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UNITED STATES PATENT OFFICE

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METHOD OF TREATING ALLOYS

No Drawing. Original application filed September 2, 1922, Serial No. 585,856. Divided and this application filed August 23, 1926. Serial No. 131,113.

This is a division of my prior application Serial No. 585,856, filed Sept. 2, 1922, which has matured into Patent No. 1,671,484, dated May 29, 1928.

My invention relates to ferrous alloys, such as silicon and aluminum steels, more especially to a method of treating iron aluminum alloys to make them readily workable mechanically.

It is among the objects of this invention to provide a method of treating aluminum iron alloys which shall render them readily workable by mechanism operations, such as bending, stamping, drawing, shearing or the like.

It is a further object of this invention to provide a method of treating aluminum iron alloys which shall be simple, inexpensive and practical for use in the commercial adaptation of such ferrous alloys.

It is generally known that silicon and aluminum impart to iron or steel hardness and brittleness that render such alloys of more than about 4% to 5% silicon or aluminum difficult to work and of little value except in castings. However, silicon-iron and aluminum iron alloys have low hysteresis and eddy-current losses and, therefore, are specially advantageous for utilization in the manufacture of transformer cores and armature and stator structures in electrical machines, in which the steel is utilized in thin-sheet form.

I have found that certain grades of aluminum steel, such as are used in electro-magnetic devices, exhibit excessive brittleness when an attempt is made to work them. This is made manifest by the inability of the metal sheets to withstand such operations as cutting, shearing, stamping, drawing or similar operations in which a certain amount of ductility is necessary. Brittleness is most commonly encountered in steels having an aluminum content in excess of about 4.0% or 5%, and such alloys will break and split spontaneously when shearing or stamping operations are attempted, leaving a rough ragged edge and rendering the material unusable. The burr may scratch through the sheet insulation in the assembled transformer.

My invention consists in the discovery of the fact that the brittleness may be avoided by conducting the desired operation of deformation at a slightly elevated temperature. Thus, in a particular case, I have found that an iron-aluminum alloy, containing about 7% aluminum, which was so brittle when cold as to be unworkable could be hammered and otherwise deformed at a temperature of 150° C. without difficulty.

Generally, the temperature of treatment of iron aluminum alloys to give temporary ductility ranges from about 30° to about 200° C. The necessary temperature depends among other things on the proportional amount of aluminum contained in the alloy.

It will be evident from the above description of my invention that, by treating aluminum steels in accordance therewith, a larger amount of aluminum may be used in commercial electrical steels, since it is possible to readily work the same in the above-described manner. Another advantage of my method of treating ferrous aluminum alloys, such as aluminum steel, is that the treated metals are not as destructive on dies and other machine tools, resulting in a considerable increase of life which reduces the expense of manufacture.

Although I have described a specific embodiment of this invention, it will be obvious to those skilled in the art that various modifications may be made in the details of the process herein set forth without departing from the principles thereof. For instance, the working temperatures at which the physical properties of alloys are altered to obtain greater temporary ductility may vary from a temperature somewhat above atmospheric to a temperature below a visible heat. The amount of aluminum or other substance permissible in such alloys may be varied to obtain an alloy having the desired characteristics. The alloys may contain other ingredients, such as silicon manganese, phosphorus and carbon, which are present as impurities or are added to modify the characteristics of the alloy.

I claim as my invention:

1. The method of working iron-aluminum alloys containing about 4 to 10% aluminum

which comprises heating said alloys to a temperature above 30° and below 200° C. and subjecting them to mechanical alterations while within this temperature range.

2. The method of working iron-aluminum alloys containing about 4 to 10% aluminum which comprises heating said alloys to a temperature above ordinary temperature and below a visible heat and subjecting them to mechanical alterations, while within this temperature range said temperature being proportional to the amount of non-ferrous alloying metal in said alloys.

In testimony whereof, I have hereunto subscribed my name this 14 day of July 1926.

NORMAN B. PILLING.