped structural part, and

FIG. 6 shows a guide device consisting of three plate-shaped structural parts for the guidance of two glass plates arranged in spaced parallel relation.

Referring to FIG. 1 which shows a partial cross-section of an annealing oven for the slow cooling of a double glass pane 10 welded in a previous oven section, the pane is supported vertically and is carried standing upright on its lower edge through the annealing furnace. The transport of the pane 10 through the annealing furnace takes place by driven rolls 11, which rotate about horizontal axes and end flanges for the guidance of the lower edge of the pane. A tilting of the pane is prevented by means of cylindrical guide rolls 12 each rotatable about a vertical axle and engaging pairwise the upper edge of the double glass pane on opposite sides thereof. The known guide rolls 12 have a very narrow width in their axial direction in order to decrease as much as possible the bearing area of the rolls on the double glass pane. In each case, several pairs of guide rolls 12 are suspended on a horizontal supporting pipe 13, whose height in the oven may be altered, in order to adapt the guide rolls 12 to double glass panes of different heights. In the drawing, the supporting pipe is shown with a pair of guide rolls 12 in its highest position. In dot-dash lines is indicated a lowered position of the supporting pipe and the guide rolls. The raising or lowering, respectively of the supporting pipe takes place by means of raising or lowering, respectively of a lifting beam 14 arranged above the oven. The lifting beam 14 is connected with the supporting pipe 13 by at least two vertical connecting rods 15, which pass through the ceiling of the oven. The annealing oven is indicated in the drawing solely by its inner wall 16.

FIG. 2a shows an embodiment of the new guide-device, in which a tapered roller 17 of relatively great width in axial direction and rotatable about a vertical axis assumes the guidance of the double glass pane 10. The actual guide surface is formed by the circumferential surface 17' of the tapered roller. The tapered roller 17 may in similar manner as the known guide rollers 12 be suspended from the supporting pipe 13. The rollers 17 may engage pairwise or offset the two sides of the double glass pane along its upper horizontal edge. Owing to the conical construction of the roller, it is insured that it engages the upper downwardly curved pane area which merges into the actual edge of the double glass pane. This curved pane area when glazing the pane is covered by the frame in which the pane is arranged. Any scratching caused by the roller at this point is accordingly not visible in the finished glazed pane. If now a pane of somewhat less height is to be guided through the annealing oven, the tapered roller 17 may remain standing in its originally adjusted high position, as it has such a long width that it may also guide panes of lesser height. Such a pane of less height is indicated in dot-dash lines. It is clearly recognized that also a pane of less height engages the roller in a range of the pane which disappears in the window frame after the glazing. An adjustment as to height of the roller is only then necessary when a pane is to be guided through the oven, which is so much lower than the pane first considered, that it no longer finds support on the peripheral surface of the tapered roller.

The tapered roller is rotatably supported on a vertical shaft 18, which is fixed to a horizontal structural part 19, which for

example is connected with the supporting pipe 13. A ring 21 attached to the lower free end of the shaft 18 and clamped thereon by a set screw 20, holds the roller on the shaft. Upon loosening the set screw, a rapid removal of the roller from the shaft 18 is possible.

The guide roller 17d shown in FIG. 2b differs from the guide roller 17 illustrated in FIG. 2a solely in that it consists of three axially aligned tapered roller sections 17a, 17b, and 17c all of which are positioned on the shaft 18 and rotatable independently of one another. The distance of the individual roller sections from one another is so adjusted by spacing rings 25 arranged between their hubs, that the annular gap 26 between the sections is relatively narrow. The division of the guide roller into several roller sections has the advantage, that the double glass pane 10 need only rotate one roller section of relatively less mass at the time, whereby the danger is lessened that a unitary roller may remain fixed when engaging the pane and may not roll along its edge, but slides along the same.

Another guide roller 22 is shown in FIG. 3. In this embodiment, the guide roller 22 is substantially cylindrical, but the peripheral surface 22' of the roller forming the pane-engaging guide surface is slightly spherical. The inclination of the peripheral surface to the double glass pane 10 is here attained by means of a downwardly angled shaft 18'. In other respects the construction and manner of operation of the roller 22 is similar to the previously described tapered roller 17. Of course, also this cylindrical guide roller 22 may be divided into several axially aligned roller sections rotatable independently of one another.

