

18



Europäisches Patentamt
European Patent Office
Office européen des brevets

11 Publication number:

**0 074 988
B1**

12

EUROPEAN PATENT SPECIFICATION

- 45 Date of publication of patent specification: **21.08.85**
- 71 Application number: **82900977.8**
- 72 Date of filing: **01.04.82**
- 86 International application number:
PCT/GB82/00102
- 87 International publication number:
WO 82/03349 14.10.82 Gazette 82/25
- 51 Int. Cl.⁴: **B 22 D 41/10, B 23 B 3/00**

54 **IMPROVED MONOBLOCK ONE-PIECE POURING STOPPER.**

38 Priority: **01.04.81 GB 8110120**

43 Date of publication of application:
30.03.83 Bulletin 83/13

45 Publication of the grant of the patent:
21.08.85 Bulletin 85/34

84 Designated Contracting States:
AT BE CH DE FR LI LU NL SE

56 References cited:
**DE-A-2 228 815
FR-A-2 292 542
FR-A-2 367 555
FR-A-2 464 769
US-A-3 632 026**

73 Proprietor: **THORNTON, James Menzies Thor
Ceramics Limited
P.O. Box 3 Stanford Street
Clydebank G81 1RW Dunbartonshire (GB)**

72 Inventor: **THORNTON, James Menzies Thor
Ceramics Limited
P.O. Box 3 Stanford Street
Clydebank G81 1RW Dunbartonshire (GB)**

74 Representative: **Wotherspoon, Graham et al
FITZPATRICKS 4 West Regent Street
Glasgow G2 1RS Scotland (GB)**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European patent convention).

Courier Press, Leamington Spa, England.

EP 0 074 988 B1

Description

This invention relates to monoblock one-piece pouring stoppers which are used as valve closures to control the outflow of molten metal through bottom pouring nozzles in foundry ladles or tun dishes in the iron and steel industry.

Each monoblock pouring stopper is made from a refractory material such as graphitized alumina or clay graphite.

These stoppers have been made in 2 pieces i.e. an extruded clay graphite body with a screwed on nose cap, which could have a different composition to improve wear resistance.

In use the nose caps wear quickly due to erosion by the pressure of the outflowing melt through the nozzle of the tun dish or ladle and it has been proposed to improve the wear characteristics of the nose cap by the addition of fused or calcined alumina to the refractory mix formula.

Another type of monoblock pouring stopper has been developed which is formed in one-piece by an isostatic pressing of graphitized alumina.

However the effective life of this stopper is also shortened by erosion at the tip of the stopper.

This necessitates removal of the stopper and reshaping and grinding of the tip in order to provide a good mating seal with the pouring nozzle in a ladle or tun dish.

In the modern continuous casting plants this interruption in production not only wastes time but also fuel due to the cooling to allow removal of the stopper and subsequent reheating required to attain operating temperatures when the stopper is replaced.

In French Patent No. 2292542 there is disclosed a corrosion-resistant stopper or nozzle which is wholly composed of a zirconium sand in admixture with natural graphite and silicon. The stopper or nozzle is manufactured by the isostatic pressing method.

It is an object of the present invention to obviate or mitigate the aforesaid disadvantages.

According to the present invention there is provided a one-piece monoblock stopper having a body formed from a refractory material and a foundry resin and an integral armoured nose portion comprising a higher refractory material selected from calcined alumina, fused alumina, magnesite and zirconia bound with a foundry resin.

The most preferred higher refractory additive material is stabilised or unstabilised zirconia.

Further according to the present invention there is provided a method of manufacturing a one-piece monoblock stopper by moulding the stopper from a refractory material and a foundry resin binder in a mould, compressing the contents of the mould by an isostatic process and firing the compressed contents to form a one-piece monoblock stopper, characterised in that said method includes the step of providing at the noseforming region of the mould a quantity of a higher refractory material selected from calcined alumina, fused alumina, magnesite and zirconia, together

with a foundry resin binder so as to form, after compressing and firing a stopper having an integral armoured nose portion.

Preferably the mould is an isostatic pressing mould and compression of the contents thereof is effected by an isostatic pressing apparatus.

Most preferably, the method comprises charging the isostatic pressing mould with graphitized alumina bonded with a foundry type resin to a level short of the full capacity of the mould and filling the remaining volume with a mix of zirconia and a foundry resin as bonding agent.

A preferred embodiment of this invention will now be described by way of example with reference to the accompanying drawing in which a monoblock stopper is illustrated mounted in an operational position above a pouring nozzle of a tun-dish.

A one-piece monoblock pouring stopper according to this embodiment of the invention is formed by a high intensity mixing of graphite and alumina powder together with foundry resin as bonding agent to form a homogeneous mix and charging the mix to a normal isostatic pressing mould to a level short of the full capacity of the mould.

A graded batch of zirconia together with a phenolic resin bonding agent, optionally including other minor ingredients such as graphite, is blended in a high intensity mixer to form a homogeneous blend and the blend is added to the mould to fill the remaining volume.

The mould is sealed and immersed in water and subjected to isostatic pressing. The compressed contents of the mould are then fired to form a one-piece monoblock stopper provided with an integral armoured nose portion of zirconia which is more highly resistant to erosion. Thus such a stopper has an extended working life.

In use a one-piece monoblock stopper 1 having an armoured nose portion 2 is fixed by conventional means to a cross arm control member 3 above the pouring nozzle 4 of a tun-dish 5.

By raising or lowering of the control member 3 the armoured nose portion 2 of the stopper 1 increases or reduces the outflow volume of molten metal 6 through the pouring nozzle 4 into a continuous casting mould 7 wherein the molten metal begins to solidify to a mass 8 suitable for subsequent rolling.

