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W. K. KEARSLEY ET AL
METHOD OF MAKING GLASS RECEPTACLES

Filed Aug. 18, 1921

Fig. 1.

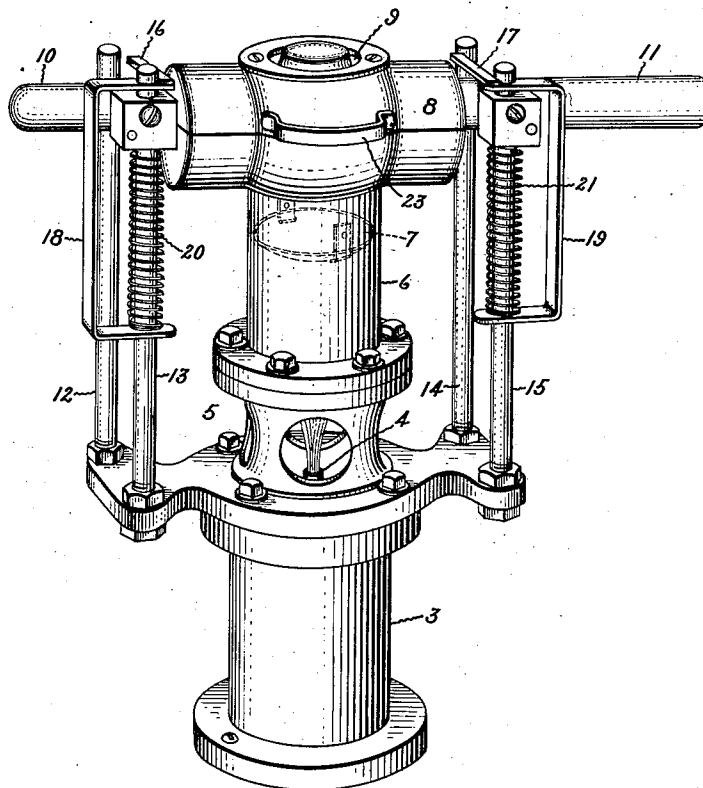
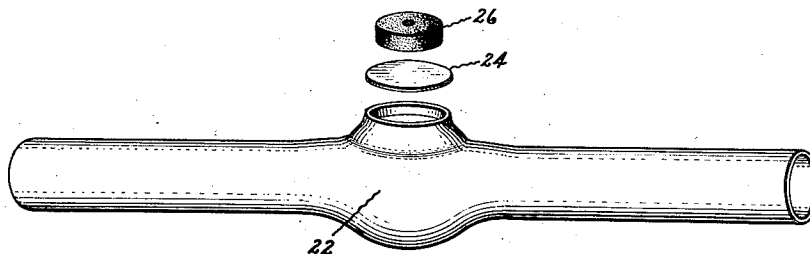


Fig. 2.



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UNITED STATES PATENT OFFICE.

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METHOD OF MAKING GLASS RECEPTACLES.

Application filed August 18, 1921. Serial No. 493,204.

To all whom it may concern:

Be it known that we, WILLIAM K. KEARSLEY, JR., and HENRY A. WAYWRINGER, citizens of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Methods of Making Glass Receptacles, of which the following is a specification.

10 This invention relates to a method of making glass receptacles provided with a window differing in thickness, composition, or other respects from the main receptacle, and specifically to the manufacture of X-ray tubes consisting of relatively thick lead glass and provided with a window of thinner lime glass.

When it is attempted to unite the edges of unlike glasses, such as the X-ray bulb and window as above noted, cracking of one or both of the glasses during the sealing operation is almost invariably encountered.

In accordance with our invention this cracking of the glass is obviated by gradually heating the glass receptacle in an enclosed space to a temperature just below the softening point of the glass, then placing the window also while heated in a desired position and applying heat locally at the region of contact to fuse the glasses to each other. Preparatory to making the seal by fusion, the regions to be joined to each other, of both the window and the main receptacle, are mechanically fitted by grinding, or otherwise, so as to come into intimate contact with each other.

The accompanying drawing shows in Fig. 1 in perspective an apparatus suitable for carrying out our invention in connection with the manufacture of X-ray tubes having a window; and Fig. 2 shows in perspective an X-ray tube and window together with a refractory shield which is useful for preventing overheating of the window as a whole during the manufacture of the seal.

The apparatus shown in Fig. 1 comprises the pedestal 3 through which projects a gas burner 4, or other suitable means for providing the necessary heat, and upon which is mounted a rotatable oven 5. This oven comprises a vertical shaft 6 containing a baffle 7, shown in dotted lines, for distributing the heat derived from the burner 4, and

a split housing 8 surrounding the X-ray tube or other receptacle. The apertured portion of the bulb with a window in place is shown projecting out of an opening 9 in the upper part of the housing 8. The arms 10, 11 of the X-ray tube rest upon holders (not shown) supported by the upright rods 12, 13 and 14, 15. The X-ray bulb can be firmly secured in position by cross rods 16, 17, which may be swung over and away from the X-ray tube by lifting the handles 18, 19 compressing the springs 20, 21.

