COMMONWEALTH OF AUSTRALIA

Patents Act 1952

P/00/001
Form 1
Regulation 9

APPLICATION FOR A STANDARD PATENT OR A STANDARD PATENT OF ADDITION

592994

Insert full name(s) of applicant(s)

(71) I/We HOESCH STAHL AKTIENGESELLSCHAFT

Insert address(es) of applicant(s)

of Rheinische Strasse 173, 4600 Dortmund 1, West Germany

Insert title of invention

(54) hereby apply for the grant of a ☑ standard patent ☐ patent of addition for an invention entitled APPARATUS FOR TEMPERATURE MEASUREMENT IN A CONVERTER

(tick appropriate box)

which is described in the accompanying ☐ provisional ☑ complete specification.

Insert name of actual inventor

(72) The actual inventor(s) of the said invention ~~is~~/are FRITZ MEININGHAUS, GERHARD MULLER, WILHELM TAPPE and HERMANN JOSEF KOPINECK

Insert address for service of notices in Australia

(74) My/our address for service is SANDERCOCK, SMITH & BEADLE, 207 Riversdale Road, (P.O. Box 410) Hawthorn, Victoria, 3122 Attorney Code SA

PATENT OFFICE
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- 8 JUN 86
Collector of Public Moneys

for Convention cases only

(ONLY TO BE USED IN THE CASE OF A CONVENTION APPLICATION)

Details of basic application(s) –

NUMBER	COUNTRY	DATE OF APPLICATION	ISO Code
P 35 21 190.3	West Germany	13 June, 1985	DE

APPLICATION ACCEPTED AND AMENDMENTS
17-11-89

Insert day, month and year form signed

Dated this 11th day of June, 19 86

Signature of applicant or Australian attorney

TO HOESCH STAHL AKTIENGESELLSCHAFT

(Signature)

SANDERCOCK, SMITH & BEADLE

THE COMMISSIONER OF PATENTS

This form must be accompanied by either a provisional specification (Form 9 and true copy) or by a complete specification (Form 10 and true copy).

Forms 7 and 8

AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

Name(s) of Applicant(s)

In support of the application made by HOESCH STAHL AKTIENGESELLSCHAFT

Title

for a patent for an invention entitled

Name(s) and address(es) of person(s) making declaration

~~I~~/We, Joachim Koenitzer and Knut Consemuller of Rheinische Strasse 173, 4600 Dortmund 1, West Germany

do solemnly and sincerely declare as follows:-

1. ~~I am~~/we are ~~the applicant(s) for the patent, or am/are~~ authorised by the abovementioned applicant to make this declaration on its behalf.

2. The basic application(~~s~~) as defined by Section 141 of the Act was/~~were~~ made in the following country or countries on the following date(~~s~~) by the following applicant(~~s~~) namely:-

Country, filing date and name of Applicant(s) for the or each basic application

in West Germany on 13 June 19 85
by Hoesch Stahl Aktiengesellschaft
in ____ on ____ 19 ____
by ____

3. The said basic application(~~s~~) was/~~were~~ the first application(~~s~~) made in a Convention country in respect of the invention the subject of the application.

Name(s) and address(es) of the or each actual inventor

4. The actual inventor(s) of the said invention ~~is~~/are Fritz MEININGHAUS of Helenenbergweg 28, 4600 Dortmund 50; Gerhard MULLER of Grabenstrasse 26, 4690 Herne 1, Wilhelm TAPPE of Wulfskamp 23, 4600 Dortmund 16; Hermann Josef KOPINECK of Wildbann-Weg 36, 46-0 Dortmund 50; all in West Germany

See reverse side of this form for guidance in completing this part

5. The facts upon which the applicant(~~s~~) is/~~are~~ entitled to make this application are as follows:-

Applicant is assignee of inventors

DECLARED at Dortmund this ____ day of 02.05. 19 86

HOESCH STAHL AKTIENGESELLSCHAFT
Joachim KOENITZER Knut CONSEMÜLLER

This form may be completed and filed after the filing of a patent application but the form must not be signed until after it has been completely filled in as indicated by the marginal notes. The place and date of signing must be filled in. Company stamps or seals should not be used.

