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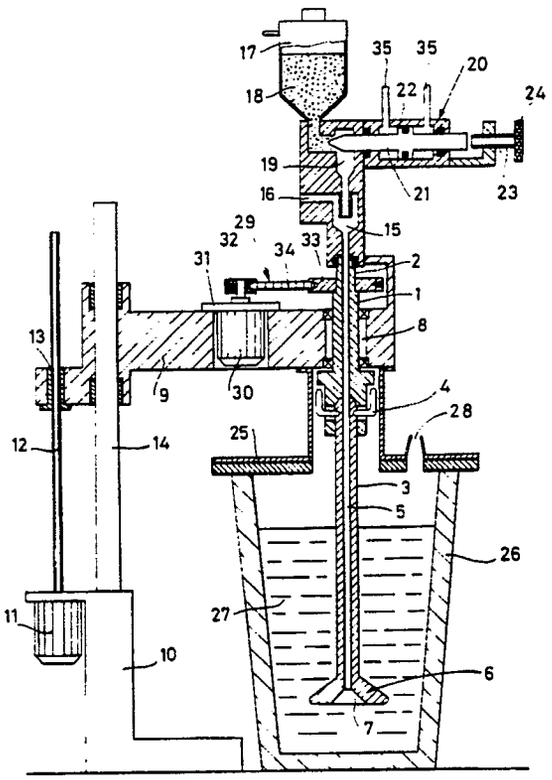
(54) Device for the purification of molten metal, in particular aluminium.

(57) The device comprises a rotor (6) which can be immersed in the molten metal (27). Said rotor is rotated by a motor (30) through a mechanism (29). There is provided above said rotor (6) a supply unit for gases and chemical compounds comprising a mixing chamber (15) into which lead a supply conduit (16) for inert gases and a supply conduit (19) for a suitably selected chemical compound (18). There is moreover provided a control system (20) of the frequency and of the quantity of chemical compound supplied on each occasion.



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Device for the purification of molten metal, in particular aluminium.

The present invention relates to a device for the purification of molten metal, in particular aluminium.

The use is known, in fields such as foundryworks, of molten metal to be introduced in appropriate die cavities.

A fundamental prerogative of the metal to be used is purity which, in the industrial practice of aluminium foundries, allows the fulfilment of the primary requirements of quality and reliability of production processes.

The proper processing of the molten metal represents a fundamental step in maintaining the high standards of quality required.

Molten aluminium contains undesired impurities, such as dissolved gases (particularly hydrogen) and heterogeneous compounds (aluminium oxides in various forms, refractory parts, etc.).

These factors worsen the quality of alloys, impair the quality of castings in hydraulic seal tests, increase the risks of crackability and greatly damage both static and dynamic mechanical resistances (resistance in fatigue tests, etc.), as well as the yield of mechanical processes and of anodization treatments and the resistance to corrosive environments.

Various devices have been accomplished in the past to carry out operations of degassing/elimination of impurities.

Among the different technologies adopted in the past to remove dissolved gases and impurities contained in molten metal baths one solution has been based on the introduction of gases or of mixtures of inert gases (N_2, Ar, halogen derivatives) inside the molten metal baths.

In particular said solution provides for the use of a device based on a rotor supplied with gas. Said rotor is made to rotate in the bath so as to disperse the supplied gas substantially increasing the yield of the operation, both in terms of the contact surface of the inert gas (H_2 bubble to be removed), and in terms of the staying time of the inert gas inside the molten bath. The gas thus centrifuged creates small bubbles which, while rising to the surface, capture the impurities present and carry them away.

The object of the present invention is now that of improving the yield of the known devices.

According to the invention such object is attained by means of a device comprising a rotor which can be immersed in the molten metal, means for causing the rotation of said rotor and means associated with the rotor for supplying an inert gas into one of its internal passages, characterized in that it comprises means for introducing into said internal passage at least one chemical compound which can be mixed with said gas.

It has been possible to verify that with the addition of said chemical compound, or possibly of a mixture of compounds of such a nature, the purification action of the inert gas is notably improved and strengthened.

The mechanical action of a finely dispersed inert rinsing gas, together with the homogeneous diffusion of chemically active salt mixtures on the impurities contained in molten aluminium baths, allows the fulfilment of high production standards in terms of quality and financial yield.

It has been possible to observe that especially suitable chemical compounds are:

- products having a degassing effect (hexachloroethane)
- products having a deoxidiser effect (20-25% alkaline fluorides, 75-80% mixture of alkaline chlorides)
- products having a slagging effect (alkaline/alkaline earth chlorides (70-80%), alkaline alkaline earth fluoro silicates 20-30%.

