Sept. 6, 1927. 1,641,883

E. T. FERNGREN

PROCESS AND APPARATUS FOR DRAWING SHEET GLASS

Filed Jan. 22, 1926

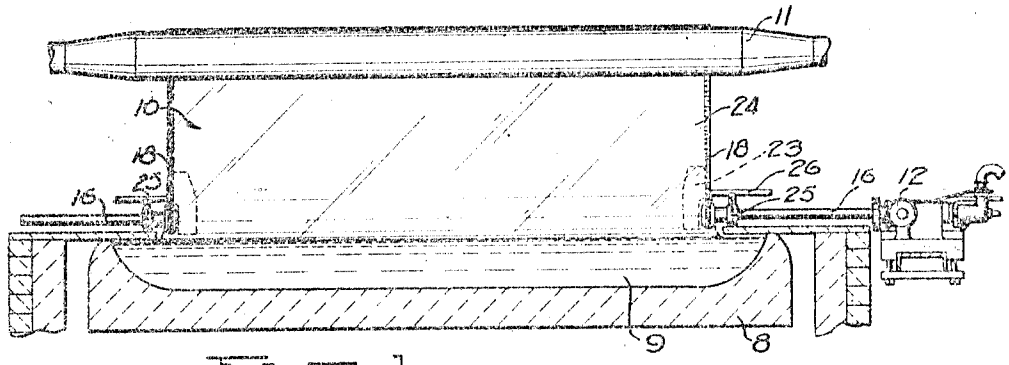


Fig. 1.

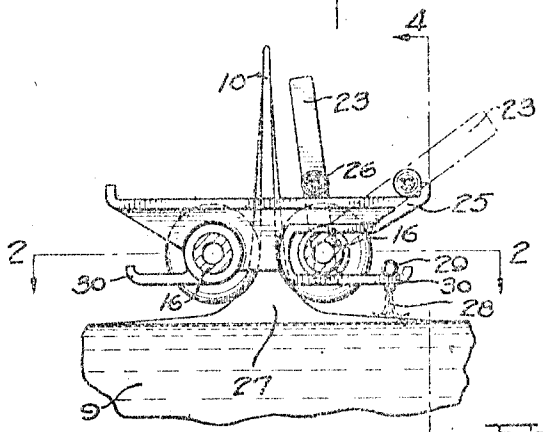


Fig. 3.

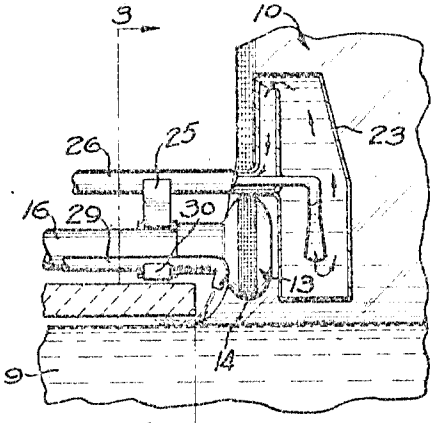


Fig. 4.

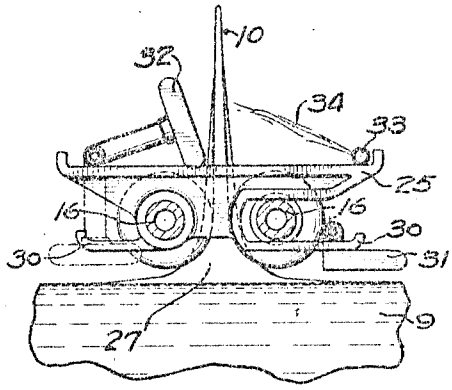


Fig. 5.

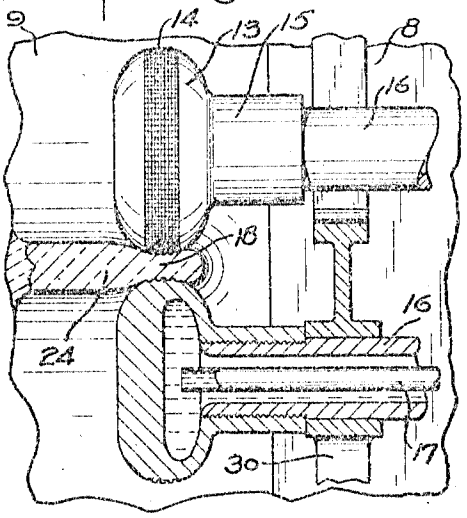


Fig. 2.

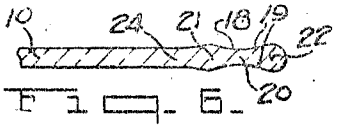


Fig. 6.

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1,641,883

UNITED STATES PATENT OFFICE.

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PROCESS AND APPARATUS FOR DRAWING SHEET GLASS.

Application filed January 22, 1926. Serial No. 82,804.

The present invention relates to sheet glass drawing apparatus, and has particular reference to an improved form of sheet width maintaining device.

An important object of the present invention is to provide a sheet glass drawing apparatus with means for holding the glass sheet to width.

