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C. R. G. STEWART

METHOD OF ANNEALING

Filed May 8, 1925

Fig. 1.

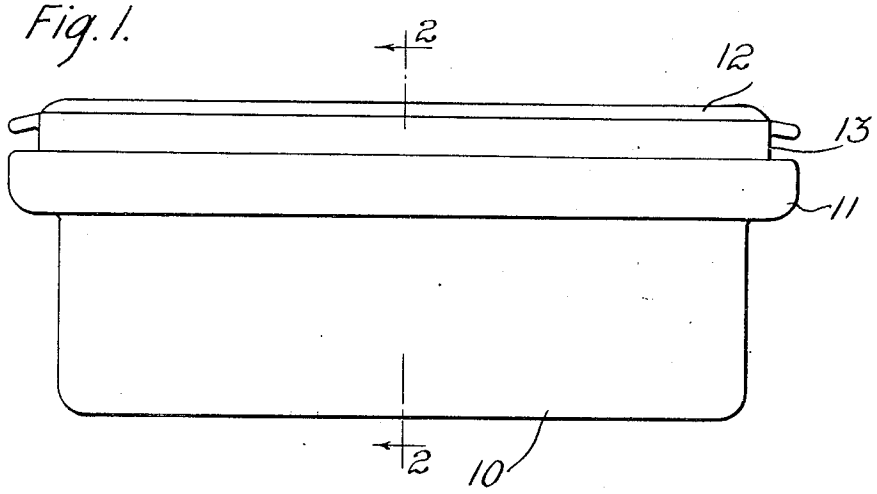
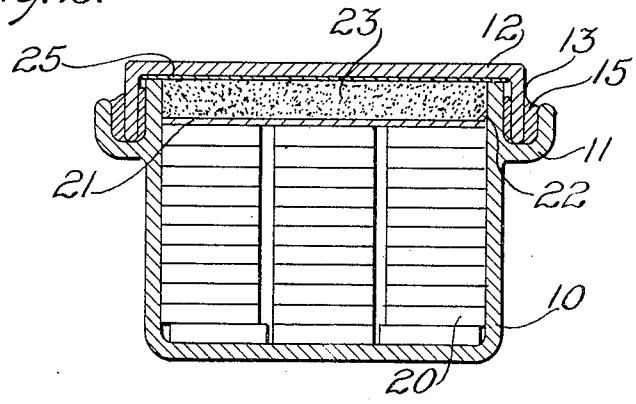


Fig. 2.



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Att'y.

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UNITED STATES PATENT OFFICE.

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METHOD OF ANNEALING.

Application filed May 8, 1925. Serial No. 28,757.

This invention relates to a method of annealing and has for its object the provision of an improved, economical method of annealing materials.

In accomplishing the invention, the material, such as metal parts, which is to be annealed, is placed in a container with a quantity of material containing hydrogen, such as electrolytic iron dust, the manner of making which will be referred to hereinafter, and the two materials heated within the container to the required annealing temperature. Both materials are annealed by the heating and each is benefited by the presence of the other, the hydrogen, which is undesirable in the iron dust, being driven therefrom and transformed by combination with oxygen, and the oxidation of the metal parts being prevented by the presence of the hydrogen, which creates a reducing atmosphere within the container.

The invention will be more fully understood from the following description taken with the accompanying drawings, in which

Fig. 1 is a side elevation of an annealing container which may be employed in practicing the invention, and

Fig. 2 is a section taken on line 2—2 of Fig. 1, showing the contents of the container and the arrangement thereof.

Any suitable annealing container may be employed in practicing the invention, but good results are obtainable by using a container such as that shown in the accompanying drawings, in which a container body 10 is provided with an upper grooved portion 11 and has a cover 12 equipped with a flanged portion 13 which is adapted to extend into the groove in the container body as shown particularly in Fig. 2. Suitable material, such as loam 15, may be employed for packing the joint between the container and the cover thereof to prevent too great influx of air into the container.

When practicing the method, a plurality of parts 20, which are sought to be annealed, are suitably placed in the container as shown, and a suitable cover, such as an iron sheet 21, placed thereon as shown, a suitable material, such as asbestos cement 22, being employed to seal the openings between the iron sheet 21 and the side walls of the container body 10. A material which contains an element capable of producing a reducing atmosphere within the container, such as electrolytic iron dust 23, the nature of which is described more in detail in a succeeding paragraph, is placed on top of the iron sheet 21 to completely fill the remaining portion of the container body. A sheet of suitable material, such as asbestos 25, may then be placed on top of the container in such a manner as to act as a gasket between the container and the cover 12 when the cover is placed in position. The container is sealed with material such as loam 15 as described above.