PF/Dec/3/75 **No legalisation is necessary**

(12) PATENT ABRIDGMENT (11) Document No. AU-B-58579/86
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 592994

(54) Title
TEMPERATURE MEASUREMENT IN A CONVERTOR

International Patent Classification(s)
(51)[4] **G01J 005/02** **G01J 005/06**

(21) Application No. : **58579/86** (22) Application Date : **12.06.86**

(30) Priority Data

(31) Number (32) Date (33) Country
3521190 **13.06.85** **DE FEDERAL REPUBLIC OF GERMANY**

(43) Publication Date : **18.12.86**

(44) Publication Date of Accepted Application : **01.02.90**

(71) Applicant(s)
HOESCH STAHL AKTIENGESELLSCHAFT

(72) Inventor(s)
FRITZ MEININGHAUS; GERHARD MULLER; WILHELM TAPPE; HERMANN JOSEF KOPINECK

(74) Attorney or Agent
SMITH SHELSTON BEADLE MELBOURNE

(56) Prior Art Documents
AU 8022[illegible]/82 G01J 5/04
AU 568720 38514/85 G01J 5/02

(57) Claim

1. Apparatus for measuring the radiation in a converter with a radiation measuring instrument, said radiation measuring instrument being connected at one end of a rectilinearly extending passage for receiving the radiation incident through the passage, whilst the other end of the passage opens into liquid steel melt in said converter, and at said ~~outer~~ other end an inert or reaction-poor gas or gas mixture flows under excess pressure into said steel melt, the passage leading either through a lance adapted to be dipped from above into the steel melt, or through the wall or the bottom of the converter, the passage having at least at the end opening into the steel ~~metal~~ melt a cross-sectional area which is not greater than 1 cm^2, there

being a gas or gas mixture discharge speed, said discharge speed being so large that per minute at least 10 grams with respect to a cross-sectional area of 1 mm^2 flow out.

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Form 10

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COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Class Int. Class

Application Number: 5857 9/86.
Lodged:

This document contains the amendments made under Section 49.

and is correct for printing.

Complete Specification—Lodged:
Accepted:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: HOESCH STAHL AKTIENGESELLSCHAFT

Address of Applicant: Rheinische Strasse 173, 4600 Dortmund 1, West Germany

Actual Inventor: FRITZ MEININGHAUS, WILHELM TAPPE, GERHARD MULLER, HERMANN JOSEF KOPINECK

Address for Service: SANDERCOCK, SMITH & READLE
207 Riversdale Road, (P.O. Box 410)
Hawthorn, Victoria, 3122

Complete Specification for the invention entitled:

APPARATUS FOR TEMPERATURE MEASUREMENT IN A CONVERTER

The following statement is a full description of this invention, including the best method of performing it known to me:—

The invention relates to an apparatus for the continuous measurement of the temperature of the steel melt of a converter with the aid of a radiation measuring instrument. The determination of the temperature is of decisive importance for the control and termination of the blowing process. Hitherto, the exact temperature in converters could be determined only with the aid of a thermocouple which with a lance is briefly dipped into the steel melt. The thermocouple can be used only for a few seconds and is destroyed by the high temperature after 10 seconds at the latest. For each measurement a new thermocouple must be attached to the lance. Because of this expenditure the temperature during blasting or blowing is measured only at relatively long intervals.

A contactless measurement of the temperature with the aid of a radiation meter is not possible because floating on the steel melt is a thick layer of slag whose surface temperature is lower than the temperature of the steel melt and in addition the measurement is falsified also by dust and hot waste gases.

German patent 1,066,039 and German patent application 2,138,540 disclose a tubular lance or a bore passing through the wall of the melting crucible to which instead of a spectrometer in obvious manner a pyrometer measuring the thermal radiation of the liquid melt could be connected. Such a device could however only be used for melt crucibles with calm liquid. It would be completely unsuitable for use in a converter because by the blasting operation fluid movements occur in surges due to which the liquid steel penetrates into the bore of relatively large diameter and clogs therein when solidified. This can also not be prevented by increasing the flow rate of the inert gas because the gas then cools down the region of the

mouth of the bore to an even greater extent and there is an even greater tendency for solidified melt to clog therein.

In addition, the cooling gas would also cool the melt directly in front of the bore and this would falsify the measurement.

The problem underlying the invention is to design a passage projecting into the melt with built-in radiation measuring instrument in such a manner that this apparatus can also be used in a blasting converter and no solidifying melt settles at the mouth of the passage and the cooling effect of the inert gas on the melt does not lead to any measurement errors.

The invention provides apparatus for measuring the radiation in a converter with a radiation measuring instrument, said radiation measuring instrument being connected at one end of a rectilinearly extending passage for receiving the radiation incident through the passage, whilst the other end of the passage opens into liquid steel melt in said converter, and at said other ~~outer~~ end an inert or reaction-poor gas or gas mixture flows under excess pressure into said steel melt, the passage leading either through a lance adapted to be dipped from above into the steel melt, or through the wall or the bottom of the converter, the passage having at least at the end opening into the steel ~~metal~~ melt a cross-sectional area which is not greater than 1 cm^2, there being a gas or gas mixture discharge speed, said discharge speed being so large that per minute at least 10 grams with respect to a cross-sectional area of 1 mm^2 flow out.

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Preferably, a radiation pyrometer is provided as said radiation measuring instrument, in particular a quotient or partial beam pyrometer.

