

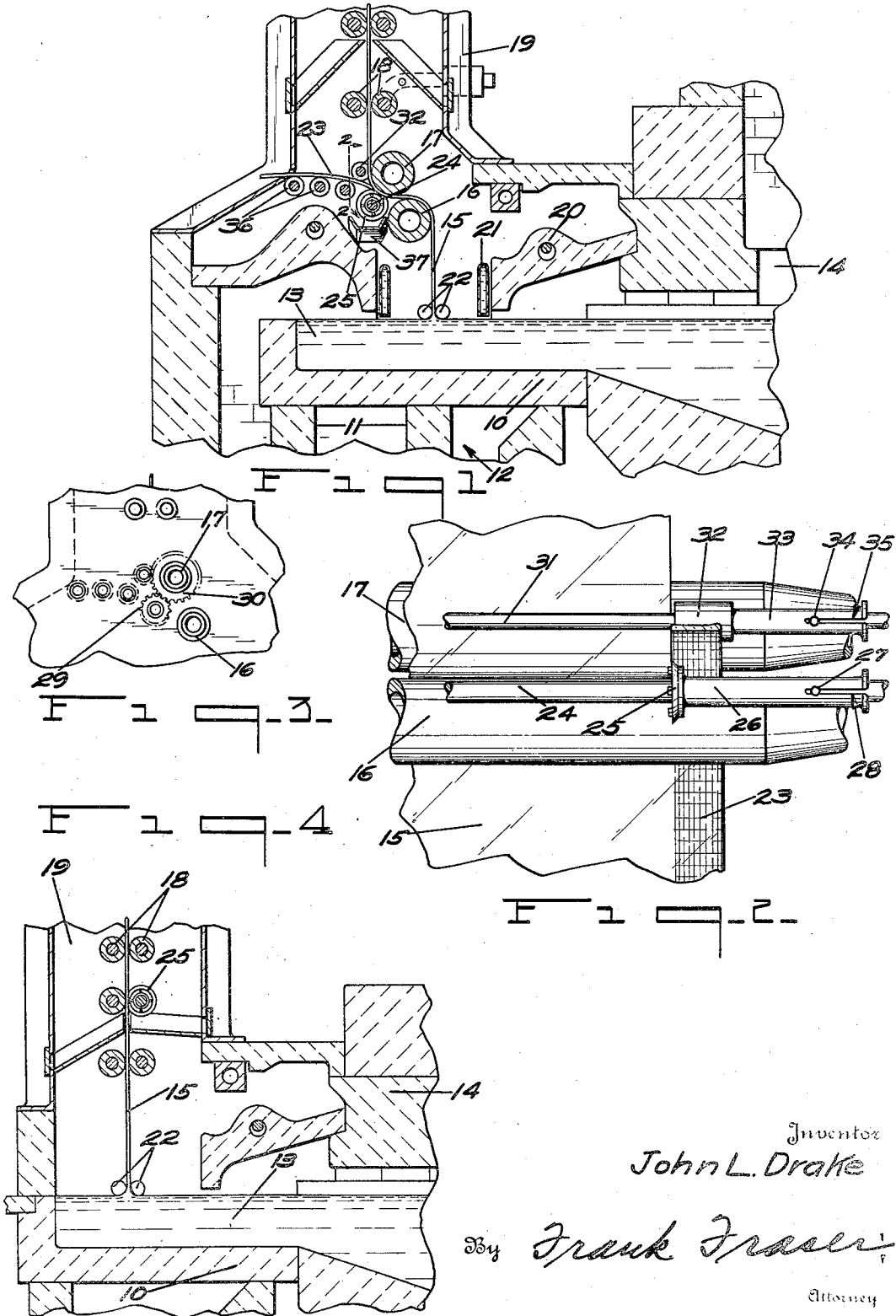
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METHOD AND APPARATUS FOR DRAWING SHEET GLASS

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METHOD AND APPARATUS FOR DRAWING SHEET GLASS

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This invention relates to the art of drawing sheet glass.

In this art, glass drawn in sheet form presents edges and it is necessary to trim them off. This necessity for trimming may arise from several causes, such as the fact that the edge portions do not form a straight line; that the sheet is of irregular thickness at the edge portions; or that the surface of the edge portions has been marred in the act of drawing the sheet, this latter marring effect being particularly noticeable when the sheet is drawn by an apparatus such as disclosed in United States Patent No. 970,182, dated Sept. 13, 1910, in which the edges of the sheet are engaged by oppositely disposed rolls to assist in the drawing operation. Heretofore, this trimming off of the edges of the drawn sheet has been performed as the said sheet has been delivered from the machine onto a cutting table. However, due to the differences in thickness and temperature between the edge portions and main body of the sheet, together with the unevenness of the said edge portions, it has been found that better annealing can be achieved if the edge portions are trimmed from the main body of the sheet prior to or at the beginning of the annealing operation. The retaining of these edge portions on the sheet during the annealing thereof causes irregular and ununiform contraction and expansion of said sheet, sometimes resulting in breakage.