When carrying out our invention, an X-ray tube such as shown at 22 in Fig. 2 consisting, for example, of lead glass and having a wall about $\frac{1}{8}$ to $\frac{1}{4}$ -in. in thickness is first preheated in a suitable heater by slowly increasing its temperature from room temperature to about 450° C. The split housing 8 is opened by the handle 23 and the X-ray bulb is placed upon the side supports, the bars 16, 17 having been removed out of the way. The cover of the housing is then placed upon the tube and the bars 16, 17 moved into the position shown in the drawing.

The temperature of the X-ray bulb within the housing 8 is increased to about 475° C. which is close to the softening point of lead glass. A lime glass window 24 having a thickness of 30 to 50 mils is preheated to a temperature of about 375° C. When the X-ray bulb is at a temperature of about 475° C. the heated window is placed upon the opening in the tube, and while the receptacle containing the X-ray tube is rotated, a pointed flame is applied to the contiguous edges of the bulb and the window which have previously been ground and polished, as above noted, to make a close contact. Preferably a preheated block 26 of refractory material, such as graphite, is placed upon the center of the window 24 leaving the edges of the window exposed, to prevent overheating of the central portion of the window during sealing operation.

When the glasses to be joined have been preheated in accordance with our invention the junction of the glasses may be readily joined by fusion, thereby making a seal which is as strong as any other part of the apparatus. It will be observed that by maintaining the temperature of the glass

below the softening point as herein set forth, distortion of the glass or change of the previously determined dimensions of the article is avoided.

5 What we claim as new and desire to secure by Letters Patent of the United States, is:—

1. The method of sealing a glass window into an opening in a glass receptacle which
10 consists in grinding and polishing said members to make a close fit at the regions to be joined, heating said receptacle in an enclosed space to a temperature slightly below the softening temperature, placing
15 said window while heated in a desired position with respect to said receptacle and applying at the regions to be united a temperature high enough to fuse said glass.

2. The method of joining a glass plate to
20 an opening in a glass wall which consists in fitting the surfaces to be joined into close contact with each other, heating said parts in an enclosed space to a temperature adjacent to but below the softening point and
25 heating the glass adjacent the surfaces to be joined while said surfaces are in contact with each other.

3. The process of joining together glass surfaces by local fusion without distorting
30 the main body of the glass, which consists in grinding or polishing the surfaces to be joined, maintaining the article at a temperature sufficiently high to prevent cracking, and applying a fusing heat at the point
35 at which the welding is to take place while maintaining the main body of the glass at a temperature sufficiently low to prevent distortion.

4. The process of joining together glass
40 surfaces by local fusion without distorting the main body of the glass which consists in forming two pieces of glass of the exact dimensions required in the finished product, maintaining the body of the article
45 at a temperature sufficiently high to prevent cracking, and applying a fusing heat at the point at which welding is to take place while maintaining the main body of the glass at a temperature sufficiently
50 low to prevent distortion or change of the previously determined dimensions of the article.

5. The process of joining together glass articles without distortion which consists in
55 mechanically fitting said articles at the re-

gions to be joined, heating the articles in an enclosed space to a temperature sufficiently high to prevent cracking, but below a temperature at which distortion may occur, and applying a localized fusing heat
60 at the points at which welding is desired while said articles remain in said space.

6. The method of sealing a glass window into an opening in a glass receptacle which
65 consists in mechanically fitting said articles by grinding at the regions to be joined, heating the receptacle in an enclosed space to a temperature sufficiently high to prevent cracking but below the softening temperature thereof, preheating said window,
70 placing it in desired position on said receptacle, and applying a localized fusing heat at the points at which sealing is desired while said articles remain in said enclosed
75 space.

7. The method of sealing a window of lime glass into a receptacle of lead glass which consists in mechanically fitting said articles at the regions to be joined, heating
80 said receptacle in an enclosed space to a temperature of about 475° C. preheating said window to about 375° C., placing the window in desired position on said housing and applying a localized fusing heat at the
85 edges of said window.

8. The process of sealing a glass member to a second glass member without distortion which consists in mechanically fitting
90 said members, heating the same in an enclosed space sufficiently high to prevent cracking but below a temperature of distortion and applying a fusing heat at points where sealing is desired while shielding
95 other portions to prevent overheating thereof.

9. The process of sealing a glass member to a second glass member without distortion which consists in mechanically fitting said
100 members, heating the same in an enclosed space sufficiently high to prevent cracking but below a temperature of distortion and applying a fusing heat at points where sealing is desired while shielding the central
105 portion of said window to prevent overheating thereof.

In witness whereof, we have hereunto set our hands this 17th day of August, 1921.

WILLIAM K. KEARSLEY, Jr.
HENRY A. WAYWRINGER.