April 12, 1932. E. W. PAXTON ET AL 1,853,879

INSULATED LEER ROLLER

Filed March 8, 1930

Fig. 1.

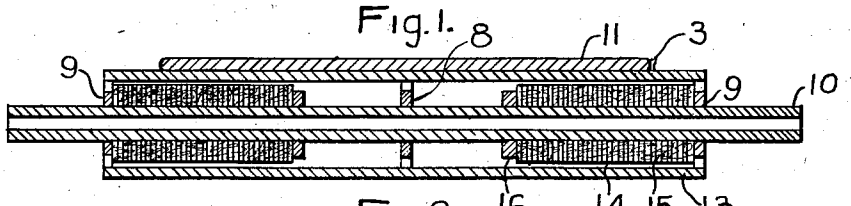


Fig. 2.

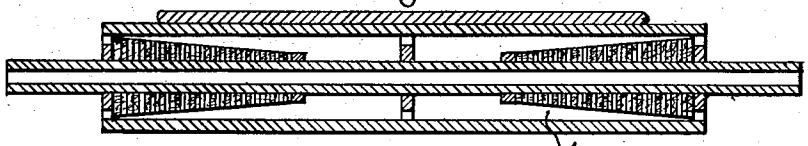


Fig. 3.

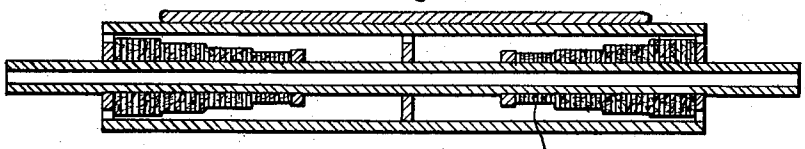


Fig. 4.

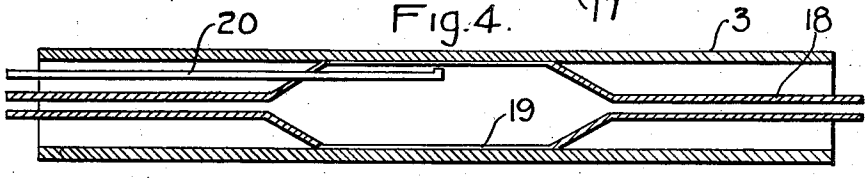


Fig. 5.

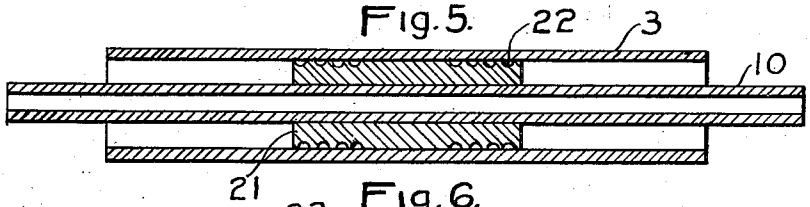


Fig. 6.

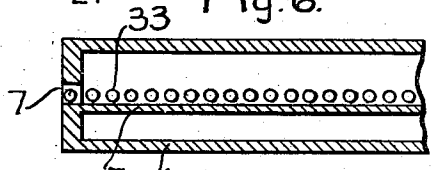
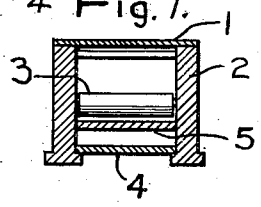


Fig. 7.



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UNITED STATES PATENT OFFICE

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INSULATED LEER ROLLER

Application filed March 8, 1930. Serial No. 434,329.

This invention relates to improvements in supporting rolls for sheet glass in glass annealing leers and it is among the objects thereof to provide improved supporting rolls for sheet glass annealing leers which are adapted to keep the isothermal lines of the glass sheet substantially straight and at 90 degrees to the length of the sheet at all points in the leer, whereby the sheet glass is maintained in transverse thermal balance during the cooling or annealing period.

Another object of the invention is the provision of a roll structure adapted to control the heat losses in a manner to produce proper thermal conditions at the surface of the rolls which contact with the glass sheet.