It is, therefore, an important object of the present invention to provide in connection with sheet glass drawing apparatus, means for automatically trimming off the edges of the sheet prior to the beginning of the annealing operation, to the end that better annealing of said sheet might be obtained and the said sheet delivered from the machine onto the cutting table with the edge portions thereof removed.

Another object of the invention is to provide in combination with sheet glass drawing apparatus, means for automatically removing the edge portions from the sheet prior to the annealing thereof and while the same is still in a semi-plastic condition although substantially set in its final sheet form.

A further object of the invention is to provide in combination with sheet glass drawing apparatus, means for automatically cutting the edge portions from the sheet during the drawing operation together with means for deflecting the cut edge portions out of the path followed by the body of the sheet, to the end that the main body of said sheet only will be passed through the annealing chamber.

Other objects and advantages of the invention will become more apparent during the course of the following description when taken in connection with the accompanying drawings.

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

Fig. 1 is a vertical longitudinal section through improved sheet glass apparatus constructed in accordance with the present invention;

Fig. 2 is a section taken substantially on line 2—2 of Fig. 1;

Fig. 3 is a detail elevation, and

Fig. 4 is a longitudinal vertical section showing a somewhat modified form of the present invention.

Referring now to the drawings and more particularly to Figs. 1 to 3 inclusive, the numeral 10 designates a receptacle or draw pot supported upon stools 11 arranged within a heating chamber 12 and containing a mass of molten glass 13. This molten glass is adapted to be continuously supplied to the draw pot 10 from a suitable tank furnace 14.

A sheet of glass 15 is adapted to be continuously drawn upwardly from the surface of the molten glass 13 in draw pot 10, and at a substantial distance from its source, the said sheet, while still in a semi-plastic condition although substantially set in its final sheet form, is deflected into the horizontal plane about a suitable rotatable bending member or roll 16. The sheet is then again deflected from the horizontal into the vertical plane about a second rotatable bending member or roll 17, and subsequently carried upwardly by and between a plurality of pairs of rolls 18 through an annealing chamber or leer 19 where it is gradually reduced to room tem-

perature as is well known in the art, after which the said sheet can be cut into sheet lengths of desired sizes.

As more fully described and claimed in my copending application filed Dec. 6, 1926, Serial No. 152,761, the sheet 15 is adapted to be drawn upwardly from the surface of the molten glass 13 by the tractive pull exerted thereon by the rotatable member or roll 16, while the rotatable member or roll 17 functions to create a snubbing action on the sheet as it is deflected about the same from the horizontal into the vertical and serves to relieve the drawing tension or stress therefrom. The rollers 18 exert only a sufficient amount of tension on said sheet necessary to carry it upwardly and prevent sagging thereof.

Arranged above the receptacle 10 at opposite sides of the sheet 15 are cover or lip tiles 20 which tend to force any heat currents present at that point downwardly towards the surface of the molten glass 13. Also positioned at opposite sides of the sheet and immediately adjacent the surface of the molten glass 13 are coolers or shields 21 which serve to protect the sheet from heated air currents and at the same time aid in absorbing sufficient heat from the molten glass passing thereunder to give it the proper viscosity to permit it to be drawn away in sheet form. Means 22, preferably though not necessarily in the form of knurled rollers, are arranged at each edge of the sheet and closely adjacent the base or meniscus thereof to maintain the sheet to width, and by referring to Fig. 2, it will be seen that these knurled rollers form roughened or knurled edges 23 on said sheet. The present invention consists essentially in the provision of means for automatically removing these marred edge portions from the sheet prior to the annealing thereof. It is to be understood, however, that the present invention is not limited for use only in connection with the particular type of drawing apparatus disclosed, as this apparatus has been shown merely for the purpose of illustration and the invention is capable of application in connection with various forms of sheet glass drawing mechanism.

In accordance with the present invention, there is provided a shaft 24 which extends parallel with the rolls 16 and 17 and carries the cutters 25, one being arranged adjacent each edge of the sheet. These cutters are mounted upon sleeves 26 slidable on the shaft 24, a securing bolt 27 carried by said shaft being received within a slot 28 formed in each sleeve. Thus, in order to adjust the cutters 25 longitudinally upon the shaft 24, it is simply necessary to first loosen the securing bolts 27, slide the sleeves carrying the cutters in the desired direction and subsequently tighten said bolts.

While, in the drawings, the cutters 25 are positioned so that they will engage the sheet

15 as it is being deflected about the roll 17 from the horizontal into the vertical plane, it will be apparent that the position of said cutters may be varied without departing from or sacrificing the spirit of the invention. Keyed to the shaft 24 is a gear 29 meshing with and driven from a gear 30 keyed to roll 17. The gear 29 is preferably somewhat smaller than the gear 30 so that the cutters 25 will be rotated at a relatively greater peripheral speed than that of the roll 17 and linear movement of the sheet 15.

