(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 070 109**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 82303261.0

(22) Date of filing: 22.06.82

(51) Int. Cl.³: C 21 C 5/46
C 21 C 7/072, C 22 B 9/05
F 27 D 3/16

(30) Priority: 08.07.81 GB 8121113

(43) Date of publication of application:
19.01.83 Bulletin 83/3

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

(71) Applicant: DYSON REFRACTORIES LIMITED
381 Fulwood Road
Sheffield, S10 3GB(GB)

(72) Inventor: Carter, Michael
188 Chapel Road
Chapeltown Sheffield S30 4GA(GB)

(72) Inventor: Hedley, Timothy William
73 Highfields Road
Dronfield Sheffield S18 6UW(GB)

(74) Representative: Houghton, David et al,
Hulse & Co. Cavendish Buildings West Street
Sheffield, S1 1ZZ(GB)

(54) **Injection lances.**

(57) The invention relates to lances for injecting gas or gas/powder mixtures into molten metal. Hitherto, lances have been formed as a long length of metal tube encased in refractory, and any damage to any point along the length usually leads to the scrapping of the whole lance. The object of the invention is to avoid this problem and is met by a construction wherein the metal pipe and the refractory are formed from a number of relatively short lengths (2, 9, 15) with the lengths of pipe being removably secured together such as by a spigot (7) and socket (12) connection.

EP 0 070 109 A1

This invention relates to injection lances of the type used, e.g., in steel production.

In steel production it is usual to inject into a bath of molten metal a gas for stirring so as to homogenise the metal and to achieve temperature equilibrium. In addition powders can be injected, e.g., for desulphurisation. In both cases the gas and/or gas/powder mixture is introduced into the bath via a lance the end of which is inserted through the slag and below the surface of the molten metal.

Currently lances are produced from a metal pipe typically 3 to 6 metres in length protected by an outer refractory coating or cladding, located around the metal pipe. Because of the forces on the lance during use, such as can arise from the turbulence of the molten metal, vibration, thermal stress from rapid heating and cooling, and possibly differential thermal expansion, the coating is prone to shelling and splitting, and in addition there is heavy wear by chemical erosion particularly at the slag line.

It is known in an attempt to minimise the mechanical loss of the coating, to provide a steel pipe with fins to assist in keying the refractory material to the pipe, and it is also known to wrap

the pipe with barbed wire. However only a relatively small amount of refractory is retained by the barbed wire and thus shelling of the coating can still occur thus producing a reduced refractory thickness. Damage at the slag line which can be excessive sometimes necessitates the removal of a complete lance because the coating is a single coating along the full length of the lance.

The object of the present invention is to provide an injection lance that avoids the above disadvantages.

According to the present invention, an injection lance comprises a metal pipe encased in an outer coating or cladding of refractory material, the metal pipe and the refractory coating or cladding being formed from a number of lengths of pipe on each of which is formed a coating or cladding, with the lengths of pipe being removably secured together.

The forming technique can involve moulding, casting or pressing the refractory material around the pipe length. To enable adjacent lengths to be removably secured together, it is preferred for one end of each length of steel pipe to extend beyond its refractory coating or cladding with the other end lying within the refractory material, formed as

a socket. To assist in preventing accidental unscrewing a proprietory locking compound can be applied to the threads of each spigot and socket. Thus with the exposed end externally screw threaded and with the socket internally threaded adjacent lengths can be secured together by screwing the projecting end of the pipe of one length into the embedded socket in an adjacent length, whereby the refractory material of one piece may be brought into firm contact with the refractory material of the adjacent length. If required a thin coating of cement or jointing compound between adjacent lengths can be provided, and when present, a cement of a highly refractory nature can be used.

If required, additional reinforcement e.g., metal spiders, can be provided within the refractory material or the refractory batch can include fibres of a metallic nature.

By virtue of the fact that the lance is formed from a series of lengths, should there be any damage to any part of the lance, e.g., at the slag line then the whole lance need not be replaced. Only the length that has suffered damage need be removed and replaced by a new length. A lance may be formed from a number of lengths and can use different refractory materials at different

sections each chosen to suit the particular conditions in that part of a vessel, e.g., ladle, occupied by the lance, and as a still further alternative, different lengths can have different thicknesses again so that each length can be ideally suited to the service conditions likely to be encountered.

Lances of the invention can be pre-assembled and delivered to the user ready for use. However, transporting relatively long lances can result in damage. It is therefore a still further advantage of the invention that there can be the avoidance of the need to transport long lengths of lance, by transporting the individual lengths which can be assembled very quickly on site.

One embodiment of the invention will now be described with reference to the accompanying drawing which is a longitudinal section through a lance in accordance with the invention.

In the drawing, a lance 1 is formed from a metal pipe encased in a refractory material, whereby the lance can be inserted into a bath of molten metal and a gas or a gas/powder mixture passed down the metal pipe and into the molten metal.

As shown, both the metal pipe and the

encasing refractory of the lance are formed as a number of relatively short lengths. Thus, there is an inlet section 2 having a metal pipe 3 externally threaded over part of its length and whereby the lance can be secured to handling mechanism for the lance. At the unthreaded end section, the pipe 3 has secured to it reinforcement 4 in the form of two inverted V-sections of mesh and is provided with an encasing refractory material 5, the refractory being co-planar with the end of the pipe 3. At that end, the pipe 3 has a screw threaded socket 6, into which is screwed the spigot 7 of a pipe 8 of a second section 9, which again has V-sectioned reinforcing mesh 10 and encasing refractory 11, the spigot 7 lying clear of the refractory, and the refractory lying co-planar with the opposite end of the pipe 8, where a socket 12 is provided. To make up the full length required, as many sections 9 as are necessary can be provided, the socket 12 of the final section receiving the spigot 13 of the pipe 14 of an end section 15, which also has V-shaped reinforcing mesh 16 and encasing refractory material 17, the outermost end of the pipe 14 having a screw-threaded socket 18, e.g., to receive a diffuser plug or the like.

