

Convention Application for a Patent

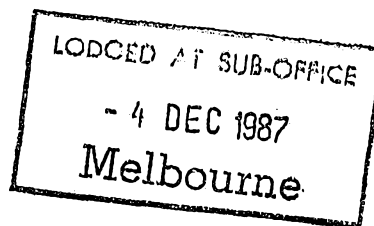
We, PAUL WURTH S.A.,

of 32 rue d'Alsace, L-1122 Luxembourg,
Grand Duchy of Luxembourg

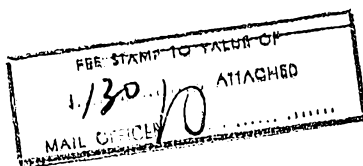
hereby apply for the grant of a Patent

for an invention entitled "PROCESS FOR INJECTING, BY PNEUMATIC MEANS, METERED QUANTITIES OF PULVERULENT MATERIAL INTO A CHAMBER WHICH IS UNDER VARIABLE PRESSURE"

which is described in the accompanying complete specification.



This application is a Convention application and is based on the application numbered 86 701 for a patent or similar protection made in Grand Duchy of Luxembourg on 4th December, 1986.



APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 21-8-90

CALLINANS

Our address for service is: ~~CALLINANS ASSOCIATES~~ Patent Attorneys, of
48-50 Bridge Road, Richmond, State of Victoria, Australia.

Dated this 4th day of December, 1987.

PAUL WURTH S.A.

By its Patent Attorneys:

CALLINANS

To The Commissioner of Patents.

AUSTRALIA
Patents Act 1952-1973

Regulation 11 (1)
Regulation 11 (2)

Declaration in Support of
(a) A Convention Application
~~(b) An Application~~
for a Patent ~~or Patent of Addition~~

Delete for Non-Convention Application.

Delete for Convention Application.

Insert Full Name of Applicant.

In support of the ~~Application~~/Convention Application made by

(c) PAUL WURTH S.A., hereinafter termed "the said Company"

for a patent/~~patent of addition~~ for an invention entitled:

Insert Title of Invention.

"PROCESS FOR INJECTING, BY PNEUMATIC MEANS,
(d) METERED QUANTITIES OF PULVERULENT MATERIAL INTO A CHAMBER WHICH IS UNDER VARIABLE PRESSURE".

Insert Full Names of Declarant(s).

~~We~~ (e) RENÉ STREFF and RENÉ MAHR, both

Insert Address(es) of Declarant(s).

(f) 32 rue d'Alsace, L-1122 Luxembourg, Grand Duchy of Luxembourg

do solemnly and sincerely declare as follows:—

Delete when Applicant is a Company.

1. (g) ~~I am/we are the applicant(s) for the patent/patent of addition~~

Delete when Applicant is an Individual. Fill in Name of Applicant, if a Company.

(h) ~~I am/we are authorised by the said Company~~

the applicant for the patent/~~patent of addition~~ to make this declaration on its behalf.

For Non-Convention Application, delete. For Convention Application, fill in details of basic application.

2. (i) The basic application(s) as defined by Section 141 of the Act was/~~were~~ made in Luxembourg on the 4th day of December, 1986 by the said Company.

Delete for Non-Convention Application by Assignee of Inventor and for Convention Application.

3. (j) ~~I am/we are the actual inventor(s) of the invention~~

Delete for Non-Convention Application by Inventor and for Convention Application by Assignee.

(k) ~~I am/we are the actual inventor(s) of the invention referred to in the basic application~~

LOUIS SCHMIT, of 39 rue Theodore Eberhardt, L-Luxembourg, Grand Duchy of Luxembourg; RADOMIR ANDONOV, of 5 rue Belle-Vue, L-Mamer, Luxembourg, Grand Duchy of Luxembourg; and HANS-KLAUS SCHOTT, of Beethovenstrasse 3a, D-4220 Dinslaken, Federal Republic of Germany

Delete for Application by Inventor. For Application by Assignee, insert name, address and occupation of Inventor.

(l)

~~of~~

~~is~~/are the actual inventor(s) of the invention and the facts upon which

~~I am/we are~~/the said Company is entitled to make the application are as follows:

the said Company would, if a patent was to be granted upon an application made by inventors Schmit and Andonov, (m) be entitled to have the patent assigned to it; and the said Company is the assignee of rights to the said invention from inventor Schott.

Insert details of Assignment, etc. Date of Assignment only is insufficient.

Delete for Non-Convention Application.

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Insert place and date of signature.

