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(54) Method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system.

(57) Method for manufacturing cast iron parts (13) by means of metal moulds (8,9) incorporating a vacuum system (5,6,7). The object of the invention is to fit the installation with air outlet nozzles connected to a channel, from which a vacuum is obtained inside the mould, the molten metal (2) entering the mouth located on the upper side, the introduction of the molten metal being automatically stopped when the cavity is full, the mould being fitted with an airtight closure during its filling which is locked and held by pressure exerted toward the upper side by hydraulic cylinders (12) located on the lower side, a predetermined period of time being elapsed later in order to insure the hardening, and then the mould being opened through a mechanical ejecting system (11), so assuring that the workpart is pulled simultaneously apart from the mould itself, the vacuum action being carried out later in a reverse manner and air being applied inside the mould.

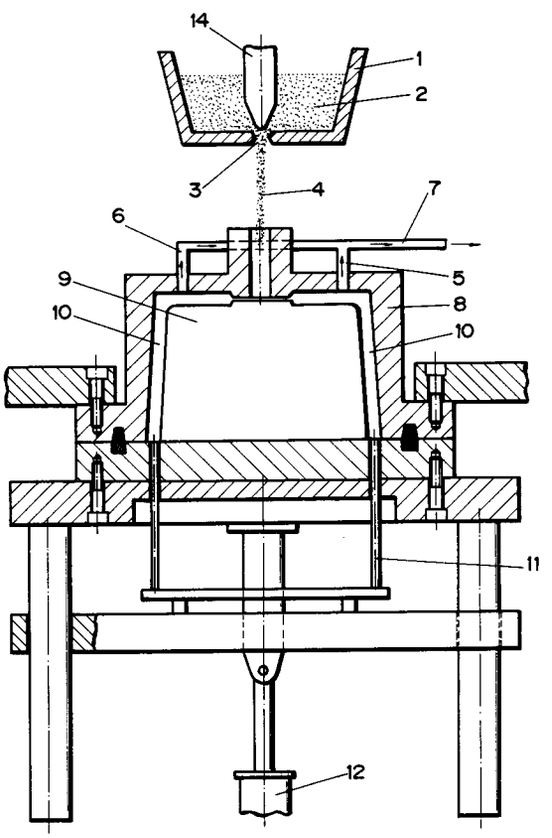

FIG-1

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SCOPE OF THE INVENTION

This invention refers to a method for manufacturing cast iron parts by means of metal moulds, incorporating a vacuum system, the obvious - purpose of which is, on a side, to allow the liquid iron to fill from the upper side of the mark and, therefore, to reduce the amount of iron used, to avoid manufacturing defective parts, to obviate the liquid - iron oxidation, and to avoid the existence of air bubbles in the molten part, apart from the fact that due to the idiosyncrasy of the method, it is also avoided the burring formation, with which the formed part can be easily ejected.

FIELD OF THE INVENTION

This invention has its application within the metallurgical industry.

PRIOR ART

At present, it is known the existence of a technology directed towards the manufacture of cast iron parts by using metal moulds, this technology being normally and usually applied in a vertical position, i.e. the mould is vertically split.

The liquid or molten iron enters the upper side and descends through the pouring channel entering thru the lowermost mark. As the liquid iron rises on the mark, the air is forced upward and escapes trhough the ventilations made on the mould surface.

The whole iron in liquid state used in this system, known as syphon feeding system, is of the order of 80% on the final part and 20% on the feeding system.

With the systems known up-to-date, it is more than probable to produce defective parts due to the air bubbles trapped in the mould marks.

It is also known that, in the present systems, the liquid iron oxidates when the liquid iron contacts the air during the filling of the mould, and it has been proved that this problem has a particular nature denoted upon manufacturing cast irons with spheroidal graphite.

The production of oxides can cause, themselves, gas forming reactions or slag inclusions, which will show as a failure when expecting a good service of the cast parts.

When a feeding is normally used in the upper side, a feeding without vacuum, the air bubbles can be trapped in the cast part, this being the reason for which the manufactured part is frequently rejected.

