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Ramacciotti

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[54] **PROCESS FOR OBTAINING A RAPID MIXING OF LIQUID METALS AND SLAG IN ORDER TO ACCELERATE SOME REACTIONS BETWEEN THE TWO PHASES**

[75] Inventor: **Aldo Ramacciotti,** Rome, Italy

[73] Assignee: **Centro Sperimentale Metallurgico SpA,** Rome, Italy

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[58] **Field of Search** 75/61, 60, 59, 51, 75/52, 46, 93

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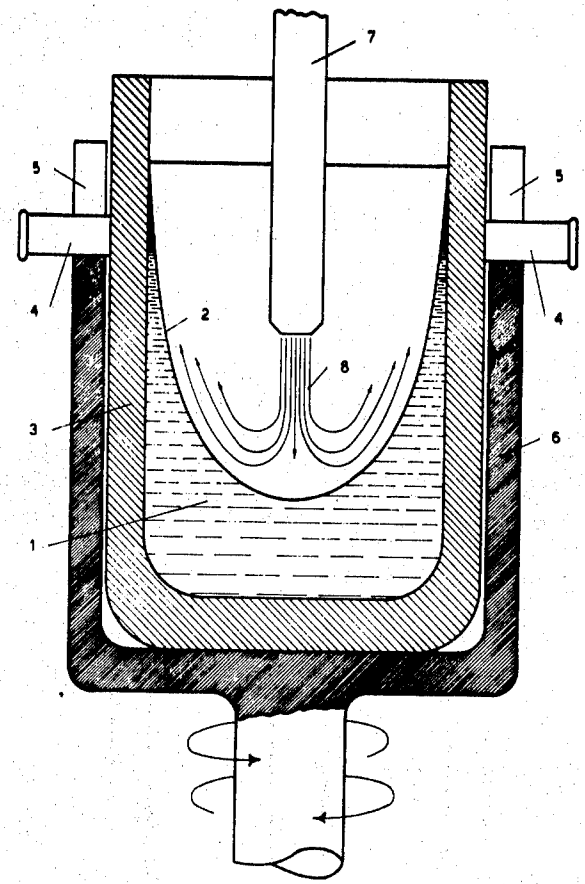
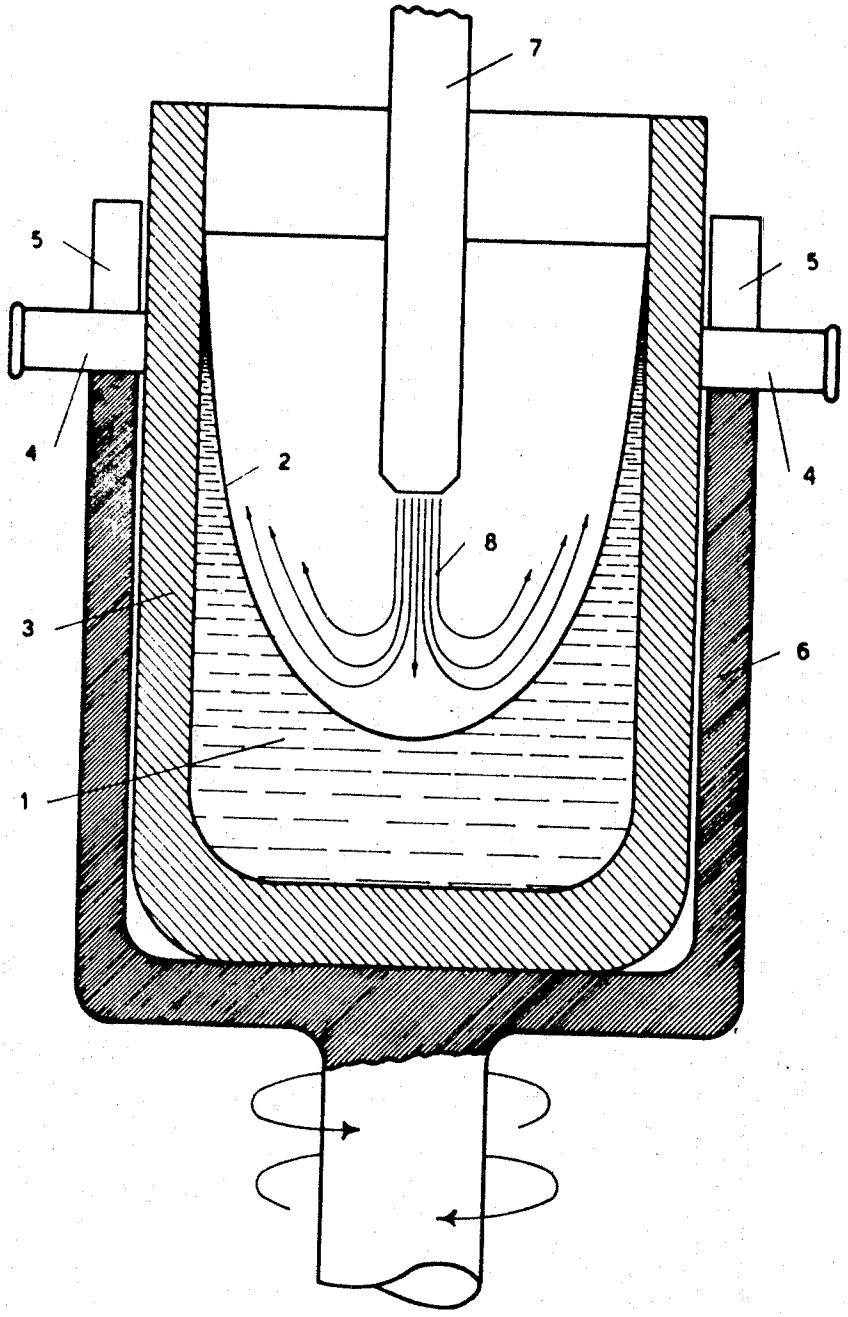
Primary Examiner—L. Dewayne Rutledge
Assistant Examiner—J. E. Legru
Attorney—Ralph M. Watson