(n) Declared at Luxembourg this 13 day of November 19 87

SIGN

PAUL WURTH S.A.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-82088/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 603162

(54) Title
PROCESS FOR INJECTING, BY PNEUMATIC MEANS, METERED QUANTITIES OF
PULVERULENT MATERIAL INTO A CHAMBER WHICH IS UNDER VARIABLE PRESSURE

International Patent Classification(s)
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(56) Prior Art Documents
EP 59904
EP 235562
AU 571547 30802/84 F23K 3/02

(57) Claim
1. The process for injecting, by pneumatic means, metered quantities of pulverulent material at different points into a chamber which is under variable pressure, according to which a pneumatic mixture comprising a relatively high content of pulverulent material in a propellant gas is formed in a single metering device and this mixture is propelled through a common primary conduit as far as a distribution head in which the mixture is divided into secondary currents which are each sent through secondary conduits to one of the injection points, wherein the flow rate of said pneumatic means is regulated in each of said secondary conduits, said regulation being carried out at a variable throttle section in each of said secondary conduits.

2. The process according to claim 1, wherein the pressure at said variable throttle sections is decreased to the extent required to accelerate the current up to the speed of sound.

603162

Australia

PATENTS ACT 1952

Form 10

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:

Lodged:

Complete Specification—Lodged:

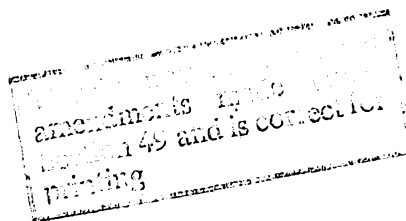
Accepted:

Lapsed:

Published:

Priority:

Related Art:



TO BE COMPLETED BY APPLICANT

Name of Applicant:

PAUL WURTH S.A.

Address of Applicant:

32 rue d'Alsace, L-1122 Luxembourg,
Grand Duchy of Luxembourg.

Actual Inventor:

LOUIS SCHMIT, RADOMIR ANDONOV and HANS-KLAUS SCHOTT.

Address for Service:

CALLINANS [REDACTED], Patent Attorneys, of
48-50 Bridge Road, Richmond, State of Victoria, Australia.

Complete Specification for the invention entitled: "PROCESS FOR INJECTING, BY PNEUMATIC MEANS, METERED QUANTITIES OF PULVERULENT MATERIAL INTO A CHAMBER WHICH IS UNDER VARIABLE PRESSURE".

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

* Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

Process for injecting, by pneumatic means, metered quantities of pulverulent material into a chamber which is under variable pressure

5 The present invention relates to a process for injecting, by pneumatic means, metered quantities of pulverulent material at different points ^{into} ~~in~~ a chamber which is under variable pressure, according to which a pneumatic mixture comprising a relatively high content of pulverulent material in a propellant gas is formed in
10 a single metering device and this mixture is propelled through a common primary conduit as far as a distribution head in which the mixture is divided into secondary currents which are each sent through secondary conduits
15 to one of the injection points.

 The invention will be described more particularly with reference to its preferred application, while not being limited to it, this preferred application being the injection of solid combustible materials, especially powdered coal, into an industrial furnace such as a blast
20 furnace.

 The known processes and installations for injecting solid combustible materials into a shaft-furnace are classified essentially into two different types. The first
25 functions with relatively "dilute" pneumatic currents, whereas in the second the pneumatic currents have a relatively high concentration of powdered coal.

 In installations of the first type, with a dilute current, the powdered coal is released under pressure from a distribution hopper into a series of metering
30 apparatuses, in which the mixture of powdered coal and ^{propellant} ~~propellant~~ gases is formed, and from which the mixture thus formed is conveyed towards the injection points in the shaft-furnace. In these installations, one metering
35 apparatus is generally used for each pipe or for each pair of pipes, with the result that the quantities injected through the pipes can be metered individually. The metering apparatuses used are of a type known per se,



for example metering apparatuses with alveolar rotors or slotted metering apparatuses such as those proposed in European Patent Application No. 0,126,917. These installations have the disadvantage that they require a large number of relatively long conduits between the distribution hopper and the shaft-furnace. In addition, metering can be made difficult by the different variable parameters, especially the fluctuations in pressure inside the furnace.

In the second type of installation, which employs pneumatic currents of high concentration, only a single metering device is used, at or downstream of the distribution hopper. In this metering apparatus, the total flow of the powdered coal is regulated so that a predetermined quantity of powdered coal is injected per unit time. These installations employ the process described in the introduction, i.e. the metered current containing the necessary quantity of coal is divided, in a distribution head, into secondary currents which are identical to one another. These installations have the advantage that the distribution head is placed in the immediate proximity of the furnace, so that the length of the secondary conduits, and consequently the congestion around the furnace, are reduced. In these installations, there is furthermore provided either in the secondary conduits or in the distribution head a throttle section where a drop in pressure necessary for the pneumatic current to accelerate up to the speed of sound is brought about. The acceleration of the pneumatic current up to the speed of sound has the advantage that the flow conditions upstream of the location where the supercritical speed is produced are no longer influenced by the flow conditions downstream of this location. Of course, this gives the great advantage that fluctuations in pressure and other variable parameters within the chamber into which the pulverulent material is injected no longer need to be taken into account. Compared with the first type of installation, the installations working with concentrated current of the type described above



have the disadvantage that it is no longer possible to regulate the flow in each pipe individually.

