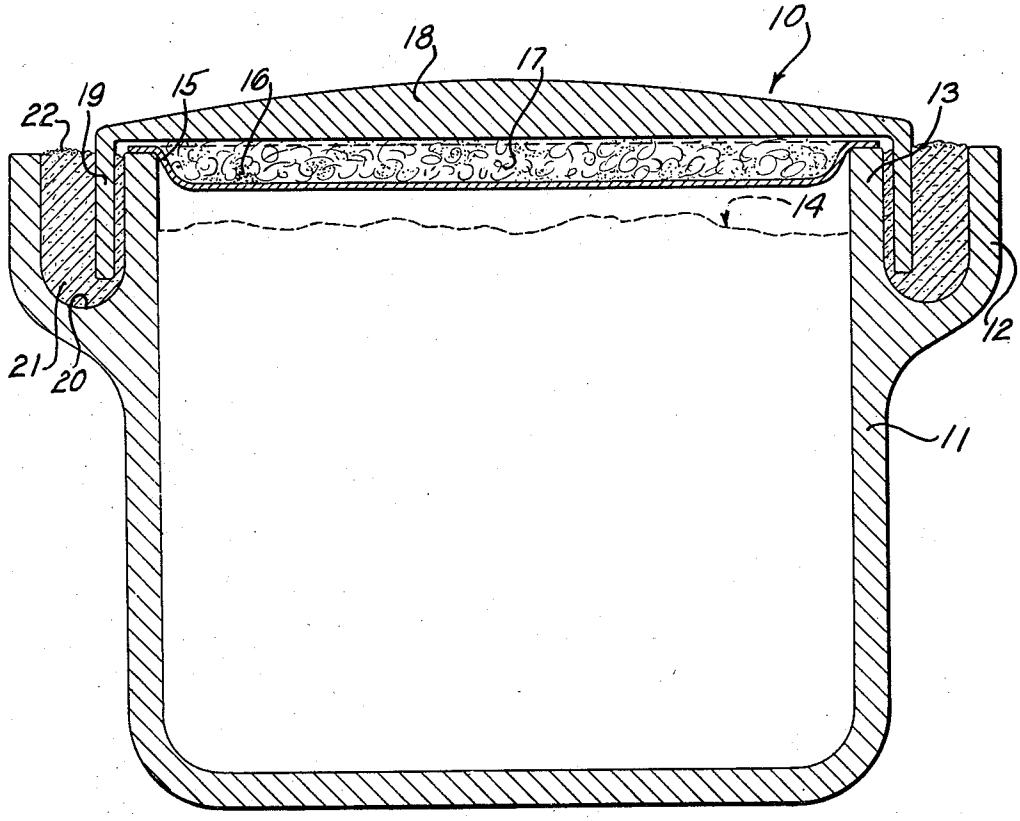
July 21, 1931. R. V. WILSON 1,815,691

METHOD OF HEAT TREATING METAL PARTS

Filed Oct. 31, 1928



Inventor
Roger V. Wilson
By H. A. Sattler. Att'y.

Patented July 21, 1931

1,815,691

UNITED STATES PATENT OFFICE

ROGER VERDEN WILSON, OF LA GRANGE, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

METHOD OF HEAT TREATING METAL PARTS

Application filed October 31, 1928. Serial No. 316,149.

This invention relates to a method of heat treating metal parts and more particularly to the bright annealing of iron parts.

In the heat treating of iron articles, it has been customary to store the articles in a sealed container, place the container in a heating chamber and gradually raise the temperature to the desired maximum, after which the container is withdrawn from the furnace and placed under a cooling hood wherein the cooling of the container and contents is effected slowly. Before placing in the furnace, the container is sealed with a material designed to permit escape of oxygen therefrom as the temperature is raised and the air therewithin expands, and which material will harden and prevent ingress of oxygen to the interior due to atmospheric pressure when the temperature is subsequently lowered. A large percentage of the oxygen contained in the container is ejected in this manner, but in some cases a sufficient quantity of the oxygen remains within the container during the entire process to oxidize the iron parts somewhat and thus discolor them.

The object of the present invention is to provide a simple and inexpensive method for heat treating parts wherein predetermined atmospheric conditions are insured throughout the process.

According to the features of the invention, a quantity of material oxidizable at a considerably lower temperature than the parts and having a relatively large area, such as copper tinsel, is placed adjacent to but not in direct contact with the parts in an annealing container.

A material having a higher affinity for oxygen at high temperatures, such as magnesium powder, may be added with the copper tinsel to insure that the atmosphere within the container shall be free of oxygen throughout the annealing process, and to reduce the articles within the container to the extent in which they may have previously become oxidized.

It is believed that the invention will be more clearly understood by reference to the accompanying drawing in which the figure represents a vertical section of a loaded annealing container prepared for heating.