It may be also pointed out that there are, at present, different ventilation systems, the function of which is to eliminate the burring problem. These systems have proved their efficiency, but at the expense of a high cost.

With the present systems, it is not possible to fill quickly the - moulds, which prevents the own system to use metal cores fitted with a small outlet. In synthesis, it can be said that, at the until now - used systems there is remarkable problematics as regards the directional differences of the hardening.

An obvious solution to this problem would be to rely on a vaccum system allowing the liquid iron to fill from the upper part of the mark and, therefore, the amount of iron used to totally fulfil the mould be substancially reduced.

Also, it would be necessary to rely on a method permitting the air emptying out of the mould cavity during the filling, so eliminating the installation of special ventilations.

Ideally, the method should be able to obviate the manufacture of defective parts due to the air bubbles possibly trapped in the mould marks.

Logically, the method should be rely on the possibility of avoiding the liquid iron to oxidize when the liquid iron contacts the air during the mould filling, avoiding these oxides to cause gas forming reactions or slag inclusions which could possible cause then a failure in the service of the cast parts.

Likewise, the method should be rely on the possibility of bubble production.

DESCRIPTION OF THE INVENTION

The method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, as proposed by the invention, constitutes an obvious solution to the present existing problems on this matter, - achieving, in a reliable manner, to incorporate all possibilities considered as suitable to the same, relying marginally on the advantage of - avoiding the air present in the mould to act as a backpressure by opposing against the rise of the liquid iron stream, and that on filling - quickly the moulds it permits to use metal cores having a very small outlet, which reduces frequently the risering machined volume and, at the same time, allows to easily eject the workpiece with 1/2º thru 1º outlets owing to the limited contact time between metal and mould, minimizing consequently the expansion of the own mould.

In synthesis, it can be said that this method incorporating a vacuum system, as well as its own feeding design through the upper side, reduces very much the problems normally arisen due to the directional differences in the hardening.

More specifically, the method for manufacturing cast iron parts by means of metal moulds, incorporating the envisaged vacuum system, can

be applied to metal mould designs where the mould opens and closes both in a vertical and horizontal sense.

The method can be applied to manufacturing plants of static or moving design, for example, carrousel, and so on.

The method works for the range of gray and nodular irons, and it has been proven for cast parts having a too high weight for standard systems.

The mould is made of two parts, being split horizontally, being locked and held through pressure exerted toward the upper side or upwards, this pressure being provided by hydraulic cylinders located on the upper side.

The vacuum is applied later; then, the mould is filled with liquid iron being designed so that a total airtight closure is obtained during filling.

When the mould cavity is totally full, the metal inflow is stopped.

Later on, enough time should elapse considered as necessary to assure the hardening.

Once the hardening has been checked, the mould is opened and an automatic ejecting system insures the part expelling simultaneously with the mould withdrawal.

The vacuum action is reversed and air is applied inside the mould so that its cooling can be effected.

At a predetermined mould temperature, the mould is closed again and the cycle repeats itself.

DESCRIPTION OF THE DRAWINGS

To complement the description which is being made and in order to help to a better understanding of the features of the present invention, the accompanying drawings, which are a part of the present specification, show, in an illustrative and non limitative manner, the following:

FIGURE 1 shows a sectional side elevation view of the mould being filled in accordance with the method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, which is the object of the invention.

FIGURE 2 shows again a sectional side elevation view of the object shown on Figure 1, when the configured part is expelled.

PREFERRED EMBODIMENT OF THE INVENTION

From these views, it can be seen how the method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system is configurated starting from a conventional ladle (1) containing the corresponding molten metal (2), being fitted with a lip (3) through which the molten metal emerges outside as a stream (4) direct to the mould, inside of which is incorporated in a cavity (10) constituted by an external mould (8) and an internal or lower mould (9) having, on the upper side of the external mould (8) two air outlets (5) and (6) connected through a pipe having an outlet through which the vacuum is obtained (7).

On the lower end, there is incorporated a system to eject the cast part (11), with a hydraulic cylinder (12) which cooperates with said system.

