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(54) **Lance.**

(57) Lance for injecting a substance in gas and/or powder form into melts, comprising a metal tube (1) surrounded by a refractory insulation (3), a distributor or spreader arranged as an extension of the metal tube, which spreader is provided with outwardly extending nozzle tubes (11), and which is fixed in a refractory lance head (4), spreader being shaped as a bolt-like body having a flange-like head and a central hollow pin extending into a corresponding central recess in the lance head (4), head being provided with holes evenly distributed around its circumference which holes are connected with the hollowness of the pin and thus the interior of metal tube (1), and in which the nozzle tubes (11) are arranged, and these nozzle tubes (11) being contained in the area between the refractory insulation (3) and the lance head (4) in recesses therein and/or in the insulation (3).

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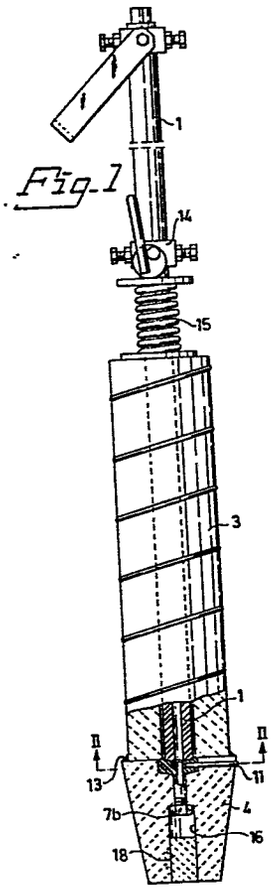


Fig. 1

TITLE OF THE INVENTION

Lance

TECHNICAL FIELD

The invention relates to a metallurgical lance useful for refining metal melts by injecting a gas, mainly air or oxygen gas (oxygen-enriched air), or for supplying alloying elements in powder form by means of a carrier gas.

BACKGROUND ART

Metallurgical lances for the purposes indicated above consist as principal parts of a metal tube, usually a steel tube, surrounded by a tubular refractory insulation, the lower end of the tube being provided with a lance tip made of refractory ceramic material into which is cast a tip attachment with laterally extending distributing tubes or nozzles for even distribution of the injection medium. The tip of the lance is usually designed as a metal sleeve having a central bore, from which the distributing tubes or nozzles extend and which in attaching the tip of the lance to the central lance tube forms a direct extension of the central passage channel thereof for the injection medium.

One major disadvantage of the metallurgical lances heretofore used has been the stresses resulting from different thermo-expansion of metal and ceramic material leading to early destruction of the refractory insulation of the lance. In regard to the lance tube proper this inconvenience has been eliminated, for example through our earlier patent application No. 81-01101-7, in that the insulation has been given the possibility of sliding along the central lance tube.

However, corresponding problems remain in regard to the tip of the lance or the head of the lance where the metal parts cast into the lance do not admit any sliding movement relative to the ceramic material.

SUMMARY OF THE INVENTION

By redesigning the tip or the head of the lance and its attachment to the lance tube and changing the position of the distributing nozzles it is the object of the invention to avoid the said disadvantages of previous lance constructions and in this manner to reduce the cost when using the lance technique by increasing the active life of the lance as a whole, i.e. also the tip of the lance.

This object is obtained by the invention which is further characterized in the appended patent claims thereby that casting of any metallic elements, i.e. the distributing nozzles and the distributing chamber or sleeve from which they extend, into the refractory ceramic tip of the lance is avoided. Instead, in accordance with the invention the distributing device for the injecting medium is designed as a bolt-like body consisting of a head in the form of a flange and a threaded hollow pin extending centrally therefrom. This bolt-like body is welded to the end of the central lance tube so that its cavity forms a direct extension of the passage of the lance tube. The head or flange of said body is drilled in even distribution about its mantle surface to form holes extending to the distributing chamber wherein the distributing tubes or nozzles are fitted.

