United States Patent

Bylund et al.

[15] **3,637,373**

[45] **Jan. 25, 1972**

[54] COMPOSITIONS FOR THE TREATMENT OF MOLTEN IRON

[72] Inventors: **Karl Gusten Bylund; Evert Henry Bark,** both of Halleforsnas, Sweden

[73] Assignee: **AB Jarnforadling,** Halleforsnas, Sweden

[22] Filed: **Mar. 2, 1970**

[21] Appl. No.: **14,799**

Related U.S. Application Data

[63] Continuation of Ser. No. 734,518, June 5, 1968, abandoned.

[30] **Foreign Application Priority Data**

June 8, 1967 Sweden.....8044/67

[52] **U.S. Cl.**.....**75/130 A,** 75/130 R

[51] **Int. Cl.**.....**C22c 37/04**

[58] **Field of Search**.....75/53, 58, 130 A, 130 R, 130.5

[56] **References Cited**

UNITED STATES PATENTS

1,555,978	10/1925	Hunt	75/53 X
3,393,996	7/1968	Robertson	75/53
3,459,541	8/1969	Hohl	75/130

Primary Examiner—L. Dewayne Rutledge
Assistant Examiner—Joseph E. Legru
Attorney—Ralph E. Bucknam, Jesse D. Reingold and Robert R. Strack

[57] **ABSTRACT**

A composition for the treatment of molten iron consists of a mechanical mixture, compacted into solid porous bodies, of magnesium which serves as a treatment agent, and sponge iron as a reaction retarding agent.

3 Claims, No Drawings

COMPOSITIONS FOR THE TREATMENT OF MOLTEN IRON

This application is a continuation application of Ser. No. 734,518, filed June 5, 1968, now abandoned.

This invention relates to a composition for the treatment of molten iron. Although the composition is particularly useful for the production of nodular iron, it can be used also for other purposes, such as the desulphurization of iron.

In the production of nodular iron by alloying with magnesium, pure magnesium or alloys having varying amounts of magnesium, such as FeSiMg, NiMg or the like, are usually employed. Various techniques have been used for introducing the magnesium into the iron. In alloying with pure magnesium, there are used either various injection procedures by which pulverulent or granular magnesium is blown into the iron in an open vessel by means of a carrier gas, or large pieces of magnesium are allowed to react with the molten iron in a hermetically sealed vessel in which a high pressure is built up. The magnesium alloys can be deposited on the bottom of the alloying vessel, sometimes covered with reaction retarding iron plates, whereupon the iron is poured over the alloys. It is also possible to throw the alloys down into the molten iron, especially if they have a higher density than the molten iron. Alloys lighter than iron are often introduced by means of immersion ladles or the like, At the iron temperatures at which alloying occurs, magnesium is in the gaseous state with very high steam pressures, for which reason the reaction will be extremely intense, especially as the magnesium alloys melt and are gasified very rapidly so that a large amount of magnesium gas is generated within a very short time. A strong boil is obtained, and as the alloying is usually done in open vessels, some iron is often thrown out of the reaction vessel and a powerful flame of burning magnesium gas is obtained from the magnesium not dissolved in the iron. The yield, calculated as the amount of magnesium in the nodular iron in relation to the amount of added magnesium, will be very low and seldom exceeds 0.5 (20–50 percent). The disadvantages of the methods hitherto employed can be summarized as follows:

1. Alloying with NiMg (15 percent Mg). This is an extremely costly technique since the Ni metal is very expensive, and besides this method results in troublesome flames and low yield.

2. Alloying with FeSiMg (5–20 percent Mg). This method produces extremely troublesome flames and involves a risk of iron ejection. Yields are low.

3. a. Injection methods. These methods produce very strong flames and involve the risk that molten iron is ejected from the treatment vessel. Moreover, the temperatures are high and the yields extremely low.

3. b. Pressure chamber methods. These methods require complicated and expensive equipment with vessels in which a high pressure is generated. Besides, some of these methods give great temperature losses and low yields.

The above named disadvantages are reduced by the present invention which relates to a composition for the treatment of molten iron, which is cheap and gives a high yield and low temperature losses, simultaneously as no complicated or expensive equipment is required. The composition according to the present invention is characterized in that it consists of a mechanical mixture, compacted into solid porous bodies, of at least magnesium which serves as an alloying agent, and sponge iron which serves as a reaction retarding agent. In the production of the bodies, magnesium powder is mixed mechanically with crushed sponge iron, whereupon the mixture is compacted into solid bodies. The mixture can thus be briquetted. It can also be combined with a suitable bonding agent to form the solid bodies. The briquettes may be given for instance cylindrical shape, with a diameter of 120 mm. and a height of 100–150 mm.; in other words, the solid bodies have a volume in the order of 1,000 cubic centimeters.

The amount of magnesium in the said bodies can be varied within wide limits depending upon the desired amount of magnesium in the iron. Thus, the magnesium may amount to 4–40 percent of the weight of the bodies, preferably 5–25 percent.

It is important that the magnesium serving as the alloying agent melts and is gasified rather slowly so that the magnesium gas passes through the iron in a relatively slow stream, which will result in smaller flames and higher yields. To this end, the bodies are porous so that, according as the temperature therein rises, the magnesium gas formed is forced out and alloyed with the iron. A suitable porosity is obtained if an apparent density of between 2 and 4 grams per cubic centimeter is imparted to the solid bodies, the lower apparent density being used for a composition having a large amount of magnesium and the higher apparent density for a composition having a low amount of magnesium. Normally, the apparent density will lie at approximately 3 grams per cubic centimeter. For purposes of comparison, it can be mentioned that the theoretical density of sponge iron is approximately 7 grams per cubic centimeter, for which reason the bodies have a porosity of approximately 50 percent.

According to a modification of the invention, the reaction retarding agent of composition consists of cast iron turnings instead of sponge iron.

In some cases, minor amounts of other substances may also be included in the mechanical mixture compacted into the solid bodies, for instance cerium, mischmetal and the like or ferrosilicon, graphite, slag binders and the like, the amount of the additive normally being approximately 0.5 percent.

In the production of nodular iron, the solid bodies can be introduced by means of an immersion ladle or the like into a cast iron melt in a processing ladle, whereby the alloying with magnesium is obtained.

The invention is not restricted to the above described embodiments and can be varied within the scope of the appended claims.

What we claim is:

1. An agent for use in the treatment of molten iron, which consists essentially of a porous body consisting essentially of a mechanical mixture of sponge iron and magnesium powder, the latter in the proportion of 4–40 percent of the weight of the body, the porosity of the body being approximately 50 percent, the apparent density of the porous body being between 2 and 4 grams per cubic centimeter.

2. The agent according to claim 1 wherein the magnesium is present in the amount of 5–25 percent.

3. The agent according to claim 1, wherein the porous body additionally contains approximately 0.5 percent of a member selected from the group consisting of cerium, ferrosilicon, graphite, or slag binder and a mixture thereof.

* * * * *