Another object of the invention is the provision of roll structures and the application of cooling media thereto which shall provide positive means for controlling the heat losses from the hot sheet material supported thereby, and from the contacting portions of the rolls.

These and other objects will become more apparent from a consideration of the accompanying drawings in which like reference characters designate like parts and in which Fig. 1 is a cross sectional view of an improved form of roll for sheet glass annealing leers embodying the principles of this invention; Figs. 2 and 3 are similar views of modifications of the invention; Fig. 4 a cross sectional view of another type of roll designed to function in accordance with the stated objects of the invention; Fig. 5 a similar view of another modification of the roll; Fig. 6 a longitudinal sectional view of a portion of a glass annealing leer showing the customary arrangement of the glass supporting rolls; and Fig. 7 a cross sectional view partially in elevation of the leer structure shown in Fig. 6.

With reference to Figs. 6 and 7 of the drawings, 1 designates the roof or top wall of a glass annealing leer; 2 the side walls; 3 rolls which are preferably driven by suitable actuating mechanism; 4 designates the bottom wall of the leer and 5 designates the wall which cooperates with the bottom wall 4 to form a heating or cooling flue employed in controlling the temperature within the muffle or leer chamber.

In the operation of the leer, the sheet glass is entered at the passage 7 and is conveyed longitudinally of the leer by the rolls 3 on which the hot sheet glass is supported; and during its travel through the leer the sheet is subjected to the proper annealing or cooling temperatures until it finally is discharged from the leer in the proper annealed and cooled state.

In the application of a roll type of leer to the manufacture of continuous sheet glass, the sheet glass is conducted from the sheet forming pass of the forming rolls directly into the annealing leer and if the thermal conditions of the forming rolls are balanced, the glass will be of substantially uniform temperature transversely of its length.

It has been found that due to the construction of metal sheet supporting rolls with solid ends and shafts, as heretofore employed, it is difficult to maintain the sheet glass in transverse thermal balance during its passage through the leer, this being partially due to the large loss of heat from the axial sections of the supporting rolls. Since the rolls are essentially journalled at their respective ends, the easiest path of travel of heat from the rolls is by conduction through their ends, and on account of the relatively heavy journals, heat loss is greater at or near the ends of the rolls. For this reason it has been necessary in the prior art to supply additional heat in the annealing chambers toward the edges of the glass sheet in an effort to neutralize the loss of heat at these points.

This method has undesirable features such as difficulty of controlling the corrective heating; necessity of continual regulation; cost of fuel; additional length of leer necessary to properly dissipate the added heat, and the fact that its whole purpose has been corrective rather than preventive.

In accordance with the present invention, the proper thermal balance transverse of the sheet is maintained by the inherent structural characteristics of the supporting rolls and without the necessity of adding any heat to the leer adjacent the ends of the rolls, with its

attendant requirement of additional leer length to dissipate such added heat.

With reference to the drawings in Fig. 1, the roll 3 is shown as provided with a central spider 8 which is optional and for mechanical support only, and end spiders 9 which are formed integrally with or mounted on a hollow shaft 10. The spokes of the spiders are of minimum cross section and constitute relatively small heat conducting paths from the roll shells 3 that are in contact with the hot glass 11 which they support, to the roll shafts 10.

In accordance with the present invention, an insulating or baffle structure, generally designated at 13, is provided at the ends of the rolls 3 and is in spaced relation with the rolls as shown at 14. The baffle structure may consist of any suitable material of relatively low heat conducting qualities, as for example, asbestos, and this can most conveniently be provided in the form of a series of discs 15 which are arranged in the manner shown and held in their respective positions by an end collar 16.

With this arrangement, it will be seen that a relatively free heat radiating space is provided at the central portion of the rolls and the baffle structure 13 is effective in producing a muffle effect that sets up a heat lag which greatly impedes the heat radiation at the portions of the rolls adjacent the baffle member. Since, as previously explained, the loss of heat from the roll shell through conductivity to its shaft is reduced to a minimum, it remains only to offset or neutralize that minimum by utilization of available radiation and for this purpose the roll construction is specifically designed to provide for radiation from shell to shaft near the center of the roll structure.

