July 21, 1931. B. J. BABBITT 1,815,695

METHOD OF AND MATERIAL FOR SEALING CONTAINERS

Filed Oct. 31, 1928

Fig. 1.

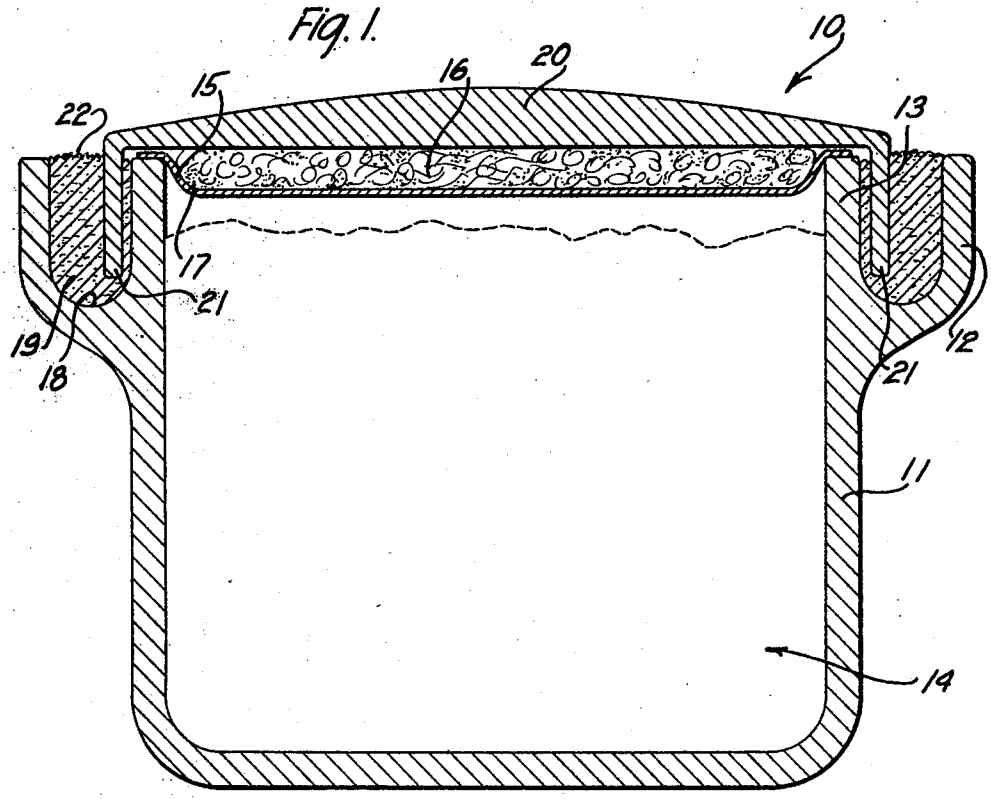
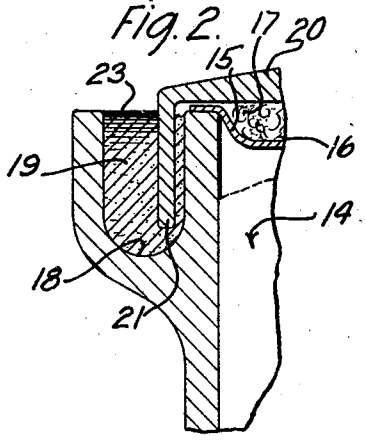


Fig. 2.



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UNITED STATES PATENT OFFICE

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METHOD OF AND MATERIAL FOR SEALING CONTAINERS

Application filed October 31, 1928. Serial No. 316,146.

This invention relates to the heat treating of articles and more particularly to the annealing of metal articles.

In the heat treating of iron articles it has been customary to store the articles in a container having a closely fitting lid. In order to secure the desired atmospheric conditions within the container, it has been the practice in some instances to seal the joints of the lid and container with a packing material such as cupola loam. The loam being moist and more or less viscous, permits the escape of gases occasioned by the expansion of the air within the box due to increased temperature. In the concluding part of the process, the loam becomes quite hard due to the heat to which it is exposed and thus assists, upon cooling, in preventing the entrance of air to the interior of the box due to atmospheric pressure after the container is withdrawn from the furnace.

