March 26, 1940. J. WILSON 2,194,730

PROCESS FOR TEMPERING GLASS

Filed March 25, 1935

Fig. 2.

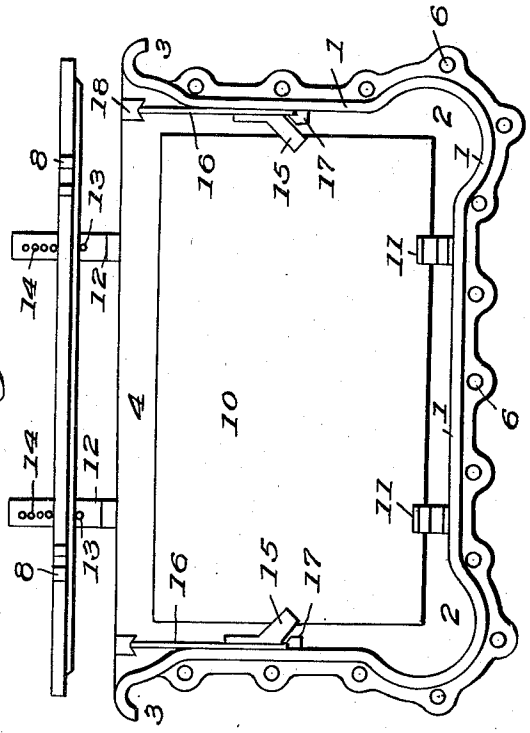


Fig. 4.

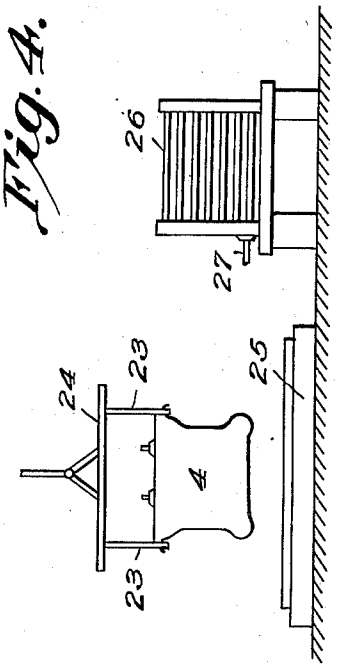


Fig. 3.

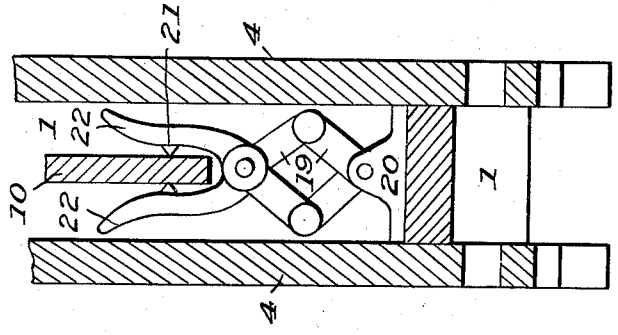
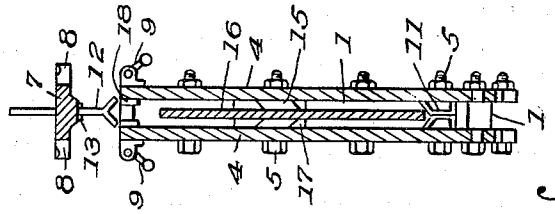


Fig. 1.



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PROCESS FOR TEMPERING GLASS

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Application March 25, 1935, Serial No. 12,963
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2 Claims. (Cl. 49—89)

This invention relates to an improved process for tempering glass.

In the process now commonly used for tempering glass, the glass is heated in a furnace mainly by radiation, the glass being exposed directly to the hot surfaces and to the hot air or gases in the furnace. It is then cooled by direct application to its surfaces of a cooling medium, usually air in the form of high pressure jets, but sometimes liquids.

According to the invention, the glass is heated and cooled indirectly through the medium of metal in liquid form, the metal being, preferably, a bismuth alloy. The glass to be tempered is enclosed in a metal box, with metal in liquid form between the walls of the box and the glass, and means are provided whereby the glass is kept approximately central in the box.

In the following, the invention will be described as applied to the tempering of a flat sheet of glass.

In the accompanying drawing:

Figure 1 is a central cross section of the metal box with glass sheet therein;

Figure 2 is a side view thereof with the front side removed, the covering being shown above the box in both figures;

Figure 3 is a part section similar to that of Figure 1, on a larger scale, showing an alternative method of holding the glass, and

Figure 4 is a diagrammatic view in elevation of the heating and cooling means.