5 The present invention seeks to provide a process of the type described in the introduction, which combines the advantages of the two known processes.

To achieve this aim, the invention provides an injection process, of the type described in the introduction, wherein the flowrate of the pneumatic means is regulated in each of the secondary conduits, said regulation being
10 carried out at a variable throttle section in which the acceleration of the current up to supercritical speed is also brought about.

The regulation can be carried out manually, or automatically under the control of flowrate detectors provided in each of the secondary conduits.

A preferred embodiment will be described below by way of example,
15 with reference to the single figure which shows, very schematically, a circuit for the pneumatic injection of combustible materials into a shaft-furnace. The pneumatic mixture, consisting of powdered coal and propellant gas, and whose flowrate corresponds to the quantity of coal needed per unit time by the shaft-furnace, is formed in a primary conduit 10 with the aid of a metering device 12,
20 which may be a metering apparatus of the type having mobile slots, or a hopper with pneumatic metering or another type. In this metering apparatus 12 there is formed a pneumatic mixture with a high concentration of coal, which may if necessary be diluted by the addition of a variable quantity of inert gas injected through a conduit 14 upstream of the distributor. This pneumatic mixture is
25 sent to a distribution head 16 of the type recommended in Australian Patent No. 587046. In this distribution head 16, the primary pneumatic current is divided into secondary currents which are each sent through secondary conduits to one of the tuyeres 22 of a blast furnace (not shown).



The number of secondary conduits 18 may, for example, correspond to the number of pipes or to half the number of pipes.

In accordance with the present invention, there
5 is provided in each of the secondary conduits 18 a throttle 20 of variable section. This throttle is preferably constructed with a valve of the type recommended by ^{Australian} ~~Luxembourg~~ Patent Application No. ^{69019/87} ~~86,311~~, i.e. a valve of which the passage is defined by the rotation of a
10 mobile socket inside a fixed socket, the two sockets being provided with openings and slots which can more or less overlap to give a larger or smaller passage. The acceleration of the secondary pneumatic currents is preferably carried out at the throttles 20.

15 The process according to the present invention thus has all the advantages of the system of injection at the speed of sound, i.e. the secondary conduits can be as short as possible in order to reduce congestion around the furnace. Moreover, the metering conditions
20 at the metering apparatus 12 are not affected by fluctuations in pressure downstream of the throttles 20, especially fluctuations in pressure in the shaft-furnace.

The valves 20 can be regulated manually in order to take into account conditions in the furnace. The
25 flowrates through the different secondary conduits 18 are thus established as a function of the openings at the throttles 20, whereas the total quantity of coal injected per unit time is determined by the metering apparatus 12.

The function of the distributor 16 is thus
30 different to that of the distributor proposed in ^{Australian} ~~Luxembourg~~ Patent Application No. ⁵⁸⁷⁰⁴⁶ ~~86,034~~. Whereas, in the latter, the distributor did indeed have a function of distribution, this was also of uniform distribution, i.e. a division such that the same flowrate of coal circulates
35 in each of the secondary conduits. In contrast, in the process according to the present invention the distributor 16 simply serves to divide the primary current into secondary currents, the flowrates of which are variable as a



function of the variable sections of the throttles 20.

It is also possible to measure the flowrate of coal in each of the secondary conduits 18 and to regulate the section of passage of the valves 20 automatically, so
5 that there is an injection flowrate determined at each of the ^{tuyeres} pipes 22. This automatic regulation allows disturbing factors such as, for example, partial obstruction of the secondary conduits 18 or of the passages in the distributor 16 to be compensated or eliminated.



The claims defining the invention are as follows:

1. The process for injecting, by pneumatic means, metered quantities of pulverulent material at different points into a chamber which is under variable pressure, according to which a pneumatic mixture comprising a relatively high content of pulverulent material in a propellant gas is formed in a single metering device and this mixture is propelled through a common primary conduit as far as a distribution head in which the mixture is divided into secondary currents which are each sent through secondary conduits to one of the injection points, wherein the flow rate of said pneumatic means is regulated in each of said secondary conduits, said regulation being carried out at a variable throttle section in each of said secondary conduits.

2. The process according to claim 1, wherein the pressure at said variable throttle sections is decreased to the extent required to accelerate the current up to the speed of sound.

3. The process according to claim 1 or claim 2, wherein said regulation is carried out manually.

4. The process according to claim 1 or claim 2, wherein said regulation is carried out automatically under the control of flowrate detectors provided in each of the secondary conduits.

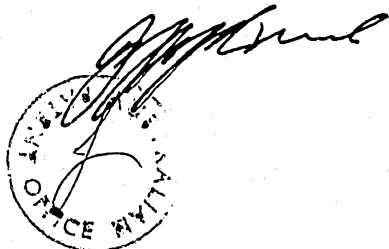
5. A process as claimed in claim 1, substantially as described herein with reference to the accompanying drawings.

DATED the 15th day of August, 1990

PAUL WURTH S.A.

by their Patent Attorneys

CALLINAN LAWRIE



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