[57] **ABSTRACT**

A process for emulsifying the constituents of a molten bath found in metallurgical refining applications. Immiscible constituents are delivered to a stationary reactor; the reactor is rotated about the vertical axis thereof; rotation is ceased for less than thirty seconds; and rotation of the reactor about the vertical axis occurs in the opposite direction. Gases are blown axially at and over the surface of the molten bath to provide a particular gaseous atmosphere.

8 Claims, 1 Drawing Figure





INVENTOR.
Aldo Ramacciotti
BY
Ralph M. Watson
ATTORNEY

PROCESS FOR OBTAINING A RAPID MIXING OF LIQUID METALS AND SLAG IN ORDER TO ACCELERATE SOME REACTIONS BETWEEN THE TWO PHASES

This invention relates to a device and a process for carrying out a rapid mixing and the possible reactions between two or more phases with different densities, for instance between two or more liquid phases, or between liquid phases and particulate solids, possibly in the presence of a suitable gaseous atmosphere.

This invention relates particularly to a device and a process for obtaining a rapid mixing of liquid metals and slag in order to accelerate some reactions between the two phases, e.g. in converting, refining or deoxidizing processes, etc.

The methods hitherto proposed are numerous. One of them comprises the falling of the metal from a considerable height into a vessel which already contains the premelted slag. Another method comprises the use of an eccentrically oscillating vessel, similar to a shaking ladle, in which the metal and the slag are strongly shaked together.

Another method comprises the introduction from the top into the metal-slag bath, of a mechanical agitator shaped as a pump impeller made up of refractory material.

Another method comprises the gurgling of an inert gas (argon) in order to obtain the same effect.

However, all the above methods have the disadvantage of requiring considerably long times of treatment owing to an incomplete mixing.

On the contrary the method of the present invention permits one to obtain an extremely fine emulsion through an extremely extensive metal-slag contact surface. This permits one to cut down considerably the duration of the treatment.

The device embodying the method set forth hereinbefore comprises a substantially cylindrical reactor or vessel, adapted to rotate, in both senses of rotation, around a vertical axis co-inciding with the geometric axis of the reactor.