The guide device shown in FIG. 4 has likewise a tapered roller 17. The shaft 18'' is, however, swingably mounted on the structural part 19 at 19' in such manner, that the roller may be swung out in a plane standing perpendicularly to the flat sides of the double glass pane 10. This has the advantage that the roller may adapt itself automatically to differently thick double glass panes. A leaf spring 23 secured with one of its ends to the structural part 19 and engaging the swingable part with its other end urges the outwardly swing roller back into the normal vertical position. The spring 23 may also be omitted if the swingable part of the guide device has a sufficient weight in order to go back automatically on account of its specific gravity.

In still another construction of the guide device shown in FIG. 5, the guide surface is stationary, so that the upper edge of the double glass pane 10 must slide along the same. The guide surface is formed by the flat side 24' of a fixed plate-shaped member 24 which from its upper fixed end extends angularly downwardly and is engaged by the double glass pane 10. The mounting 25 of the plate-shaped member 24 may also be fixed on the supporting pipe 13. For reducing the friction between the double glass pane 10 and the guide surface of the plate-shaped member 24, the guide surface may be covered with a material decreasing the friction, for example, polytetrafluorethylene, at least it should have however, a surface as smooth as possible.

The guide device 27 shown in FIG. 6 serves for the guidance of two single glass panes 28 arranged in parallel spaced relation, whose edges are welded together at a following welding station to form the fused edge of a double glass pane. The guide device consists of three vertical plates or strips 29 extending in horizontal direction parallel and spaced from another. The vertical guide surfaces 29' of the strips 29 which engage the glass panes are so inclined, that the guide surfaces 29' and the flat sides of the glass panes 28 extend downwardly divergently apart. The centrally arranged strip 29 has there-

fore a cross-section tapering downwardly on both its sides to form a cone while the two outer strips 29 in each case taper solely at the side facing the glass plate. For the adaption of the guiding space present between the guide faces 29' to glass panels of different thickness or different height, the two outer strips 29 may be pre-tensioned resiliently in direction toward the central strip 29.

The central strip 29 is in this connection preferably constructed as a rod of circular cross-section while the two side strips 29 consist each of a bar of semi-circular or circular cross section so that solely a point contact takes place between the bars and the glass pane in the guide-spaces.

WHAT I CLAIM IS:

1. Guide device for the upper horizontal edge of an upright glass sheet moved in horizontal direction along support means engaging the bottom edge of said glass sheet, said guide device engaging both faces of said glass sheet solely in the immediate vicinity of the upper horizontal edge, particularly for the production of multiple glass sheets in which at least two glass sheets in vertical position are welded together along their edges and are subsequently conveyed upright through an annealing oven, wherein the improvement comprises that each face of said glass sheet is engaged by a frusto-conical guide roller which in vertical direction is substantially wider than the area of the glass sheet which is engaged by said frusto-conical guide roller, a substantially vertical shaft on which said frusto-conical guide roller is rotatably mounted, the peripheral surface of said frusto-conical guide roller being inclined with respect to the adjacent face of the glass sheet in such a manner that the area of the peripheral surface of the guide roller and of the glass sheet located below the common area of mutual engagement diverge downwardly and out of contact with each other.

2. Guide device for the upper horizontal edge of an upright glass pane unit moved in horizontal direction along support means engaging the bottom edge of said glass pane unit, said guide device engaging both faces of said glass pane unit solely in the immediate vicinity of the upper horizontal edge, particularly for the production of multiple-glass panes, in which at least two glass panes in vertical position are welded along their edges to form a multiple-glass-pane which is subsequently conveyed upright through an annealing oven, wherein the improvement comprises that each face of said glass pane unit is engaged by a guide surface formed by the peripheral surface of a roller which in vertical direction is substantially wider than the area of the glass pane unit which is engaged by said guide surface, including a substantially vertical shaft on which said roller is rotatably mounted, said peripheral surface of the roller being inclined with respect to one of the flat sides of the glass pane unit in such manner, that the area of the guide surface and of the glass pane unit located below the common area of engagement diverge downwardly and out of contact with each other, means for swingably mounting the upper end of said shaft in a plane perpendicularly to said flat side of the glass pane unit and perpendicularly to the horizontal plane of the flow, and means including a spring for limiting the pivotal movement of said shaft on which said roller is mounted.

3. Guide device according to claim 2, in which said guide roll is composed of a plurality of sectional rolls aligned on said shaft.

4. Guide device according to claim 2, in which said guide surface is formed by the peripheral surface of a substantially cylindrical guide roll.

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