To guard against accidental unscrewing of the sections, a proprietory compound to prevent accidental unscrewing can be applied to the threads of each spigot and socket, and to prevent molten metal penetration at the junction between each length of refractory, the abutting faces can be coated with an appropriate refractory jointing compound or cement. Thus, for example, the refractory material can be an 80% alumina, high purity castable refractory material, and the cement a phosphate-bonded air-setting cement.

Thus, during use of the lance, should unacceptable damage be occasioned at some point along its length, accidentally, by erosion or by chemical attack, e.g., at the slag line, the damaged length can be uncoupled from the adjacent lengths and replaced by a new length, thereby avoiding the need to throw away a complete lance because it has been damaged at one point, as is the case with the lances of the prior art.

CLAIMS

1. An injection lance comprising a metal pipe encased in an outer coating or cladding of refractory material, the metal pipe and the refractory coating or cladding being formed from a number of lengths of pipe on each of which is formed a coating or cladding, with the lengths of pipe being removably secured together.

2. An injection lance as in Claim 1, wherein the refractory material of each length is formed by moulding, casting or pressing the refractory material around the pipe length.

3. An injection lance as in Claim 1 or Claim 2, wherein to enable adjacent lengths to be removably secured together, one end of each length of steel pipe extends beyond its refractory coating or cladding, with the other end lying within the refractory material, formed as a socket.

4. An injection lance as in Claim 3, wherein a proprietory locking compound is applied to the threads of each spigot and socket to assist in the prevention of accidental unscrewing.

5. An injection lance as in any of Claims 1 to 4, wherein abutting surfaces of adjacent lengths of refractory material are provided with a coating of a jointing compound or cement.

6. An injection lance as in Claim 5, wherein the cement is a highly refractory cement.

7. An injection lance as in any of Claims 1 to 6, wherein each length of metal pipe is provided with reinforcement to assist in the retention in place of the refractory coating or cladding.

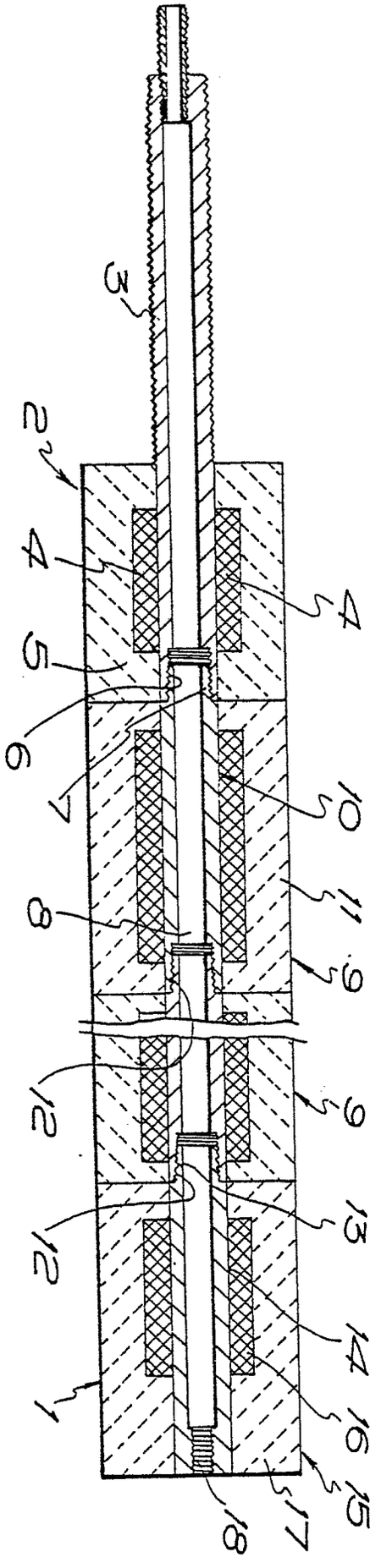
8. An injection lance as in Claim 7, wherein the reinforcement is in the form of mesh of V-section, secured to each metal pipe length.

9. An injection lance as in any of Claims 1 to 8, wherein the refractory material of a particular length is chosen to suit the particular conditions in that part of the vessel occupied by that length.

10. An injection lance as in any of Claims 1 to 9, wherein different lengths of refractory material can have different thicknesses chosen to suit the particular conditions in that part of a vessel occupied by that length.

11. An injection lance substantially as hereinbefore described with reference to the accompanying drawing.

0070109



European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 82 30 3261

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl. ³)
X	GB-A-1 014 255 (THE BRITISH OXYGEN) *Figures 1-3; page 2, line 121 - page 3, line 30*	1-4,9, 11	C 21 C 5/46 C 21 C 7/072 C 22 B 9/05 F 27 D 3/16
Y	US-A-3 495 815 (HOLMES) *Figure 2; column 3, lines 54-73*	1-3,9, 11	
Y	WO-A-8 001 923 (HÖGANÄS) *Abstract; figures and claims*	1,7-9, 11	
A	BE-A- 879 036 (DESAAR) *Figures 2 and 3; page 4, lines 26-31*	1,7,8, 11	
A	US-A-3 352 552 (KOENIG et al.) *Figure; column 3, lines 4-7*	1,11	

TECHNICAL FIELDS SEARCHED (Int. Cl ³)

C 21 C
C 22 B
F 27 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-10-1982	OBERWALLENEY R.P.L.I

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503. 03.82