The object of the present invention is to provide an improved method of and material for securing desired atmospheric conditions within a container.

According to the features of the invention a mixture, preferably in powder form of approximately equal parts by weight of a penetrating material such as lead borate, and a crust forming material such as glass, is deposited upon the loam covering the joints of the container to permit the escape of the gases during the annealing operation and to prevent the entrance of air during the subsequent cooling of the parts.

It is believed the invention will be more clearly understood by reference to the accompanying drawings, in which

Fig. 1 represents a vertical section of a loaded annealing container prepared for heating, and

Fig. 2 represents a fragmentary vertical section showing the condition of the seal upon completion of the process.

In the drawings an annealing container generally denoted by the numeral 10 comprises a vertical wall 11, the upper portion of which consists of an upwardly projecting lip 12 and an inner portion 13. Suitably arranged within the container is a desired quantity of articles to be treated, generally denoted by the numeral 14. Resting upon the inner portions 13 is a tray 15 upon which is placed a suitable quantity of material 16 capable of absorbing a large portion of the oxygen remaining in the container after the oxygen content is materially reduced by heat expansion, and a suitable quantity of an easily oxidizable metal 17 capable of absorbing the oxygen content of the container at the higher temperatures attained in the process, preferably as described in the application of R. V. Wilson, for a method of heat treating metal parts, Serial No. 316,149, filed October 31, 1928. It should be understood, however, that the present invention is independent of the use of oxidizable metal or of other means for reducing the quantity of oxygen in the annealing container. A groove 18 comprising the area between the inner portions 13 and the upwardly projecting lip 12 is packed full with a packing material 19, preferably composed of moistened cupola loam. A lid 20 designed to cover the container, tray and contents and having a depending flange 21 is shown, the depending flange extending through the loam to the bottom of the groove 18. A suitable quantity of sealing mixture 22 is shown sprinkled on the loam around the circumference of the lid. After fusing, the sealing mixture assumes the condition shown in Fig. 2, and is denoted by the numeral 23.

For the purpose of clarity the sealing material constituting the features of applicant's invention will be described first, the steps of the method being described subsequently thereto.

It is well known that types of glass in commercial use fall into two broad classes, for general purposes being known as easily fusible types and highly refractory types. Experience has shown that in order to procure a glass which would be easily fusible, boron in some form must be added to the mixture. It is also known that the melting point of a glass in the highly refractory group may be lowered by the addition of a suitable quantity of boron to the other ingredients.

In compounding the sealing mixture, it has been found advantageous to use certain predetermined proportions of the various materials hereinafter specified, but it should be understood that those proportions are not fixed and that satisfactory results may be secured even though the proportions of the materials specified be considerably varied. Approximately 34 pounds of powdered boric acid is thoroughly mixed with 166 pounds of dry red lead in a ball mill. A frit furnace heated to a temperature of 1900° F. is placed over a pan of water to insure a suitable receptacle for the molten frit as it flows from the furnace. A portion of the mixed batch is then placed in the heated furnace and allowed to run out into the water as it melts. The frit (lead borate) is removed from the water and thoroughly dried at a temperature ranging from 250° to 300° F. Approximately 150 pounds of the dried lead borate is put through a ball mill and ground for about two hours and screened through a 60 mesh screen. Approximately 150 pounds of the ground lead borate, finer than 60 mesh, is placed in a ball mill with approximately 150 pounds of ground scrap glass which has also been screened through a 60 mesh screen and are mixed for about one hour. In the form thus produced the material constitutes a sealing mixture such as may be employed in carrying out the method described below.

It is preferred that the materials mentioned should be used, but it is obvious that other boron compounds appropriate for mixing with the red lead may be used, such as sodium tetra borate, colemanite, etc. Practically equivalent results may be obtained by using compounds other than red lead, such as the various lead oxides, barium, sodium and barium, etc., the important consideration being that a glass be produced which will be capable of fusing at a considerably lower temperature than those glasses in the highly refractory group. Likewise, although ground scrap glass seems to be preferable, other highly refractory substance such as porcelain, flint, silica, felspar, etc., may be used.

Although the above method of preparing the sealing mixture represents an economical and efficient means of producing the sealing material in the desired form, it should, nevertheless, be understood that it represents only one of a number of well known methods of accomplishing the desired results and the present invention is not to be limited by any of the steps indicated above.

