



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 096 216 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**02.05.2001 Bulletin 2001/18**

(51) Int. Cl.<sup>7</sup>: **F27D 23/00**, F27B 3/10,  
F27D 1/16

(21) Application number: **00123036.6**

(22) Date of filing: **24.10.2000**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(30) Priority: **26.10.1999 IT TO990931**

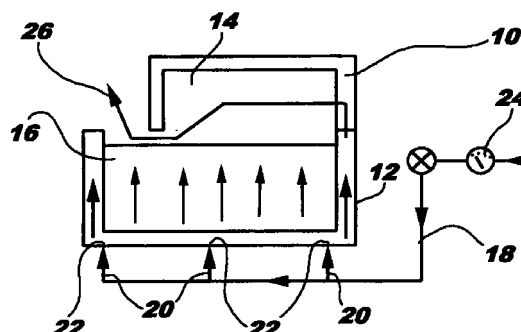
(71) Applicant: **FERRARI S.p.A.**  
**41100 Modena (IT)**

(72) Inventors:  
• **Coombe, Vian Francis**  
**41053 Pozza Di Maranello (Modena) (IT)**  
• **Davoli, Emilio**  
**41050 Colombaro Di Formigine (Modena) (IT)**

(74) Representative:  
**Gerbino, Angelo et al**  
**c/o JACOBACCI & PERANI S.p.A.**  
**Corso Regio Parco, 27**  
**10152 Torino (IT)**

(54) **A method of drying a furnace and/or performing continuous degassing, and plant for implementing the method**

(57) The method of drying a furnace having walls (10) made of refractory material, particularly for the fusion of metals, (16) provides for a flow of substantially dry gas to be introduced into the walls (10) and to be caused to flow through the walls (10) so as to remove the moisture contained therein. The method can also be implemented during the operation of the furnace so as to degas the molten metal (16). The plant for implementing the method comprises a duct (18) for the supply of substantially dry gas, at least one outlet tube (20) branching from the duct and opening into a respective hole (22) formed in the furnace walls (10).



**EP 1 096 216 A2**

## Description

**[0001]** The present invention relates to a method of drying a furnace, particularly for the fusion of metals, and to a plant for implementing the method.

**[0002]** The method is connected with the need to keep metals which are at or above their melting points as free as possible of water. In fact, at these temperatures, any trace of moisture present is transformed into its constituent atomic elements, hydrogen and oxygen, with decidedly adverse effects on the properties of the metal.

**[0003]** For example, molten aluminium and alloys thereof readily absorb hydrogen which gives rise to porosity due to the presence of gas during subsequent solidification.

**[0004]** Moreover, molten copper and alloys thereof absorb oxygen and hydrogen which give rise to defects due to gas reactions during solidification.

**[0005]** The absorption of hydrogen and oxygen into the metal tends to go on until an equilibrium is reached, the quantity absorbed increasing as the temperature and the relative humidity of the surrounding atmosphere increase. On the basis of these preliminary statements, it is clear that the problem of absorption becomes more acute during the summer season when temperature and relative humidity are greater.

**[0006]** According to the prior art, a new furnace or a partially renovated furnace in which some components have been renewed is subjected to several empty heating cycles, before it is actually used, to eliminate the traces of moisture present in its walls which are typically made of refractory material.

**[0007]** Moreover, the elimination of the chemically bound moisture continues during the initial period of actual operation of the furnace. To prevent this having adverse effects on the metal produced during this period of time, which may be of the order of more than three months, it is therefore necessary to perform periodic degassing treatments of the metal to eliminate the chemical elements contained therein, which result from the traces of moisture present.

**[0008]** However, it is difficult to eliminate these impurities completely, since the residual moisture tends to collect in the outer portions of the furnace walls which, as a result of the use of energy-saving techniques, are at relatively low temperatures, of the order of 100°C. Moreover, temporary interruptions in the normal operating conditions of the furnace, for example, for maintenance, holidays, and the like, may lead to re-cooling of the furnace walls with the penetration of further moisture, thus necessitating an extension of the period of degassing operations.

**[0009]** The object of the present invention is therefore to provide a method of drying furnaces which overcomes the disadvantages of the prior art mentioned above.

**[0010]** According to the invention, this object is

achieved by means of a method and a plant for implementing the method having the specific characteristics recited in the following claims.

**[0011]** Advantages and characteristics of the present invention will become clear from the following detailed description, provided by way of non-limiting example, with reference to the appended drawing, in which the single figure is a schematic representation of a plant for implementing a drying method according to the invention.