The box is composed of a metal strip 1, forming its edge, bowed out at the lower corners 2 and turning outwardly at the upper corners and ending in hooks 3 by which the box is lifted. The two sides of the box are two metal plates 4 pressed against the strip 1 by bolts 5 passing through holes 6 in the plates 4. The cover 7 is provided with lugs 8 adapted to receive pivoted latches 9 attached to the sides 4. The box is filled with molten metal (not shown) which is preferably a fusible alloy of melting point sufficiently low to permit a cold glass sheet to be inserted into it when molten. The glass plate 10 is caused to occupy a central position in the box by thin sheet metal pieces. Two such pieces 11 of Y shape are fixed to the strip 1 at the bottom, so that the glass, when pressed down on them finds a central position. Two similar pieces 12 pass through slots in the cover 7 and are prevented from rising by pins 13 each passed through one of the holes 14 in the pieces which afford a means of adjustment of the length of piece 12 below the cover 7. The glass sheet is inserted into the molten metal in the box, into which it descends by its weight till about one quarter is submerged; the cover 7 is then placed over the upper edge of the sheet, so that the Y pieces 12 engage the edge, and the sheet is then pressed into the box by lowering the cover, which is then secured by the latches 9. This operation must be carried out rapidly so that the sheet does not remain partially submerged for an appreciable time. By means of the Y pieces 11 and 12, the sheet then occupies a position central in regard to the sides 4. Centrality in regard to the edges is ensured by edge pieces consisting of V strips 15 secured to vertical strips 16 which are lowered into the box to engage hooks 17 on the strip 1, and their upper ends sprung under the projections 18 on the sides 4. V strips 15 of lengths suited to different lengths of sheets can readily be put in place in the box. By reason of the inclined V strips, the sheet finds a central position endwise as it is pressed into the box.

Alternatively, the glass may be fixed centrally in a frame adapted to fit inside the box, and the frame with the glass inserted into the molten metal in the box.

Alternatively, the glass may be suspended in the molten metal from below by any suitable suspension device attached to the bottom of the box, such, for instance, as the hooks commonly employed for suspending glass sheets in air for tempering. This device is shown in Figure 3, in which the tongs 19 are attached to the brackets 20 on the bottom strip 1. Above the usual points 21, for gripping the glass, the tong arms 22 are splayed outwards, so that the glass sheet opens them when pushed downwards into the molten metal. Since the specific gravity of a fusible alloy is about 10, the tongs, made of steel will hang upwardly and so will automatically close on the glass, just as they do when hanging downwardly in air.

The box, suspended by rods 23 from a bar 24 is lowered by any convenient lifting and transporting means into the furnace 25, which is sunk below the floor level. The molten bath and the glass within the box is then heated to a temperature near the softening point of the glass. After heating, the box is lifted out of the furnace and brought into the cooling device consisting of a pair of grids composed of pipes 26 fed with water through the pipe 27, adapted to spray water on the sides of the box.

The furnace need not necessarily be of the type hitherto used in tempering glass, which is especially designed to heat the glass uniformly, but may be a more economical furnace, such as

a gas fired furnace, since the heat applied to the outer surface of the box tends to be uniformly distributed over the glass sheet, by reason both of conduction in the metal and convection currents in the molten metal.

Further, uniformity in cooling is not so essential as in the case of cooling applied directly to the surface of the glass, and the cooling may be applied by dipping the box into water. The cooling is stopped before the temperature of the box has reached the solidifying point of the molten metal, and the glass sheet is then removed from the still molten metal.

When the means employed for cooling are such that the edges of the box are cooled equally with the sides, as in cooling by immersion in water, the edges are preferably bowed out at the corners as shown in Figure 2 so as to provide a larger amount of molten metal round the corners of the sheet and thus prevent excessive cooling from the edges of the box.

To avoid injury to the surface of the glass by the molten metal, the glass may be covered with a layer of protective material, as for instance, by smoking it, before inserting it into the metal.

Having described my invention, I declare that what I claim is:

1. The method of tempering glass which comprises immersing a glass article in a molten metallic bath having a melting point below the strain point of said glass, thereafter heating the bath and the glass article to a temperature near the softening point of the glass and subsequently chilling the glass article to a temperature below the strain point of said glass.

2. The method of tempering glass which comprises immersing a glass article in a molten metallic bath having a melting point below the strain point of said glass, thereafter heating the bath and the glass article to a temperature near the softening point of the glass and subsequently chilling the bath with the immersed glass article to a temperature below the strain point of the glass and above the melting point of the metal.

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