Said reactor is metallic, conveniently sized to stand the centrifugal force of the bath, and is lined inside by refractory material.

The device is provided with suitable means for rotating the reactor at variable speed and with the possibility of reversing the direction of rotation. Other suitable means provide the tilting of the reactor and the pouring of the product for obtained at the end of the process.

In order to provide the appropriate gaseous atmosphere required by the process, the device further comprises at least one injector, vertically movable with respect to the reactor, suitable for blowing the required gases over the free surface of the bath.

An embodiment of the device according to the invention is illustrated, only by way of example, in the accompanying drawing.

The FIGURE is a diagrammatical vertical section of the device. With reference to it, 1 is the bath with its paraboloidal free surface 2 in rotation, 3 is the container with trunnions 4 located in the grooves 5 of the rotatable envelope 6, 7 is the end portion of the blowing apparatus, 8 are the trajectory lines of the fluids leaving said blowing apparatus.

The operation of the above-mentioned device is now illustrated, only by way of example, with reference to a process for decarburizing molten pig iron. The hot

metal and the slag to be emulsified are poured into the reactor in absence of rotation. The reactor is then rotated around its own vertical axis in such a way as to reach a peripherical speed of 200 to 300 m/min along the lateral inner surface of the lining.

After rotating during 2 to 4 minutes, the reactor is stopped for a time not longer than 30 seconds and then is again rotated in the reverse for other 2 to 4 minutes. The cycle is finished with the stopping of the reactor, but may be repeated if required.

After the last stop of the reactor and after a suitable decantation time of 2 to 5 minutes, the metal may be poured into the special transfer vessel (ladle) and sent to the subsequent uses.

During the treatment, if the process requires a particular (reducing, oxidizing or inert) atmosphere, any gas (oxygen, hydrogen methane, argon, etc.) may be blown by a suitable lance.

The aforementioned device and process are usable for other various metallurgical operations such as for instance, for mixing base metal and master alloys in fast alloying processes.

What is claimed is:

1. In a process for decarburizing molten pig iron in which hot metal and slag are emulsified to accelerate the reactions therebetween, the improvement which comprises pouring the hot metal and the slag to be emulsified into a stationary substantially cylindrically-shaped reactor having a a refractory lining; then rotating the reactor about the vertical axis thereof at a peripheral speed of 200 to 300 m/min along the lateral inner surface of the lining for between 2 and 4 minutes; stopping the reactor from rotating after 2 to 4 minutes; rotating the reactor again in a direction the reverse of the initial rotation for 2 to 4 minutes; again stopping the reactor from rotating; allowing the metal and the slag to decant after the last stop for a time of 2 to 5 minutes and finally pouring the metal from the reactor into the ladle.

2. A process according to claim **1** further comprising the step of blowing gases downwardly axially at the surface of the bath and over the free surface of the bath to provide a particular gaseous atmosphere.

3. A process as in claim **2** wherein the gas blown axially at the surface of the bath and over the surface of the bath is oxygen.

4. A process as in claim **2** wherein the gas blown axially at the surface of the bath and over the surface of the bath is hydrogen.

5. A process as in claim **2** wherein the gas blown axially at the surface of the bath and over the surface of the bath is methane.

6. A process as in claim **2** wherein the gas blown axially at the surface of the bath and over the surface of the bath is an inert gas.

7. In a process for refining metals in a molten bath having normally immiscible constituents which normally immiscible constituents can be emulsified to accelerate reactions therebetween during the refining process, the improvement comprising:

delivering the normally immiscible constituents to a stationary substantially cylindrically shaped-reactor

rotating the reactor in a first direction at a speed sufficient to force the surface of the molten bath to assume a configuration which is parabolic in cross-section through every plane;

stopping the reactor from rotating;

maintaining the reactor stationary for less than 30 seconds;

rotating the reactor in a direction opposite to said first direction at a speed sufficient to force the surface of the molten bath to assume a configuration which is parabolic in cross-section through every plane; and

allowing the molten bath to decant.

8. A process according to claim **7** further comprising the step of blowing gases downwardly axially at the surface of the bath and over the surface of the bath to provide a particular gaseous atmosphere.

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