The lance tube with the distributing body welded thereto may then be inserted into a refractory insulating tube of a known type, suitably of the type described in our above-identified patent application. Obviously, one may also apply the insulation as a monolith or as cylindric shaped bodies attached to each

other by joint sealing mass onto the lance tube. The lower surface of this refractory insulation is provided with a central recess corresponding to the flange or head of the distributing body and with chutes or channels extending therefrom wherein the distributing tubes or nozzles are fitted.

These chutes or channels may, of course, also be arranged in the upper surface of the tip of the lance, which is particularly preferred, or partitioned between the lower surface of the insulation and the upper surface of the tip of the lance.

Finally, the refractory insulation of the free surfaces of the distributing body is provided. This is obtained by using a separate lance head made of refractory mass and having a planar upper surface wherein there opens a hole with interior threads matching the threads of the bolt-like distributing body. This refractory lance head is screwed onto the threaded pin of the distributing body, suitably while applying a jointing mortar for filling out the gaps between the threads and irregularities between the planar upper surface of the lance head, the head or flange and the lower surface of the lance tube insulation. Alternatively, the lance head is provided with a through-going axial bore, wherein it is secured with a nut engaging the threads of the bolt-like body and resting on a shoulder in the said bore.

EXAMPLE

In the following the invention will be further described with reference to the appended drawing illustrating a preferred embodiment.

In the drawing, Fig. 1 shows a complete lance with the lower part at the tip of the lance being shown in section.

Fig. 2 shows a section along the line II-II in Fig. 1.

Fig. 3 shows on a larger scale the design of the distributor and its connection to the lance tube.

In the drawing there is shown a device according to the invention having a central lance tube 1 and 2, a flow passage 2 for the injection medium arranged therein. The lance tube 1 is surrounded by a tubular refractory insulation 3 and the lance terminates at the lower end with a lance head 4 also made from a refractory material. The distributor or spreader for the injection medium, generally designated 5 consists of a head or a flange 6 from which a threaded pin 7a extends. Centrally from the head or flange 6 and down into pin 7a a distributing chamber 8 is drilled which when distributor 5 is welded to lance tube 1 as indicated at 9 will constitute an extension of bore 2 of lance tube 1. With even distribution around flange 6 the latter is provided with a number - suitably three - holes 10 extending into the distributing chamber 8. In these holes spreader tubes or nozzles 11 are inserted. At their inner part holes 10 have a somewhat smaller diameter than in the outer part so that between said parts a shoulder or stop 12 for the inserted nozzle tube 11 will be provided.

Lance head 4 is cast of a refractory mass about a core having a diameter corresponding to the threads of pin 7a to enable in assembly inserting this pin for engagement or contact with the lower surface of flange 6 and the lower surface of insulation 3. The attachment of distributor 5 to the lance head 4 is done by a nut 7b screwed onto pin 7a from below through a central bore 16 (Fig. 1) which is then sealed with a refractory plug 18. For sealing between the contact surfaces of distributor 5 a suitable quantity of jointing mortar is supplied in assembly, said mortar when attaching lance head 4 by

screwing being squeezed out between the threads and between the contact surfaces to form a joint between the insulation 3 of the lance tube and the head 4 of the lance. The outer edge of this joint is indicated at 13 in Fig. 1. Chutes or channels for the nozzles have been previously cut out in the upper surface of lance head 4 so that the lower surface of the insulation 3 of the lance tube can be maintained practically planar. By this arrangement nozzles 11 instead of being cast into the ceramic lance head will be positioned in a jointing mass in the border zone between the ceramic bodies 3 and 4, whereby the risks for the formation of cracks by different thermal expansion of metal components and refractory ceramics will be eliminated.

To clamp the insulation 3 against the flange 6 and the lance head 4 an eccentric 14 is provided which through a spring 15 imparts downward bias to insulation 3. In this context it is suitable in order to obtain soft contact to arrange a ceramic fibre disc 16 between the upper surface of the flange 6 and the lower end of insulation 3.