**[0012]** A furnace for the fusion of metals has walls 10 made of refractory material covered externally by metal plates 12. The walls 10 define an internal chamber 14 for holding the metal 16.

**[0013]** A duct for the supply of substantially dry gas is indicated 18; a plurality of outlet tubes 20 branch from the duct 18 and open in respective holes 22 formed in the covering plates 12 at the lowest points of the walls 10. The holes 22 and the associated ends of the outlet tubes 20 advantageously have complementary threads (not visible in the drawing) to permit a leaktight connection.

**[0014]** The gas is, for example, air, argon, nitrogen or carbon dioxide and may be supplied, in known manner, from bottles or suitable circuits. Again in known manner, the supply duct 18 has means, generally indicated 24, for regulating the gas-flow, such as valves, pressure reducers, or the like.

**[0015]** Before the loading of the metal 16 into the chamber 14 is started, the furnace is subjected to a drying process by the continuous supply of dry gas into the walls 10, from the duct 18 and from the tubes 20, and at a pressure preferably of between 0.5 and 1.5 bar. Since the gas is introduced at the lowest points of the walls 10, it passes through substantially the entire extent of the walls, penetrating the pores of the refractory material, and removes the moisture contained therein, including that which is chemically bound.

**[0016]** The time required to reduce the moisture present to negligible levels or at least to levels which are not such as to compromise the quality of the metal 16 treated is of the order of two weeks, in comparison with the three months required by conventional drying methods.

**[0017]** These values relate to the drying of a new furnace or, in any case, of a furnace which has been inactive for a long time. Naturally, similar methods may also be implemented after short shutdowns of the furnace, for example, for maintenance operations, requiring markedly shorter times to reduce the moisture ratio to the required value. Alternatively, if compatible with other requirements, the introduction of dry gas through the walls 10 may continue without interruption during these short shutdowns so that there is no increase in the moisture ratio and production activity can start again immediately, without loss of time due to the need to perform a further drying process.

**[0018]** Gas is advantageously also introduced dur-

ing the operation of the furnace. In this case, the gas which continues to flow through the walls 10 emerges from the walls by passing through and above the bath of molten metal 16 in order then to leave the furnace through an opening schematically indicated 26 which may, for example, be formed in a loading door.

**[0019]** As well as continuing to keep the walls 10 free of water by removing the moisture which tends to infiltrate into them from outside, the gas thus also removes any traces of moisture contained in the metal 16, as well as the chemical elements resulting from decomposition of moisture. This ensures that the metal 16 remains free of damaging impurities, without the need to perform specific degassing procedures.

**[0020]** Naturally, the principle of the invention remaining the same, the details of construction and forms of embodiment may be varied widely with respect to those described purely by way of example, without thereby departing from its scope.

### Claims

1. A method of drying a furnace having walls (10) made of refractory material, particularly for the fusion of metals (16), the method being characterized in that it provides for a flow of substantially dry gas to be introduced into the walls (10) and to be caused to flow through the walls (10) so as to remove the moisture contained therein.
2. A method according to Claim 1, characterized in that the gas is introduced at the lowest points of the walls (10).
3. A method according to any one of the preceding claims, characterized in that the gas is selected from the group consisting of air, argon, nitrogen and carbon dioxide.
4. A method according to any one of the preceding claims, characterized in that the gas is introduced at a pressure of between 0.5 and 1.5 bar.
5. A method according to any one of the preceding claims, characterized in that it is performed before the introduction of the metal (16) into the furnace.
6. A method according to any one of the preceding claims, characterized in that it is performed after the introduction of the metal (16) into the furnace, during the operation thereof, so that the flow of gas emerging from the walls (10) flows above and through the molten metal (16), removing the moisture contained therein, as well as the atomic elements resulting from decomposition of the moisture.
7. A plant for implementing a method of drying a fur-

nace, particularly for the fusion of metals (16), characterized in that it comprises a duct (18) for the supply of substantially dry gas, at least one outlet tube (20) branching from the duct and opening into a respective hole (22) formed in the walls (10) of the furnace.

8. A plant according to Claim 7, characterized in that the hole (22) is formed in a metal plate (12) covering the outside of the walls (10) of refractory material.
9. A plant according to any one of preceding claims 7 to 8, characterized in that the hole (22) is formed at the lowest point of the walls (10) of the furnace.
10. A plant according to any one of preceding claims 7 to 9, characterized in that the supply duct (18) is provided with means (24) for regulating the gas-flow.