Preferably, in the thicker portion of the passage an optical waveguide is disposed at the start of which a convergent lens is arranged and said optical system is aligned with the opening cross-section of the passage, shutting out the edge regions, and the optical waveguide is led through a fitting out of the supply line for the gas or gas mixture and to the radiation measuring instrument.

The invention also provides a method of operating the apparatus of the previous paragraph, wherein the apparatus is calibrated at relatively large intervals of time by comparisons with a conventional immersion temperature measurement.

It has been surprisingly found that small nozzles with high flow rate of the cooling gas are suitable for the measurement. Presumably, turbulence of the liquid directly in front of the nozzle ensures that the particles struck or cooled by the gas are largely surrounded by uncooled particles and consequently the radiation incident into the passage depends mainly on the uncooled particles. Due to the turbulence in front of the nozzle the solidifying parts of the steel melt cannot settle because they are torn away from the edge of the nozzle and blown back into the steel melt.

The temperature can be determined with a single measuring device at various points of the melt bath and at various heights of the melt bath if the apparatus is

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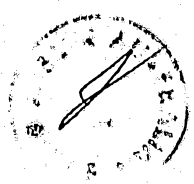
attached to a lance which is introduceable from above into the melt bath and contains a passage for the radiation to be measured.



Advantageously, the passage for the measurement leads through the bottom of a converter into which "agitating gas nozzles" are built. The passage for the measurement may itself act as "agitating gas nozzle". It may however also be operated with a lower gas speed than the "agitating gas nozzles" if in its vicinity agitating gas nozzles are installed which ensure adequate agitation of the melt in the region of the passage to be measured as well.

Because of the very small diameter and the long length of the passage it is difficult to receive adequate radiation from the melt at the pyrometer. For this reason, advantageously the radiation is received through a lens which is installed approximately one third of the thickness of the converter wall from the outer surface in the passage, somewhat widened at this point, and conducts the radiation via an optical waveguide to the pyrometer which is disposed outside the converter. The diameter of the optical lens and the optical waveguide should only be of such magnitude that the remaining free flow area is greater or equal to the cross-sectional area of the thinner portion of the passage.

In the Figure an example of embodiment of the invention is illustrated, only the bottom 11 and the lower portion of the side wall 12 of the converter being shown. Indicated in the bottom 11 are the agitating gas nozzles 13, 14 and 15 which receive the inert gas from the manifold tube 16. The agitating gas nozzle 14 serves at the same time as passage for passage of radiation to the pyrometer 17. The radiation is incident firstly on the lens 18 and from there radiated into the optical waveguide 19 which conducts the radiation to the pyrometer 17. The optical waveguide 19 leaves the manifold tube subjected to gas pressure at a bore which is sealed by a seal 20.

In a somewhat poorer embodiment the radiation measurement would still be possible if the lens 18 and the optical waveguide 19 were omitted instead of the seal 20 a transparent window is provided and the pyrometer 17 installed directly beneath the window.

The passage 14 with the radiation measuring instrument may be incorporated in another embodiment also in a lance adapted to be dipped from above into the steel melt.

The claims form part of the disclosure of this specification.

converter with a radiation measuring instrument, said radiation measuring instrument being connected at one end of a rectilinearly extending passage for receiving the radiation incident through the passage, whilst the other end of the passage opens into liquid steel melt in said converter, and at said ~~outer~~ other end an inert or reaction-poor gas or gas mixture flows under excess pressure into said steel melt, the passage leading either through a lance adapted to be dipped from above into the steel melt, or through the wall or the bottom of the converter, the passage having at least at the end opening into the steel ~~metal~~ melt a cross-sectional area which is not greater than 1 cm^2, there being a gas or gas mixture discharge speed, said discharge speed being so large that per minute at least 10 grams with respect to a cross-sectional area of 1 mm^2 flow out.

2. Apparatus according to claim 1, wherein the passage consists of a thin portion which faces the melt and said thin portion makes up about 50% to 70% of the total passage length and consists of a bore having a diameter of 4 - 8 mm and the remaining portion of the passage has a diameter between 7 and 12 mm.

3. Apparatus according to claim 1 or claim 2, wherein in the vicinity of the passage with connected radiation measuring instrument in the bottom of the converter at least 2 further nozzles are disposed for introduction of an agitating gas.

4. Apparatus according to any preceding claim,

wherein a radiation pyrometer is provided as said radiation measuring instrument, in particular a quotient or partial beam pyrometer.

5. Apparatus according to any preceding claim, wherein in the thicker portion of the passage an optical waveguide is disposed at the start of which a convergent lens is arranged and said optical system is aligned with the opening cross-section of the passage, shutting out the edge regions, and the optical waveguide is led through a fitting out of the supply line for the gas or gas mixture and to the radiation measuring instrument.