Mounting or assembly of the metallurgical lance as described above is suitably carried out in the following manner.

First, the distributing body 5 is welded 9 to the end of lance tube 1. Then, nozzles 11 are fitted into holes 10 and lance tube 1 with the welded distributing body 5 into insulation 3, so that flange 6 of the distributing body 5 will fit into a corresponding recess in the lower surface of insulation 3 and the distributing tubes or nozzles 11 will fit into corresponding recesses in the upper surface of lance head 4. The contact surfaces are sealed with refractory jointing mass or mortar. Finally, spring 15 and eccentric 14 are brought into engagement against the upper surface of insulation 3. Device 14 is locked against the central lance tube 1 after which by means of eccentric 14 the insulation is

biassed towards the upper side of flange 6 or a ceramic fibre packing applied thereto.

Due to the invention the nozzles 11 will not, as in constructions heretofore used, be cast into the interior of the ceramic lance head 4. This in turn means on the one hand that the crack-forming heat stresses between the nozzles and the ceramic insulation will be avoided and on the other hand the nozzles may easily be removed and replaced with new ones if for example clogging will arise in connection with injection of alloying powder.

It should be observed that the invention is not limited to the embodiment described above. Thus, for example the lance can be modified in regard to the design and attachment of distributor 5, the number of distributing tubes 11, their orientation, which need not be radial, i.e. normal to the longitudinal axis of the lance, etc. The essential feature of the invention is the position of distributor 5 and distributing tubes 11 in the area between lance tip 4 and insulation 3 which results in extended period of life, facilitated maintenance and thus reduced operational interruptions.

PATENT CLAIMS

1. Lance for injecting a substance in gas and/or powder form into melts, comprising a metal tube (1) surrounded by a refractory insulation (3), a distributor or spreader (5) arranged as an extension of the metal tube, which spreader is provided with outwardly extending nozzle tubes (11), and which is fixed in a refractory lance head (4), characterized thereby that spreader (5) is shaped as a bolt-like body having a flange-like head (6) and a central hollow pin (7a) extending into a corresponding central recess in the lance head (4), that head (6) is provided with holes (10) evenly distributed around its circumference which holes are connected with the hollowness (8) of the pin (7a) and thus the interior (2) of metal tube (1), and in which the nozzle tubes (11) are arranged, and that these nozzle tubes (11) are contained in the area between the refractory insulation (3) and the lance head (4) in recesses therein and/or in the insulation (3).

2. Lance according to claim 1, characterized thereby that every hole (10) inwards shows a narrower part for the formation of a shoulder (12), which restricts the penetration depth of the nozzle tube (11) in the hole (10).

3. Lance according to claim 1 or 2, characterized thereby that the pin (7a) is outwardly threaded for fixation in a corresponding thread in the recess of the lance head (4), or for fixation by means of a nut (7b) arranged in a bore (16) in lance head (4).

4. Lance according to any preceding claim, characterized thereby that the nozzle tubes are arranged to extend radially and outwardly.

5. Lance according to any preceding claim, characterized by a ring-shaped disc (16) of for example ceramic fibre arranged between the head (6) and the end of the insulation (3).

6. Lance according to any preceding claim, characterized thereby that a jointing mass is arranged between the upper side of the lance head (4) and the end of the insulation (3).

7. Lance according to any preceding claim, characterized thereby that the recesses for the nozzle tubes (11) are arranged in the upper surface of lance head (4).