This filling operation can be seen in a clear and reliable manner on Fig. 1, i.e., the mould formed by two parts (8) and (9) is split in a horizontal plane.

The mould closes and is held under pression exerted toward the upper end by means of hydraulic cylinders (12) located on the lower end.

The operation under vacuum is applied and the mould (10) fills up with the liquid iron (12) entering inside the mould as a stream (4).

The mould is designed so that its insures an airtight seal.

When the mould cavity (10) configurated starting from the portions - (8) and (9) is totally full, the material inflow from the ladle (1) is automatically stopped , the lip (3) being closed by the action of the part (14)

From this moment on, a predeterminated time should be elapsed in order to insure completely and absolutely the material hardening.

Figure 2 shows how the mould opens and, by means of a mechanical ejecting system, the part (13) is simultaneously separated from the mould, to be withdrawn.

The vacuum action is reversed, entering the outlet (7'), and passing inside the mould through the ducts (5) and (6).

Later on, the application of air within the mould is carried out so that the cooling thereof is easied.

When the mould reaches a predetermined temperature, the mould closes and the cycle repeats again.

It is not considered necessary to extend this description for any - skilled person in the art to understand the scope of the invention and the advantages derived thereof.

The materials, shape, size and arrangement of the components will be open to modification whenever this does not mean to modify the essentials of the invention.

The terms on which this specification has been described should be always taken in a broad sense and non limitative.

Claims

1. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, characterized in that the same can be applied to metal mould designs wherein the moulds opens and closes both in vertical and

horizontal sense, being able to be applied to production installations of static or moving design, working for the range of gray and nodular irons, **characterized** in that the mould used is formed of two parts and it is split in a horizontal plane, being closed and held by pressure exerted upwards provided by hudraulic cylinders situated on the lower side.

2. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, according to claim 1, **characterized** in that the vacuum is applied while the mould is being filled with the liquid iron from the ladle containing molten metal. disposing of two openings or pipes connected to a duct through which the air emerges outside

3. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, according to claim 1, **characterized** in that the mould carries an airtight seal acting during the filling, disposing of a device stopping the filling of the material and closing the ladle lip when the mould cavity is full of molten metal.

4. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, according to claim 1, **characterized** in that after carrying out the above operations, a predetermined time is elapsed insuring the hardening, the mould being opened then and, by means of a mechanical ejecting system, the part is simultaneously separated from the mould when the mould is withdrawn.

5. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, according to claim 1, **characterized** in that, later, the vacuum operation is reversed, the air emerging outside through the nozzles situated on the upper part of the external mould, the air being then applied inside the mould to be cooled until reaching a predeterminated mould temperature, then starting again the cycle.

6. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, according to claim 1, **characterized** in that the amount of molten metal supplied is controlled, as well as the desired thickness of the part, relying on the possibility of obtain the desired size thereof and being able to determine the pouring speed of the molten metal.

7. A method for manufacturing cast iron parts by means of metal moulds incorporating a vacuum system, according to claim 1, **characterized** in that the parameters related to the temperature of the supplied molten metal, pressure or vacuum, awaiting time for opening the mould, as well as the temperature, speed and ejecting force of the part and the air humidity, are controlled in accordance with the molten metal quality, type or composition.