Another object of the invention is to provide a sheet glass drawing apparatus with means for forming border portions along the edges of a continuously drawn sheet of glass which will eliminate the tendency of glass breakage during the annealing thereof.

A further object of the invention is to reduce the waste ordinarily formed at the sheet edges or borders of a continuously drawn sheet of glass.

Further objects and advantages of the invention will become apparent during the course of the following description.

In the drawings wherein like numerals are employed to designate like parts throughout the same,

Fig. 1 is a transverse vertical section through a sheet glass drawing apparatus, showing the improved width maintaining device in elevation,

Fig. 2 is an enlarged plan view of the improved device,

Fig. 3 is a sectional end elevation of the device, taken on line 3—3 in Fig. 4,

Fig. 4 is a view taken substantially on line 4—4 in Fig. 3,

Fig. 5 is a sectional end elevation of a modified form of the present invention, and

Fig. 6 is substantially a full size section of the sheet border or edge which is produced by the present form of width maintaining device.

In drawing a sheet of glass vertically from a mass of molten glass, there is a tendency upon the part of the sheet to narrow, and unless means are provided to overcome such a tendency the sheet will soon pull to a string or thread at the source thereof. Such means are set forth in the patent to Colburn 1,248,809, granted December 4, 1917, which consists of a pair of suitably rotating knurled rolls, engaging the sheet edges at the source thereof, and which have proved commercially successful. After the sheet has been formed and annealed, the edges formed by the knurled rolls are cut off and later used for cullet. It is an improvement on such a width maintaining device as disclosed by the Colburn patent to which the present invention refers.

In the drawings the numeral 8 refers to a draw pot supplied with molten glass 9, from which the glass sheet 10 is vertically drawn, and then bent into the horizontal over the bending roll 11, more fully disclosed in the patent to Colburn above referred to. The numeral 12 refers to substantially the same drive, drive connections and supporting means for the improved width maintaining rolls 13 as employed in the Colburn patent, so it is not deemed necessary to further describe the same here as the details thereof do not form a part of the present invention.

It is to be understood that the improved form of width maintaining device is not limited to the well-known Colburn process of drawing sheet glass, but may be used in connection with most any sheet glass drawing process. The rolls 13 are substantially in the form of oblate spheroids having knurled portions 14. Attached to one face of the rolls is a shank 15 into which an end of the drive and supporting shaft 16 is screw-threadedly mounted. A cooling fluid is circulated through the shafts 16 and rolls 14 by means of pipes 17 in order to prevent the rolls and shafts from oxidizing, and also to suitably chill the sheet edges passing between said rolls.

The rolls 13 grip the least possible surface area of the border portion 18 of the sheet by the knurled portions 14 forming arcuate impressions 19 therein. The border 18 of the sheet being gripped in this manner at its source will have a portion 20 of slightly reduced cross sectional area (which is gripped by the knurling on the rolls), bounded on each side thereof by relatively thick or beaded portions 21 and 22, similar to the illustration shown in Fig. 6.

A cooler or heat absorbing member 23 is used in connection with the edge gripping rolls 13 to localize the cooling of the glass 24 immediately adjacent the beaded portion 18. The cooler may be pivotally supported on a suitable bracket 25 pivotally mounted upon the roll shafts 16. The cooling intensity upon the glass being treated may be controlled by positioning the cooler 23 on

either side of and at varying distances from the sheet and swung at any desired angle. A cooling medium is preferably circulated through the cooler substantially in the direction indicated by the arrows and passes out through the hollow supporting member 26. The purpose of this cooler is to give the desired rigidity and thickness to the glass 24 adjacent the sheet borders 18, and to confine or localize its cooling effect on only that portion of glass coming directly under its influence.

An advantage of this particular type of edge rolls 13 is that they substantially conform to the natural curvature of the glass supply 27 at the source of the sheet, and in so doing the cooling influence on the sheet borders 18 is brought to bear thereon gradually and at a point beginning almost at the base of the glass supply 27.

The supply of the glass flowing into the borders of the sheet at its source may be pretreated on either side by impinging a jet of air or gas flame 28 thereon from the member 29 as the occasion so requires. The member 29 may be pivotally and slidably associated with either arm 30 of the bracket 25.

It is believed that by employing the combined use of the rolls 13 suitably supported and rotated, and the coolers 23, it will be possible to hold the continuously drawn sheet of glass to width with the least possible waste occurring at the borders thereof, that is, this particular type of roll having a relatively small actual gripping surface, but sufficient however to prevent glass from slipping out from between the pairs of coacting rolls and the ends or faces thereof having a curvature which will prevent their gouging into the glass supply 27; and the cooler, functioning to give the required rigidity to the glass 24 adjacent the glass portion 18 to prevent the narrowing tendency of the sheet 10 after leaving the influence of the gripping rolls 13, will present an ideal apparatus for holding the sheet to width and for forming suitable edges or borders on the sheet.

