Oct. 2, 1934. J. H. CRITCHETT 1,975,742

COMPOSITE METAL ARTICLE

Filed May 12, 1933

Fig. 1.

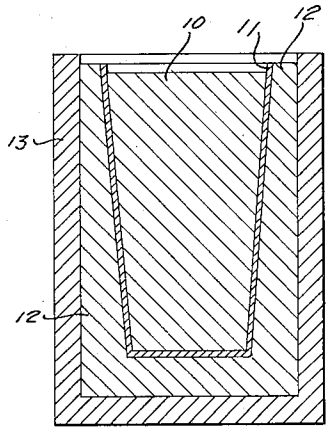


Fig. 2.

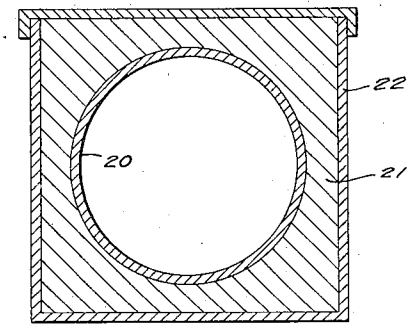
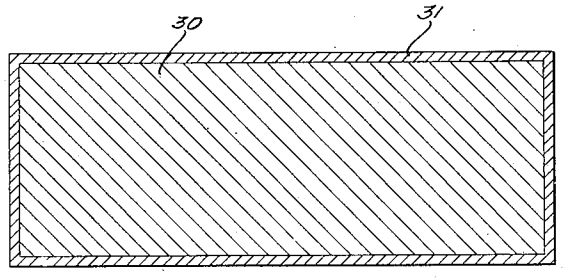


Fig. 3.



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COMPOSITE METAL ARTICLE

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Application May 12, 1933, Serial No. 670,672

2 Claims. (Cl. 29—181)

The invention is a composite article comprising a ferrous metal body provided with a corrosion resistant surface. More specifically the article of the invention comprises a ferrous metal body portion consisting for example of steel or cast iron, and a securely bonded surface portion consisting of an alloy of chromium, iron, copper, and silicon, the said surface portion being alloyed with the body portion at the interface.

The invention is based at least in part on the discovery that substantially homogeneous alloys of chromium, iron, carbon, copper, and silicon, described in my application Serial Number 670,673 filed May 12, 1933, and containing about 4% to 50% chromium, about 8% to 80% copper, about 8% to 40% silicon, less than 6% carbon, and the remainder iron, are not only extremely resistant to corrosion, but also are adapted for use to form a coating securely bonded to the surface of ferrous articles.

The homogeneous alloys of chromium, iron, copper, and silicon, go into solution with ferrous materials at moderately elevated temperatures with an unpredictable and surprising readiness that may not be simply explained by the fact that these alloys have a low melting point.

Especially useful as coating alloys are the compositions containing 20% to 80% copper, 5% to 50% chromium, 15% to 40% silicon, and the remainder iron and carbon.

The composite article may be formed by known methods. For example, a sand mold or chill mold may be coated with a paste formed from granulated coating alloy and a binder, as described for instance in U. S. Patent 1,588,111 to Charles B. Jacobs, and the base metal cast into the coated mold. Or the ferrous metal article to be coated may be packed in granulated coating alloy mixed with a flux, and the article and alloy heated to cementing temperatures below the melting points of the article and coating alloy as described in U. S. Patent 1,672,444 to Frederick M. Becket.

These two methods are shown diagrammatically in Figures 1 and 2 of the accompanying drawing, in which:

Figure 1 is a diagrammatic cross-section of a sandmold containing a composite cast article,

Figure 2 is a diagrammatic cross-section of a cementing box containing an article to be coated and a cementation mixture, and

Figure 3 is a diagrammatic cross-section of a representative composite article.

In Figure 1, a sand mold consisting for example of an outer shell 13 and a sand inner surface 12, is coated with comminuted coating alloy and a binder 11. Into the coated mold, the body metal 10 is cast. If the body metal 10 is cast iron, the above-described coating alloy forms a coating securely bonded by interalloying with the cast iron, but there is little diffusion of the coating alloy into the base metal unless the latter is cast very hot; if the body metal 10 is a steel, there is a considerable amount of diffusion of the coating alloy into the steel, the amount of such diffusion increasing as the casting temperature is raised.

In Figure 2, an iron or steel article 20 is packed in a mixture of comminuted coating alloy and flux 21, in a metal box 22, and the box then heated to cementing temperatures. By the use of this method, a firmly bonded surface layer is obtained, and there is comparatively little diffusion of the cementing alloy into the main body of the article.

Figure 3 is a cross-section of the composite articles of the invention, showing a body metal 30 and a corrosion resistant surface portion 31.

In Figures 1, 2, and 3, the surface portion has been shown relatively thicker than will usually be desired for the sake of clarity.

I claim:

1. A composite article comprising a ferrous metal body portion and a corrosion resistant surface portion composed of a substantially homogeneous alloy having a composition within the limits 4% to 50% chromium, 8% to 80% copper, 8% to 40% silicon, not more than 6% carbon, and the remainder iron, said surface portion being bonded firmly to the body portion.

2. A composite article comprising a ferrous metal body portion and a corrosion resistant surface portion composed of a substantially homogeneous alloy having a composition within the limits of 20% to 80% copper, 5% to 50% chromium, 15% to 40% silicon, carbon in an amount not over 5%, and the remainder iron; said surface portion being firmly bonded to the body portion.

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