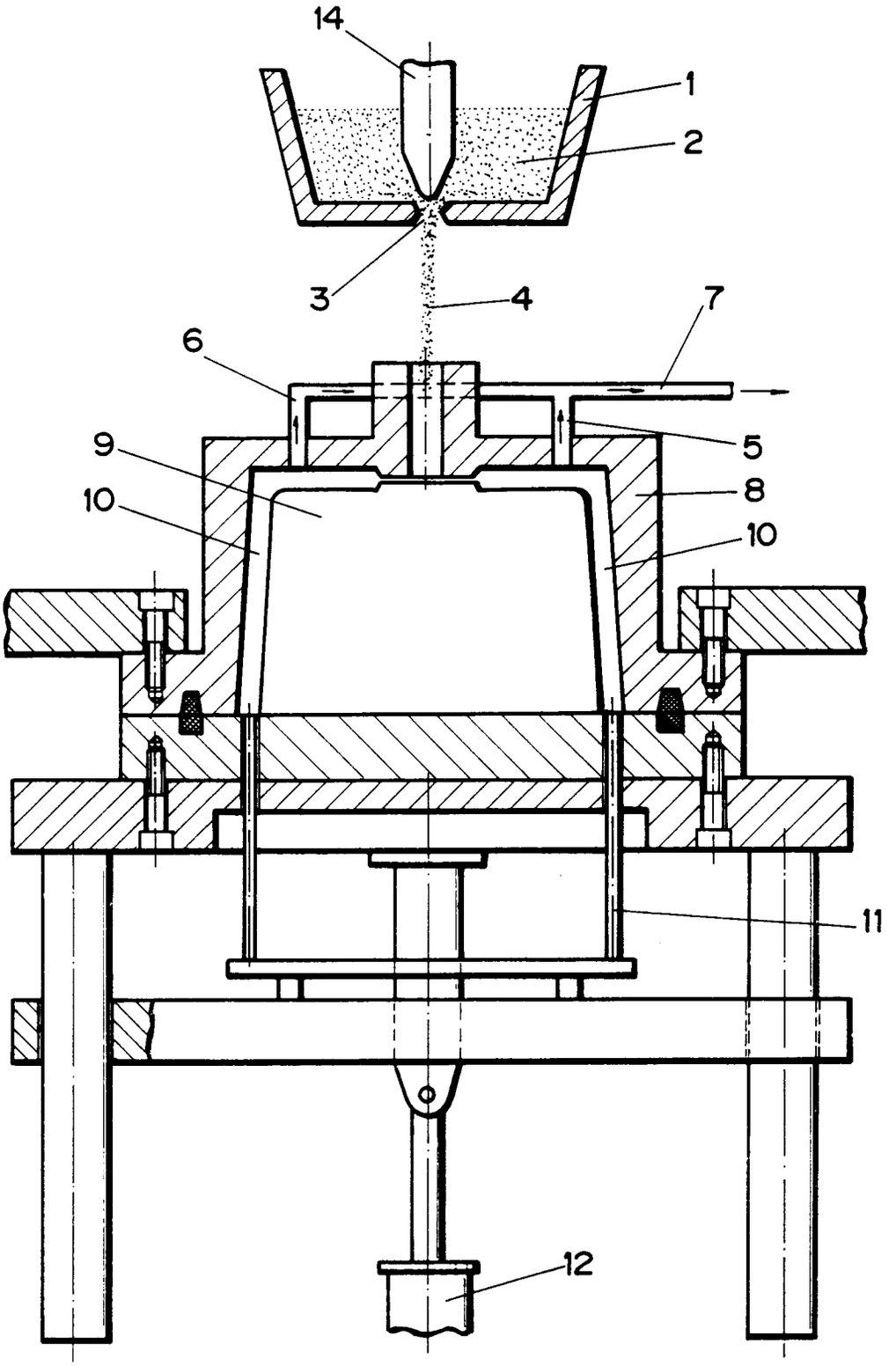

FIG.-1

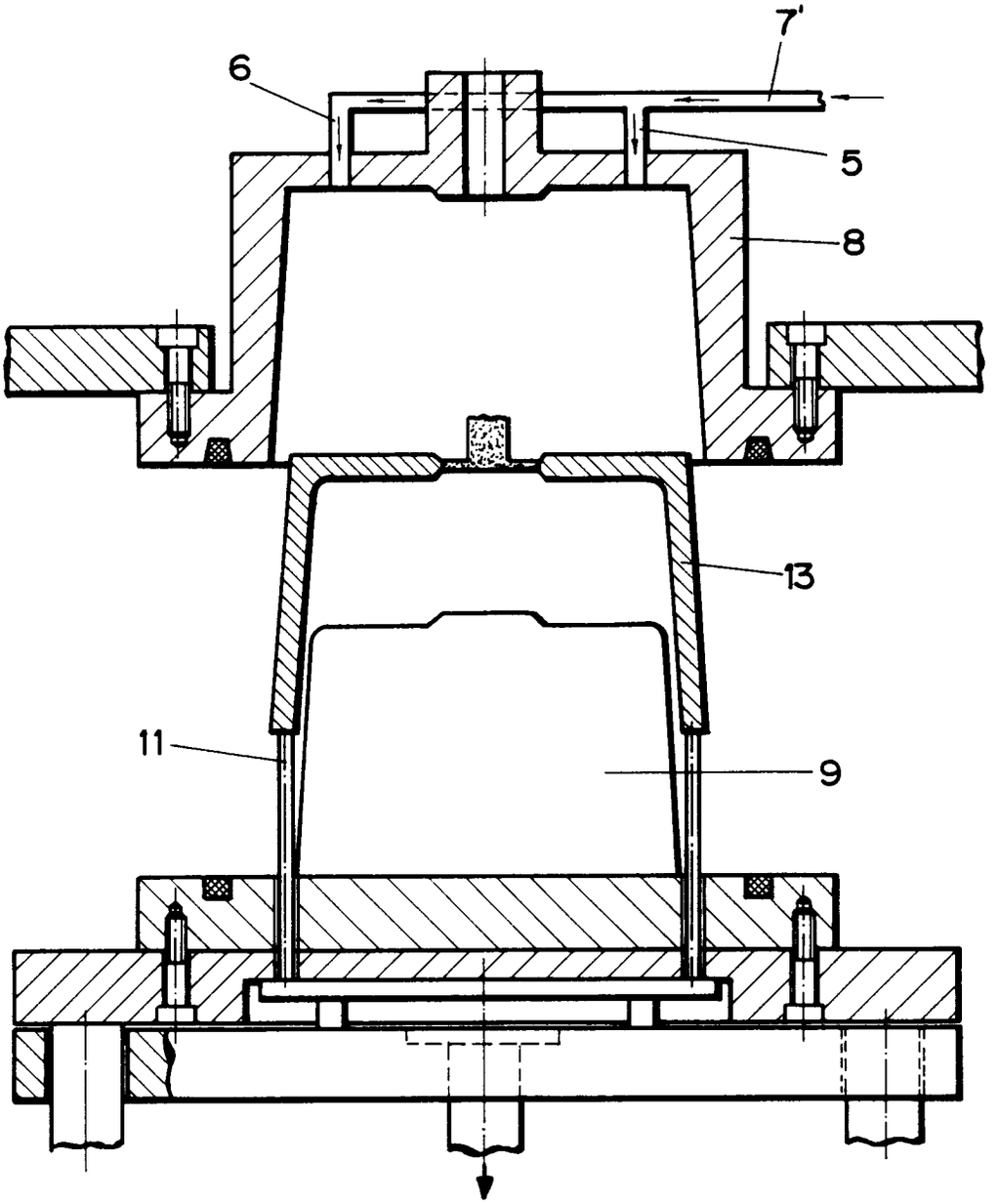

FIG.-2

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EUROPEAN SEARCH REPORT

Application Number

EP 91 50 0117

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)
A	PATENT ABSTRACTS OF JAPAN vol. 7, no. 55 (M-198)(1200) 5 March 1983 & JP-A-57 202 958 (AKIRA WASHIDA) 13 December 1982 * abstract * ---		B22D27/15
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 1 (M-550)(2448) 6 January 1987 & JP-A-61 180 643 (TOYODA GOSEI CO LTD) 13 August 1986 * abstract * ---		
A	PATENT ABSTRACTS OF JAPAN vol. 7, no. 1 (M-183)(1146) 6 January 1983 & JP-A-57 160 565 (KOMATSU SEISAKUSHO K.K.) 2 October 1982 * abstract * -----		TECHNICAL FIELDS SEARCHED (Int. Cl.5) B22D B22C B29C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 OCTOBER 1992	HODIAMONT S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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