These and other features of the present invention shall be made evident by the following detailed description of one of its embodiments illustrated as a non-limiting example in the single figure in the enclosed drawing.

The purfication device shown in the drawing comprises a rotor 6 mechanically supported by a rotor-holding rod 3 loosely connected to a chuck 1 by means of a coupling 4.

Inside said rotor 6 and said rod 3 there is obtained a channel 5 which terminates at its lower end in a divergent mouth 7 in the shape of an inverted V.

Chuck 1 is rotatably supported by a pair of bearings 8 inside a support 9, which is adjustable in height with respect to a base structure 10 by means of an adjustment system consisting of a motor 11, a threaded rod 12, a nut screw 13 and a slide guide 14.

Above the chuck 1 there is fastened to support 9 a unit for supplying gases and chemical compounds comprising a mixing chamber 15 into which run a conduit 16 for supplying an inert gas and a conduit 19 for supplying suitably selected chemical compounds.

A hopper 17 contains chemical compound 18 and it intermittently communicates with conduit 19 through a system which controls the frequency of supply of the chemical compound as well as the quantity supplied.

Said control device, indicated in its entirety with 20, consists in the example considered of a

stem valve 21 with operating piston 22. Two conduits 35 allow the introduction and the discharge of operating air for piston 22. There is also present a limit device for piston 22 which is constituted by a threaded rod 23 with a corresponding operating handwheel 24.

Below said support 9 there is constrained a closing cover 25 for a vessel 26 suitable for containing the molten metal to be purified, indicated with 27.

The above cover is provided with a vent opening 28.

There is lastly provided an operating device 29 of rotor 6, which comprises a motor 30 held by support 31, a toothed pulley 32 keyed on the output shaft of motor 30, another toothed pulley 33 keyed on chuck 1 and a toothed connecting belt 34.

Due to the effect of the described structure the device for the purification of molten metal illustrated in the drawing is in a position of operating as follows.

Once the rotor 6 has been introduced into the bath of molten metal 27 and the corresponding vessel has been closed with closing cover 25, chuck 1 is rotated by motor 30 and mechanism 29.

An inert gas is supplied under pressure to internal passage 5 of rod 3 and of rotor 6 in combination with chemical compound 18, added intermittently to the gaseous vehicle due to the effect of the alternating movements of stem valve 21.

The gaseous vehicle and the chemical compound are forcefully introduced into the molten metal through terminal mouth 7.

It should be noted in this respect that the divergent shape of the above mouth 7 has the advantage of avoiding problems of obstruction which may otherwise be caused by the chemical compound added, simplifying cleaning operations.

Claims

1. Device for the purification of molten metal, in particular aluminium, comprising a rotor (6) which can be immersed in the molten metal, means (29, 30) for causing the rotation of said rotor and means (16) associated with the rotor for supplying an inert gas into one of its internal passages (5), characterized in that it comprises means (17, 19, 20) for introducing into said internal passage (5) at least one chemical compound which can be mixed with said gas.

2. Device for the purification of molten metal according to claim 1 characterized in that said internal passage (5) terminates at its lower end in a divergent mouth (7) in the shape of an inverted V.