The aperture 9, allows the optional step of injection of argon gas through the stopper into the metal, may not be present in other embodiments so as to leave a thick solid armoured nose. This solid coating is advantageous in cases of severe wear.

Claims

1. A method of manufacturing a one piece monoblock stopper (1) by moulding the stopper (1) from a refractory material and a foundry resin binder in a mould, compressing the contents of the mould by an isostatic process and firing the compressed contents to form a one-piece mono-

block stopper (1), characterised in that said method includes the step of providing at the nose-forming region of the mould a quantity of a higher refractory material selected from calcined alumina, fused alumina, magnesite and zirconia, together with a foundry resin binder so as to form, after compressing and firing a stopper having an integral armoured nose portion (2).

2. A method according to claim 1, wherein the mould is an isostatic pressing mould and compression of the contents thereof is effected by an isostatic pressing apparatus.

3. A method according to claim 2, wherein the isostatic pressing mould is charged with graphitized alumina bonded with a foundry type resin to a level short of the full capacity of the mould and the remaining volume is filled with a mix of zirconia and a foundry resin as bonding agent.

4. A one-piece monoblock stopper (1) having a body formed from a refractory material and foundry resin and an integral armoured nose portion (2) comprising a higher refractory material selected from calcined alumina, fused alumina, magnesite and zirconia, bound with a foundry resin.

5. A stopper according to claim 4 wherein the nose portion comprises stabilized or unstabilized zirconia bound with a foundry resin.

6. A stopper according to claim 4 or 5 wherein the nose of the stopper is provided with an aperture (9).

Patentansprüche

1. Verfahren zum Herstellen einer einteiligen, einen Block bildenden Stopfenstange (1) durch Formen der Stopfenstange (1) aus einem hitzebeständigen Material und einem Gießharz-Bindemittel in einer Form, Pressen des Inhaltes der Form in einem isostatischen Verfahren und Brennen des gepreßten Forminhaltes zu einer einteiligen Stopfenstange (1) dadurch gekennzeichnet, daß das Verfahren den Schritt umfaßt, in den die Nase der Stopfenstange ausformenden Bereich der Form eine Menge höher hitzebeständigen Materials, das aus kalziniertem Aluminium, geschmolzenem Aluminium, Magnesit und Zirkonerde ausgewählt ist, gemeinsam mit einem Gießharz-Bindemittel einzubringen, so daß eine Stopfenstange geformt wird, die nach dem Pressen und Brennen einen einteiligen, armierten Nasenbereich aufweist.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Form eine isostatische Preßform ist und ihr Inhalt mittels einer isostatischen Preßeinrichtung komprimiert wird.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß die isostatische Preßform mit durch ein Harz vom Gießharztyp gebundenem, graphitiertem Aluminium bis zu einer knapp unter dem vollen Fassungsvermögen der Form liegenden Füllhöhe beschickt und das verbleibende Form-

volumen mit einer Mischung aus Zirkonerde und einem Gießharz als Bindemittel gefüllt wird.

4. Einteilige, einen Block bildende Stopfenstange (1) mit einem aus hitzebeständigem Material und einem Gießharz geformten Körper und einem einteiligen armierten Nasenbereich (2), der ein höher hitzebeständiges Material enthält, das aus kalziniertem Aluminium, geschmolzenem Aluminium, Magnesit und Zirkonerde ausgewählt und durch ein Gießharz gebunden ist.

5. Stopfenstange nach Anspruch 4, dadurch gekennzeichnet, daß der Nasenbereich stabilisierte oder unstabilisierte Zirkonerde enthält, die durch ein Gießharz gebunden ist.

6. Stopfenstange nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß die Nase der Stopfenstange mit einer Öffnung (9) versehen ist.

Revendications

1. Procédé de fabrication d'un tampon monobloc en une seule pièce (1) par moulage du tampon (1) à partir d'un matériau réfractaire et d'un liant constitué par une résine de fonderie dans un moule, compression du contenu du moule par un procédé isostatique et cuisson du contenu comprimé pour former un tampon monobloc en une pièce (1), caractérisé en ce que ledit procédé comprend une étape de fourniture, dans la zone de formage de l'extrémité du tampon, d'une quantité d'un matériau plus réfractaire, choisi parmi les alumine calcinée, alumine fondue, magnésite et zircone, avec un liant constitué par une résine de fonderie de manière à former, après compression et cuisson, un tampon ayant une portion terminale blindée d'un seul tenant (2).

2. Procédé suivant la revendication 1, selon lequel le moule est un moule de compression isostatique et la compression du contenu du moule est effectuée par un appareil de compression isostatique.

3. Procédé suivant la revendication 2, selon lequel le moule de compression isostatique est chargé avec de l'alumine graphitée liée avec une résine de type fonderie à un niveau proche de la capacité totale du moule et en ce que le reste du volume est rempli avec un mélange de zircone et de résine de fonderie comme agent liant.

4. Tampon monobloc d'un seul tenant (1) ayant un corps formé à partir d'un matériau réfractaire et d'une résine de fonderie, et une portion terminale blindée d'un seul tenant (2) comprenant un matériau plus réfractaire choisi parmi les alumine calcinée, alumine fondue, magnésite et zircone, lié avec une résine de fonderie.

5. Tampon suivant la revendication 4, dans lequel la portion terminale comprend de la zircone stabilisée ou non stabilisée, liée avec une résine de fonderie.

6. Tampon suivant la revendication 4 ou la revendication 5, dans lequel la partie terminale du tampon présente une ouverture (9).

0 074 988