Fig_1

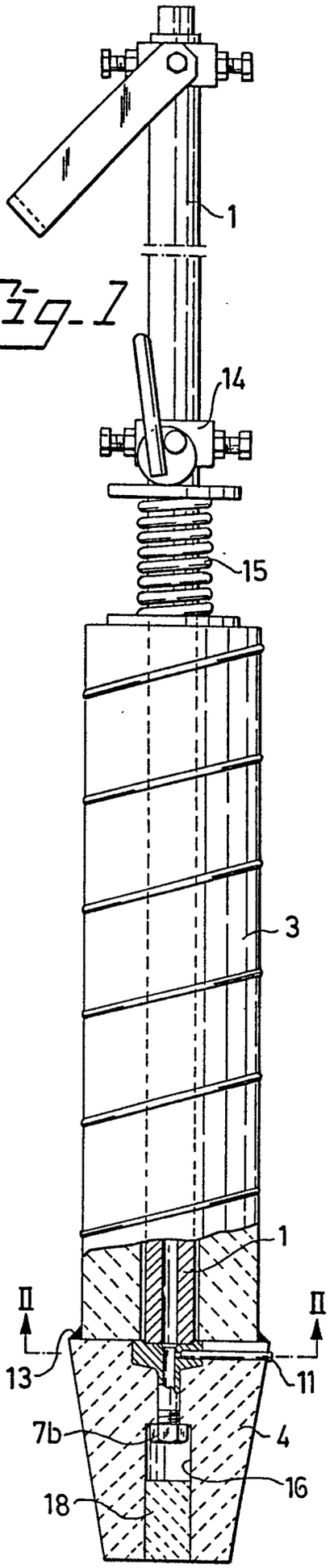
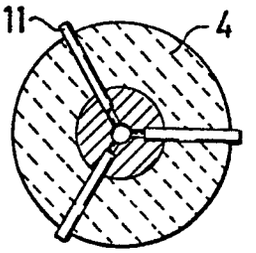
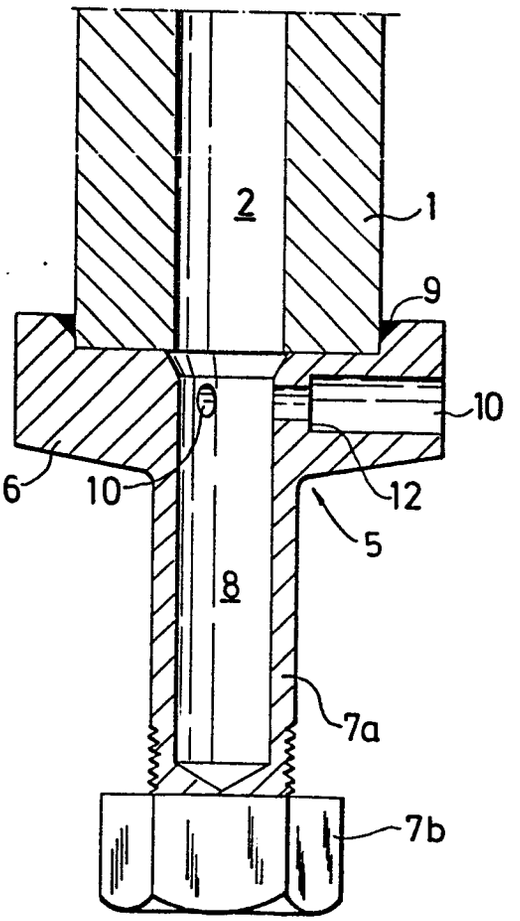


Fig_2



II-II

Fig_3



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EUROPEAN SEARCH REPORT

0088059
Application number

EP 83 85 0030

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)
Y	DE-A-2 934 292 (CHAMOTTE GIBBONS CONTINENTAL) * Figure *	1	C 21 C 5/46
Y	DE-C-1 144 009 (A. FINKL & SONS) * Figure 3 *	1	
Y	WO-A-8 001 923 (HÖGANÄS) * Figures 3, 5 *	1	
A	GB-A-2 005 815 (STIFTELSON FOR METALLURGISK FORSKNING)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

C 21 C 5/46
C 21 C 7/072
C 22 B 9/05

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	16-05-1983	SUTOR W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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