By employing the hollow shafts 10, the temperature of the rolls may be further controlled by conducting a suitable cooling medium, such as air or water, through the hollow shafts. Since the maximum heat radiation from roll shell to shaft is effected at the central portion of the roll, as explained above, the corresponding portion of the hollow shaft will be the hottest and by setting up a forced circulation of cooling medium in the shaft the heat is removed from the shaft by conduction and convection and consequently from the roll shell by radiation and convection, at this central portion. By controlling the length of the baffle structure 15 in accordance with the physical dimensions and thermal properties of the roll, and the width and temperature of the sheet glass, a transverse thermal balance may be effectively produced or maintained in the sheet glass 11 throughout the annealing range of the leer.

In Figs. 2 and 3 are illustrated modifications of the form of baffle structure as shown in Fig. 1, for example, in Fig. 2 the asbestos sheet discs are of gradually decreasing diameter, thus forming a conical shaped baffle which increases the width of the space 14 so as to obtain a gradual increase of heat radiation towards the center of the roll. This is equally obtainable by a structure shown in Fig. 3 in which the air gap or space between the roll and baffle structures is varied by assembling a series of discs of different diameters to produce the steps or sections 17.

As shown in Fig. 4, the roll may be constructed without the use of baffles of the type described in connection with Figs. 1, 2 and 3, to bring about a maximum loss of heat at the central portion of the rolls. This may be effectively obtained by supporting the roll 3 on a hollow shaft 18 having an expanded central portion 19 which is in contact with the roll 3. Disposed in the roll is a conduit 20 leading to the expanded portion of the hollow shaft. This conduit functions to conduct a cooling medium to the interior of the roll which is passed out through the respective ends of the hollow shaft and maintains a cooling effect on the center portion of the roll structure similar to that obtainable by the provision of means for controlling and/or localizing the heat radiation as hereinbefore explained.

In the modification shown in Fig. 5, the roll 3 is provided with a hollow shaft 10 having a bushing 21 interposed between the roll and the shaft, which bushing is of substantial length and provides a maximum surface area of contact with the roll 3 to produce a maximum loss of heat through conduction at its central portion. The bushing 21 may be provided with grooves 22 of variable size, depth, and/or spacing, to reduce its conduction capacity near the ends thereof so that the loss of heat is gradually tapered off from the center in the direction of the ends of the roll.

It is apparent from the foregoing description of this invention that proper thermal balance may be obtained transversely of the sheet glass by controlling the loss of heat by means of suitable construction and design of the leer rolls, namely, by so constructing said rolls that their heat conducting and radiating properties are controlled. By the use of this invention, the annealed glass is of a more nearly uniform quality and free from strains and no applied heat is necessary to maintain the proper thermal conditions in the annealing leer during the critical or annealing range of the glass.

Although one embodiment of the invention has been herein illustrated and described, it will be obvious to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

We claim:

1. A roller for conveying sheet material

through an annealing chamber comprising a roll-shell, a shaft supported in said shell, connections for said shell and shaft which are adapted to minimize the loss of heat by conduction from the shell to said shaft and baffle means for effecting radiation of heat at the center of the roll-shell and for controlling the amount of heat radiation from shell to shaft through the length of the said shell.

2. Rollers for supporting sheet material in an annealing chamber, each comprising a roll-shell, a shaft for journalling said shell, means for supporting said roll-shell and shaft in radially spaced relation and insulating means disposed between said shaft and the said shell out of contact with the latter, and adjacent the end of the rolls to reduce the heat radiation losses from the roll shell to the shaft adjacent the ends of the roll-shells.

3. Rollers for supporting sheet material in an annealing chamber, each comprising a roll-shell, a shaft for journalling said shell, means for supporting said roll-shell and shaft in radially spaced relation, and insulating bushings disposed between said roll shell and shaft for reducing the heat radiation losses adjacent the ends of the roll.

4. On a roll structure for conveying sheet material through an annealing chamber, the combination with a roll shell of a supporting shaft therefor and means on said shaft and in spaced relation with said shell for controlling the loss of heat through conduction and heat radiation to obtain a thermal balance between the roll-shell and consequently in the sheet material supported thereon.

In testimony whereof we have hereunto set our hands this 30th day of January, 1930.

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