6. Apparatus according to any preceding claim, wherein the inert gas glows into the traversed passage at a pressure higher than 5 bar.

7. A method of operating the apparatus for temperature measurement according to any one of claims 1 to 6, wherein the apparatus is calibrated at relatively large intervals of time by comparisons with a conventional immersion temperature measurement.

8. Apparatus for measuring the radiation in a converter, substantially as herein described with reference to the accompanying drawings.

9. A method of measuring the radiation in a converter, substantially as herein described.

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DATED THIS 6th November, 1989

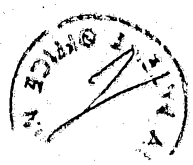
SMITH SHELSTON BEADLE

Fellows Institute of Patent

Attorneys of Australia.

Patent Attorneys for the Applicant

HOESCH STAHL AKTIENGESELLSCHAFT



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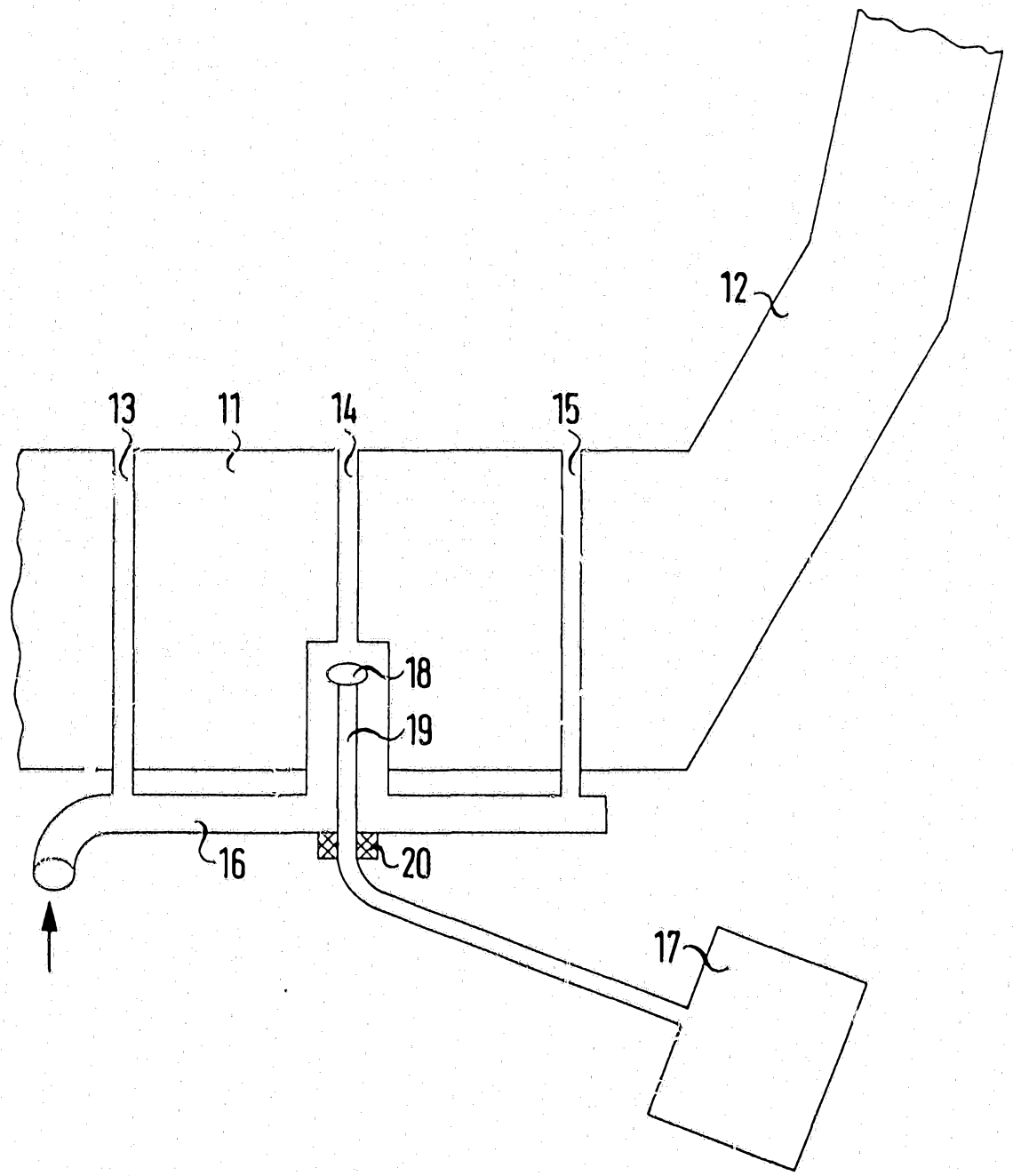
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