In order to make clear the type of material which is referred to as electrolytic iron dust, reference will now be made, briefly, to the manner in which this material is obtained. An iron anode is placed in an electrolyte, consisting of a mixture of solution of ferrous sulphate, ammonium sulphate and ammonium chloride, a starting plate of any suitable material being also introduced. A current is passed from the anode through the electrolyte to the starting plate, which in this case forms a cathode, and the iron in the anode is electrolytically deposited on the cathode. When a sufficient amount of iron has been deposited, the cathode, together with the iron deposited thereon, is removed from the electrolyte. The electrolytically deposited iron is then removed from the cathode and is reduced to a very finely divided form, preferably by preliminarily breaking it into smaller pieces in a hammer-mill and then grinding it in a ball mill. On account of the manner in which the material is produced, it contains a great deal of hydrogen which is not removed by the grinding process, but which may be subsequently removed by annealing. Dust produced in this manner is frequently formed into magnetic cores for use in electrical apparatus, such as loading coils for telephonic transmission circuits. In order to produce certain magnetic effects which are not detailed herein, since they are not essential to a complete understanding of the invention, it is sometimes desirable that it be annealed and the hydrogen be removed before it is formed into magnetic cores.

Particularly good results are obtainable when practicing the present invention by employing electrolytic iron dust as the material in the upper portion of the container

capable of emitting hydrogen. This is very readily and economically accomplished in accordance with the features of the invention in the manner shown and described. At the same time the metal parts 20 are benefited greatly, all oxidation thereof being prevented by the presence of the hydrogen in the electrolytic iron dust, the parts being removed from the container after annealing in even a brighter condition than when placed therein. This obviates the necessity of tumbling or pickling or submitting the parts to any other processes for the purpose of cleaning them after the annealing step and before they are fitted for further use. It is well known that even where the parts are to be further worked after annealing, they are preferably freed from oxide scale in order to render them more easily workable.

It is obvious that by the process described the parts and the material are annealed in one operation in place of separate operations therefor, and each derives a beneficial result from the presence of the other. Furthermore, it is evident that any material containing a large amount of hydrogen may be employed instead of the electrolytic iron. It is understood that the invention is not limited to the particular materials described, but may have a wide variety of other applications and it is limited only by the scope of the appended claims.

What is claimed is:

1. A method of bright annealing metal parts, which consists in associating therewith a metallic material containing hydrogen, and then subjecting the metal parts and the material to a sufficiently high temperature to anneal the metal parts.

2. A method of bright annealing metal parts, which consists in associating therewith a metal in finely divided form containing hydrogen, and then subjecting the metal parts and the metal in finely divided form to a sufficiently high temperature to anneal the metal parts.

3. A method of bright annealing metal parts, which consists in associating therewith a quantity of electrolytic iron particles, and then subjecting the metal parts and the particles to sufficiently high temperature to anneal the metal parts.

4. A method of simultaneously annealing metal parts and a metallic material containing hydrogen, whereby the metal parts are prevented from oxidizing and the hydrogen is beneficially removed from said material, which consists in associating with said metal parts said material containing hydrogen, and then subjecting said metal parts and said material containing hydrogen to a sufficiently high temperature to anneal both the metal parts and the material containing hydrogen.

5. A method of simultaneously annealing electrolytic iron dust and metal parts, which consists in associating with said metal parts a quantity of electrolytic iron dust, and subjecting the dust and parts to a sufficiently high temperature to anneal both simultaneously.

6. A method of simultaneously annealing electrolytic iron dust and metal parts, which consists in associating said parts and said dust, mechanically separating them, and then subjecting the metal parts and dust to heat to simultaneously anneal them.

7. A method of bright annealing metal parts, which consists in associating therewith a metallic material in finely divided form containing a gas, and then subjecting the metal parts and the metallic material to a sufficiently high temperature to anneal the metal parts and cause the production of a reducing atmosphere by the evolution of the gas contained in one of said materials.

8. A method of simultaneously annealing a plurality of materials of different character, which consists in associating said materials together, subjecting them to a sufficiently high temperature to anneal both materials simultaneously and to cause one of said materials to evolve a gas which interacts with the other material.

In witness whereof, I hereunto subscribe my name this 30th day of April A. D., 1925.

CLARENCE ROSS GALE STEWART.