The present invention also embodies means for deflecting the cut edge portions 23 out of the path followed by the balance of the sheet in order that the main body of the sheet only will be carried upwardly through the annealing chamber or leer 19. In order that this might be accomplished, there is provided a second shaft 31 extending parallel with and positioned above the shaft 24. Carried by this shaft adjacent the opposite edges of the sheet are rollers 32 mounted upon sleeves 33 which are also slidable on the shaft 31, a bolt 34 carried by said shaft operating in a longitudinal slot 35 formed in each sleeve so that proper adjustments of said rollers may be effected to correspond with the adjustments of the cutters. After the edges 23 are cut from the sheet by the action of the rotatable cutters 25 engaging therewith, they are directed beneath the rollers 32 and carried exteriorly of the machine by and upon a plurality of rollers 36.

An inclined trough or chute 37 positioned beneath the cutters 25 is provided for catching and conveying exteriorly of the machine any glass which might break off from the sheet so that the glass is thus prevented from falling back into the molten glass 13 in draw pot 10. Inasmuch as the edges formed by the width maintaining means 22 are removed from the sheet at the beginning of the annealing operation, the main body of the sheet only will be passed through the annealing leer 19 with the result that the danger of ununiform contraction and expansion of the sheet, heretofore caused by the said edge portions, together with the resultant breakage, will be reduced to a minimum.

In Fig. 4, wherein has been shown a somewhat modified form of the present invention, the sheet 15 is drawn vertically from the surface of the molten glass 13 by a plurality of pairs of rolls 18 and carried upwardly through the annealing chamber or leer 19, the sheet, at no time, being deflected into the horizontal plane. The cutters 25 are substituted for one of the rollers 18 at the lower end of the leer 19 so that the edges will be trimmed from the sheet as the same is traveling vertically and at the beginning of the annealing operation. Also, it will be noted that the cut edges are not deflected out of the path traveled by the sheet, but instead are carried

along with the sheet through the annealing chamber or leer 19.

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 sheet glass apparatus, means for drawing a sheet from a mass of molten glass, means for trimming the edges from said sheet while the same is in a semi-plastic condition, means for carrying the sheet vertically, means for deflecting the cut edges out of the path followed by said sheet, means for adjusting the trimming means transversely of said sheet, and means for adjusting said deflecting means to correspond with the adjustments of said trimming means.

2. In sheet glass apparatus, rotatable means for trimming off the edge portions of a moving sheet as it is being deflected from one plane into another.

3. In sheet glass apparatus, rotatable means for trimming off the edge portions of a moving sheet as it is being deflected from one plane into another, and means for carrying said sheet vertically after said edge portions have been removed.

4. In sheet glass apparatus, rotatable means for cutting the edges from a moving sheet as it is being deflected from one plane to another, and means for deflecting the cut edges out of the path followed by said sheet.

5. In sheet glass apparatus, rotatable means for cutting the edges from a moving sheet as it is being deflected from one plane to another, means for deflecting the cut edges out of the path followed by said sheet, means for adjusting said rotatable cutting means transversely of said sheet, and means for adjusting said deflecting means to correspond with the adjustments of the cutting means.

6. In sheet glass apparatus, rotatable means for trimming off the edge portions of a moving sheet as it is being deflected from one plane into another, means for carrying said sheet vertically, and rollers for deflecting the cut edges out of the path followed by said sheet.

7. In sheet glass apparatus, means for cutting the edges from a moving sheet as it is being deflected from one plane to another, means for deflecting said edges out of the path traveled by said sheet, an annealing leer, and means for carrying said sheet vertically through said leer.

8. In sheet glass apparatus, means for drawing a sheet from a mass of molten glass, means for deflecting said sheet from one plane to another, and means for trimming

off the edges of said sheet as it is being thus deflected.

9. In sheet glass apparatus, means for drawing a sheet from a mass of molten glass, means for deflecting said sheet from one plane into another, means for trimming the edge portions from said sheet as it is being thus deflected, an annealing leer, and means for carrying said sheet vertically through said leer.

10. In sheet glass apparatus, rotatable means engaging a moving sheet of glass being deflected from one plane to another and driven at a peripheral speed relatively faster than the linear movement of said sheet to remove the edges therefrom.

11. In sheet glass apparatus, rotatable means for trimming the edge portions from a moving sheet as it is being deflected from one plane to another, rollers for carrying said sheet vertically, and rollers for carrying the cut edges horizontally.

12. The method which consists in drawing a sheet from a mass of molten glass, bending said sheet from one plane to another, trimming the edges from said sheet during the bending thereof, and then annealing said sheet.

13. The method which consists in drawing a sheet from a mass of molten glass, bending said sheet from one plane to another, trimming the edges from said sheet during the bending thereof, and then annealing said sheet while carrying the same vertically through an annealing leer.

14. The method which consists in drawing a sheet from a mass of molten glass, bending said sheet from one plane to another, trimming the edges from said sheet during the bending thereof, deflecting the cut edges out of the path followed by said sheet, and then annealing said sheet while traveling vertically.

15. In sheet glass apparatus, means for completely severing and separating the edge portions from a moving sheet as it is being deflected from one plane to another.

16. The method which consists in forming a continuous sheet from a mass of molten glass, bending the sheet from one plane to another, completely severing and separating the edge portions from the sheet during the bending thereof, and then annealing said sheet.

Signed at Toledo, in the county of Lucas and State of Ohio, this 19th day of February, 1927.

JOHN L. DRAKE.