In utilizing the material specified, a conventional annealing container is loaded with a desired quantity of articles to be annealed, and the groove 18, which extends completely around the container, is packed full with a cupola loam. The tray 15 is placed in the container in such manner that it rests upon the inner portions 13 of the side walls, and a desired quantity of oxygen-absorbing material is placed thereon. The lid 20 is placed over the container and pressed down, its depending flange 21 being forced downwardly into the groove. The excess loam which is thereby forced from the groove is removed and the upper surface of the loam is troweled with a suitable tool (not shown), in this way forming a seal which, at ordinary temperatures, would be air-tight. A desired quantity of the sealing mixture described above is sprinkled on the top surface of the loam around the circumference of the container. The container being now fully prepared, is placed in a furnace and subjected to the range of temperature customarily employed in an annealing process.

It is obvious that as the temperature of the container and contents is raised, the air within the container expands and is forced out through the loam which is still moist and somewhat viscous. As the temperature is steadily increased, the gases within the container expand and are continually forced out through the mud seal, which in a very short time loses its moisture content. Since the customary range of temperatures within the first portion of the annealing process, from 50° to 2000° F. is progressively scaled from low to high temperatures, it will be seen that the sealing mixture employed in no way hinders the escape of gases from the box, due to the fact that during the period of rise in temperature, when the gases are being forced out, the seal is either in a powdered or liquid state. As the temperature is increased to a point commensurate with the fusing point of the lead borate, that portion of the mixture fuses and the ground glass comprising the remainder of the mixture immediately goes into solution with the fused lead borate. The tendency of the fused lead borate to flow causes a distribution of the solution over the surface of the loam forming an intimate contact with the upper edge of the upwardly projecting lip 12 and the edge of the lid 18. The tendency of the fused lead borate to seep downwardly through the loam is counteracted at this stage by its being in solution with the still unfused ground glass. As the temperature is increased the viscosity of the sealing mixture is decreased proportionately, thus causing an even distribution of the material over the surface of the loam. At the higher temperatures in the range of the annealing process, the ground glass fuses and, having been previously in solution with the fused lead borate, forms a conglomerate molten mass which, as the temperature is increased still higher, becomes less viscous than formerly and seeps downward through the loam to a certain extent, until the freely flowing surplus has been absorbed by the packed loam. Upon the gradual lowering of the tempera-

ture of the container, the conglomerate seal formed on the surface of the loam cools and hardens and since, in its less viscous state, it has become evenly distributed over and through the upper surface of the loam, it forms a perfect seal upon hardening which is capable of resisting the tendency of air to flow into the container due to atmospheric pressure during the cooling step of the process.

Upon completion of the annealing the seal is broken in order to permit the removal of the lid. Owing to the fact that it is necessary to use a comparatively small amount of mixture over a given area, the breaking of the conglomerate seal may be accomplished with only a trifle greater effort than was formerly required to break the loam seal, both operations being easily accomplished manually by means of a trowel or similar tool.

The loam under the top crust provides a relatively soft support for the hard crust and it is therefore easily broken whereas if the mixture was used throughout instead of just on top, it would be extremely difficult to remove it.

What is claimed is:

1. A method of sealing heat treating containers which consists in applying a packing material to the apertures to be sealed, covering the packing material with a mixture of lead borate and a highly refractory glass, and fusing the mixture.

2. A method of sealing heat treating containers, which consists in applying a packing material to the apertures to be sealed, covering the packing material with a mixture of lead borate and a highly refractory glass which mixture upon fusing of the lead borate will form a viscous mixture supported by the packing material, and fusing the lead borate to form a solution supported by the packing material.

3. A method of sealing heat treating containers, which consists in applying a packing material to the apertures to be sealed, covering the packing material with a mixture of refractory glass and a flux therefor, and fusing the mixture to form a liquid supported by the packing material.

4. A method of sealing a heat treating container, which comprises applying cupola loam to the apertures to be sealed, covering the loam with a mixture of refractory glass and lead borate, and heating the container to fuse the mixture.

In witness whereof, I hereunto subscribe my name this 19th day of October, A. D. 1928.

BETHEL JAY BABBITT.