A sheet border, having a form substantially as described and illustrated in Fig. 6, will be less apt to break when being annealed than the ordinary type of edge, for the reason that the two thicker portions or beads 21 and 22 will retain more heat and will therefore be more pliant (particularly the bead 21) than other portions of the sheet or sheet borders. It is believed that these beaded portions, by being more pliant, will yield when a sudden stress is set up in the sheet, particularly in the thinner portion 20 of the sheet borders, and thus avoid breakage.

The modification shown in Fig. 5 covers the use of additional coolers or heat absorbing members 31 and 32, pivotally supported upon the bracket 25. The coolers are adjusted both transversely of and at varying distances from the sheet of glass. It is often found while drawing a continuous sheet of glass that, what is known in the art as "hot streaks" appear, which cause irregularities to form upon the surface of the glass thus drawn. It is the purpose of these coolers when concentrated upon a so-called hot streak to reduce the temperature thereof to normal. The adjustments of the coolers are such that a hot streak in the glass may be treated before entering, or after having passed into the glass sheet. In order to control the temperature of the glass in the sheet borders, an adjustable member 33, supported on the bracket 25, is employed. This member is so provided that it may be possible to impinge a jet of air or a gas flame 34 upon any point along the borders of the sheet which may be found necessary to treat.

It is to be understood that the form of the invention herewith shown and described is to be taken as the preferred embodiment of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Claims:

1. In a sheet glass drawing apparatus, including means containing molten glass, means for drawing a sheet of glass therefrom, and rolls having substantially the form of an oblate spheroid, engageable with the sheet edges.

2. In a sheet glass drawing apparatus, including means containing molten glass, means for drawing a sheet of glass therefrom, and a sheet edge forming means including a heat absorbing member and a rotatable roll, said roll having substantially the form of an oblate spheroid.

3. In sheet glass apparatus, means for drawing a sheet from a source of molten glass and width maintaining means at the edges of said sheet, including a heat absorbing member and a knurled rotatable roll, said roll having substantially the form of an oblate spheroid.

4. A sheet glass width maintaining device of the class described, including a roll having substantially the form of an oblate spheroid.

5. A sheet glass width maintaining device of the class described, including rolls having substantially an oblate spheroidal form, and a cooling means cooperating with said rolls.

6. A sheet glass width maintaining device of the class described, including a rotatable roll having substantially an oblate spheroidal form.

7. In a sheet glass drawing apparatus, means containing a mass of molten glass, means for drawing a sheet of glass there-

from, substantially spheroidically shaped rotatable rolls engageable with the edges of said sheet, and cooling means cooperating with said rolls adapted for localized cooling of the glass immediately adjacent said sheet edges.

8. In a sheet glass drawing apparatus, means containing a mass of molten glass, means for drawing a sheet of glass therefrom, means for forming a double bead on the sheet edges, and means adapted for localized cooling of the glass adjacent the sheet edges after being thus formed.

9. In a sheet glass width maintaining device, a roll having substantially the form of an oblate spheroid, and means carried by one face thereof for supporting and permitting rotation of said roll.

10. In a sheet glass width maintaining device, a roll having substantially an oblate spheroidal form, a portion of the surface thereof being knurled.

11. In a sheet glass width maintaining device, a rotatable roll having substantially an oblate spheroidal configuration, the rotation of said roll being about its minor axis.

12. In a sheet glass width maintaining device, a rotatable roll having substantially an oblate spheroidal configuration, and the surface thereof being knurled between its flattened faces.

13. In a sheet glass width maintaining device, a rotatable roll having substantially an oblate spheroidal form, the surface thereof described by its greatest circumference being knurled.

14. In a sheet glass width maintaining device, a roll having substantially an oblate spheroidal form, a portion of the surface thereof between its flattened faces being knurled, and said roll rotatable about its minor axis.

15. In a sheet glass width maintaining device, a rotatable roll having substantially an oblate spheroidal form, and a knurled zone bisected by the rolls equator, said roll rotating about its minor axis.

16. The combination with a sheet glass drawing apparatus and rotatable sheet edge gripping rolls of an adjustable cooling means for localizing the effect thereof upon the glass immediately adjacent the sheet edges and means for adjusting the said cooling means independently of said edge gripping rolls.

17. The combination with a sheet glass drawing apparatus and sheet edge gripping device, of an adjustable means for cooling either side of the sheet and which localizes said cooling upon the sheet immediately adjacent the edges thereof.

18. In a sheet glass drawing apparatus, means containing a mass of molten glass, means for drawing a sheet of glass therefrom, and a pair of rolls having substantially the form of oblate spheroids engaging the sheet edges.

19. In a sheet glass width maintaining device, including a heat absorbing member, a plurality of cooperating knurled rolls having substantially the form of oblate spheroids, and means for positively driving said rolls.

20. The process of reducing breakage in the edges of a continuously drawn sheet of glass, consisting in forming two parallel beads in the sheet edges, by chilling the glass formed on each side of the knurled gripped portion of glass in said sheet edges.

21. The process of preventing breakage of a flat drawn sheet of glass in a leer, consisting in retaining more heat and giving more plasticity to the border glass by forming two parallel thickened portions at each edge of the sheet.

Signed at Toledo, in the county of Lucas, and State of Ohio, this 19th day of January, 1926.

ENOCH T. FERNGREN.