In the drawing an annealing container generally denoted by the numeral 10, comprises vertical side walls 11, the upper portion of which consists of an upwardly projecting lip 12 and an inner portion 13. Suitably arranged within the container are a desired number of articles such as iron parts, generally denoted by the numeral 14. Resting upon the inner portions 13 is a tray 15 upon which is placed a quantity of a material which by reason of its large surface area as compared to its weight is capable of absorbing a large portion of the oxygen remaining in the container after the oxygen content is materially reduced by heat expansion, and also such oxygen as may be drawn into the container during the cooling process. On the tray is placed also a quantity of material such as magnesium, aluminum or other of the metals comprising the class which are capable of combining vigorously with oxygen at the higher of the temperatures within the range reached during the heat treating process. The drawing illustrates the use respectively of a desired quantity of copper tinsel 17 and a lesser quantity of magnesium powder 16 as examples of the classes of materials indicated above. The copper tinsel referred to is copper in fine ribbon form such as is commonly used in the flexible conductors comprising telephone cords and similar types of electrical conductors, which has been gathered into a bundle and matted to cause it to fit in the tray 15. It should be understood that the invention may be satisfactorily practiced through the substitution of such other materials in each of the respective classes as will meet the requirements laid down above for those classes of materials. Should the material of the first class which is used be copper tinsel, and should the material of the second class which is used be magnesium powder, it is sufficient that 25 grams of copper tinsel and 10 grams of magnesium powder be used in an annealing container having a capacity of about 15 liters and designed to receive about 200 pounds of material, although the quantities may be in-

creased or decreased to accommodate the size of the container used. A lid 18 having a depending rim 19 covers the container, tray and contents the depending rim fitting within a groove 20 between the inner portions 13 and the lip 12 of the vertical side walls. The groove 22 is filled with a stiff clay composed of cupola loam 21, the upper surface being troweled flat. A suitable quantity of sealing mixture 22, preferably of the type described in the application of B. J. Babbitt, for Annealing seals, Serial No. 316,146, filed October 31, 1928, is sprinkled on the loam around the circumference of the lid.

After preparation in the above indicated manner, the container is placed in a furnace (not shown) and heat is applied thereto. Assume that the customary maximum temperature for annealing iron parts is 900° C. As heat is applied to the container the temperature within is slowly and steadily increased from the initial room temperature, and a substantial portion of the oxygen is driven out through the loam seals by heat expansion of the air remaining within the container. Being of a material and in such form as to be more readily oxidizable at lower temperature than the iron articles stored in the container, the copper tinsel will absorb a large portion of the oxygen remaining in the container after the temperature has been raised to approximately 600° C., and the combination of the copper tinsel with oxygen will continue until a point is reached commensurate with the oxidation point of the more energetically combustible magnesium. Experiments have shown that the magnesium combines with oxygen at a point somewhat lower than that at which the iron parts would become materially oxidized. Owing to the great natural affinity of magnesium, and other metals in its class, for oxygen the combination between the oxygen remaining in the container and the magnesium powder has been found to take place with such energy that not only is all trace of oxygen removed from contact with the iron parts, but the magnesium has been found to act as a reducing agent on those portions of the parts which may have previously become oxidized. The remainder of the annealing process is carried on with the metal parts being heated in an atmosphere entirely free from oxygen, no traces of oxidation will remain upon the surfaces of the parts at the completion of the process and subsequent cooling steps and the articles will be found to possess the desired bright anneal.

By the employment of the above method it may be seen that a very small additional amount of labor beyond that which is ordinarily required to load and seal an annealing container will be required. Since copper tinsel in a form suitable for the practice of this method may be produced as a by-product of the manufacture of telephone cords and since a comparatively small amount of magnesium powder is required, it will be observed that the cost of bright annealing parts is not materially increased in spite of the fact that much better results are procured by applicant's process.

What is claimed is:

1. A method of annealing parts which consists of associating with the parts in a container copper tinsel and a combustible metal of the group including magnesium and aluminum, sealing the container, and applying heat.

2. A method of annealing parts which consists of associating with the parts in a container copper tinsel and a combustible metal of the group including magnesium and aluminum in powder form, sealing the container, and applying heat.

3. A method of annealing parts which consists of associating with the parts in a container a quantity of copper tinsel and a lesser quantity of magnesium powder, sealing the container, and applying heat.

4. A method of annealing parts which consists of associating with the parts in a container copper tinsel and magnesium powder in the proportions of 2.5 to 1.0 by weight, sealing the container, and applying heat.

5. A method of annealing parts which consists of associating with the parts in a container of 15 liters capacity 25 grams of copper tinsel and 10 grams of powdered magnesium, sealing the container, and applying heat.

6. A method of annealing parts which consists of associating with the parts in a container copper tinsel and an easily oxidizable metal of the group which includes magnesium and aluminum in powder form, sealing the container, and applying heat.

7. A method of annealing parts which consists in associating with the parts in a container a quantity of copper tinsel and a lesser quantity of powdered aluminum, sealing the container and applying heat.

8. A method of annealing parts which consists in associating with the parts in a container a quantity of metal tinsel and a lesser quantity of magnesium powder, sealing th container, and applying heat.

In witness whereof, I hereunto subscribe my name this 12th day of October, A. D. 1928.

ROGER VERDEN WILSON.