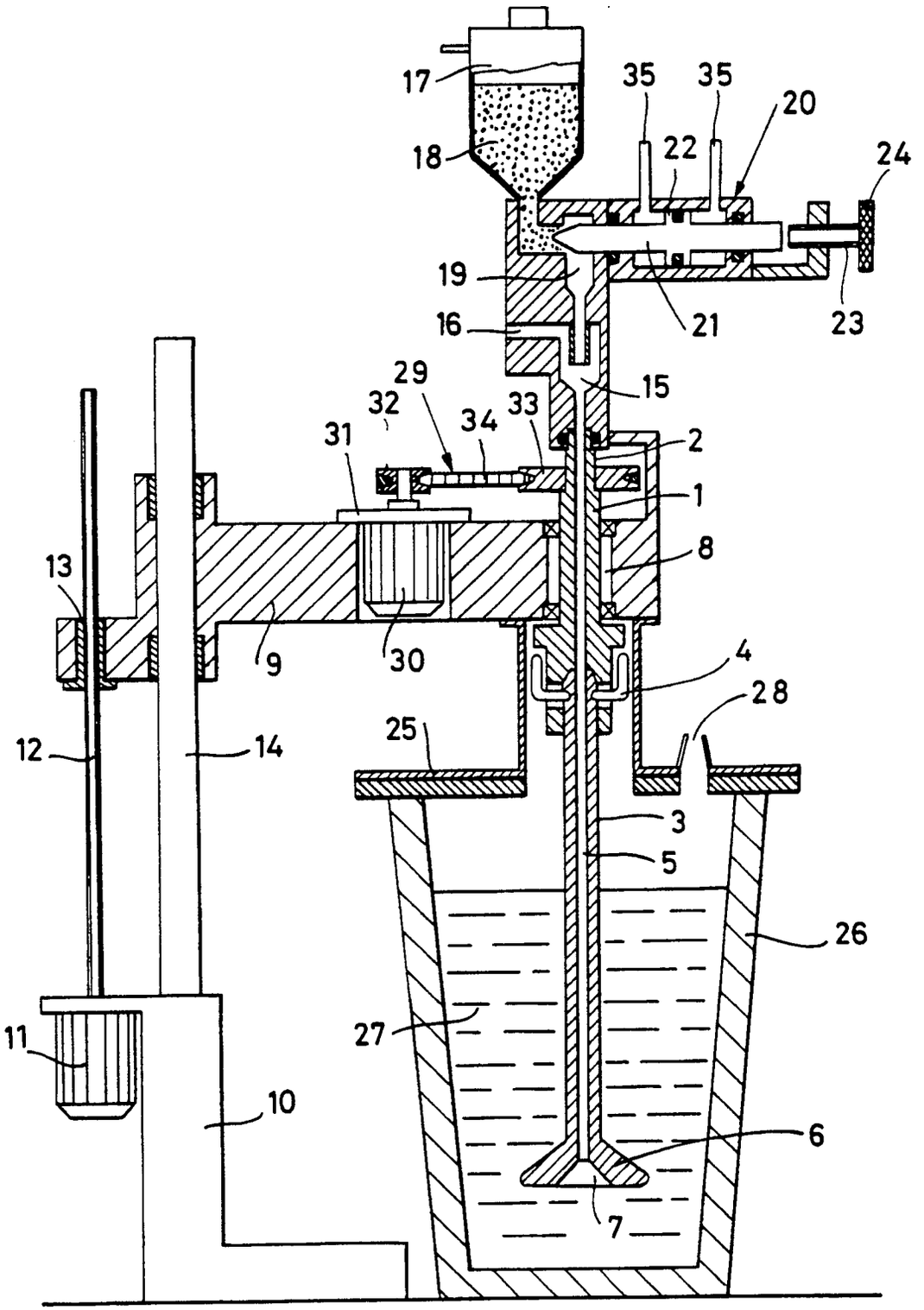
3. Device for the purification of molten metal according to claim 1 characterized in that there is provided a mixing chamber (15), in which converge said means (16; 17, 19, 20) for supplying the inert gas and the chemical compound.

4. Device for the purification of molten metal according to claim 1 characterized in that said means (17, 19, 20) for introducing the chemical compound include means for controlling the frequency and the quantity of supply.

5. Device for the purification of molten metal according to claim 1 characterized in that said chemical compound is constituted by one or more products having a degassing effect, such as hexachloroethane.

6. Device for the purification of molten metal according to claim 1 characterized in that said chemical compound is constituted by one or more products having a deoxidiser effect, such as alkaline fluorides (20-25%), mixture of alkaline chlorides (75-80)%.

7. Device for the purification of molten metal according to claim 1 characterized in that said chemical compound is constituted by one or more products having a slagging effect such as alkaline/alkaline earth chlorides (70-80%), alkaline/alkaline earth fluoro silicate (20-30%).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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 0932

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.5)
X	US-A-3 891 196 (E. FÖRSTER) * Claims; columns 4-5 *	1,3-4	C 22 B 9/05 C 22 B 21/06 C 21 C 7/00
X	US-A-4 286 774 (V. BANATAR) * Claims *	1,3-4	
X	FR-A-2 185 570 (ARBED) * Claims *	1,3-4	
X	US-A-2 807 508 (C.E. BIENIOSEK) * Claims; figure 4 *	1,3-4	
X	US-A-2 614 585 (J.B. WAGSTAFF) * Claims; figure 4 *	2	
X	US-A-2 804 339 (D.H. BARBOUR) * Claims; figure 2> *	2	
X	GB-A-2 041 982 (MAGYAR ALUMINIUMIPARI TRÖSZT) * Claimms *	5-7	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

C 22 B
C 21 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03-07-1990	JACOBS J.J.E.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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