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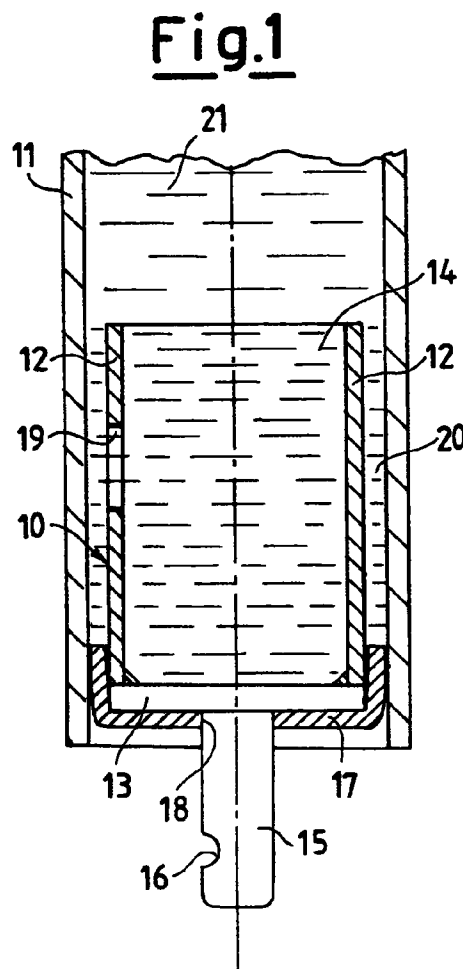
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(54) **A head casting device for a billet continuous casting process**

(57) A head casting device for a billet continuous casting process, said device can be placed in a casting duct (11) continuously cooled and comprising a box-shaped portion which can be put longitudinally inside the duct (11), said portion is provided with an opening (14) in correspondence to a base which is parallel to a cross section of the duct and with an engagement portion (15) extending from the closed wall (13) of the box-shaped portion which is opposite the opening (14), a gasket (17) can further be associated to the closed wall (13), said gasket is inserted between said closed wall and the inner surfaces of the duct (11).



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Description

The present invention discloses a head casting device for a billet continuous casting process.

In the continuous casting processes, in particular for steel casting, during the starting phase of the continuous casting process a stable casting head must be formed, said head is made of steel at least partially solidified so as to engage the steel which is continuously poured into the ingot mold. In fact, the ingot mold is usually made of a copper duct, which has highly cooled walls, wherein the liquid metal is poured directly from the ladle. At the start of said operation, the liquid metal has to find an element that closes said duct and that will become an integral portion as well as the pulling head of said liquid metal while the liquid steel, through solidification, realises a continuous billet.

Currently, a fake billet is fixed to a pulling group, e.g. formed by chains, and the front portion or head of the liquid steel coming from the ladle engages with said fake billet.

This operation is particularly critical since, in case of a faulty engagement, when the pulling group is started, there might be the separation between the fake billet and the leading portion of the liquid steel. In such a case the steel, which is in its solidification phase, will stop flowing within the duct with the consequent stop of the plant.

Further, once the fake billet has started pulling the developing billet, it will be necessary to cut the connection area between the fake billet and the billet in the making process. Said operation has to be performed once that the continuous billet has reached a situation of sufficient cooling and is positioned on a conveyor.

Such an operation requires the following restoration of the head of the fake billet so as that said fake billet is ready to start a new operation of continuous casting.

A purpose of the present invention is then to solve the above mentioned technical problems relative both to the safety of the starting part of a continuous casting process and to the easiness of conducting this initial working phase.

This purpose, according to the present invention, is reached through the realization of a head casting device for a billet continuous casting process, said device can be placed in a casting duct continuously cooled, characterised by comprising a box-shaped portion which can be put longitudinally inside said duct, said portion is provided with an opening in correspondence to a base which is parallel to a cross

section of the duct and with an engagement portion extending from the closed wall of the box-shaped portion which is opposite the opening, a gasket can further be associated to the closed wall, said gasket is inserted between said closed wall and the inner surfaces of said duct.

Preferably, at least one side wall of said box-shaped portion has a further opening facing said inner surfaces

of said duct.

Said gasket is advantageously made of a flexible material, like felt.

The outside dimensions of said box-shaped portion are smaller than the inner dimensions of said duct. In this way, said flexible material of said gasket can be bent inside an annular space comprised between the inner surfaces of said duct and the outer surfaces of said box-shaped portion.

The structural and functional features and the associated advantages will be better understood through the description of a non limiting example of a head casting device for a billet continuous casting process realised according to the present invention and to the attached drawings, in which:

Figure 1 is a sectional view of a portion of the continuous casting duct wherein a device according to the invention has been placed, said device containing liquid steel in the solidification phase;

Figure 2 is a side view of the device shown in Figure 1, after a 90° rotation;

Figure 3 is a top plan view of the device of Figure 2.

With reference to the figures, a head casting device, indicated by numeral 10, for a billet continuous casting process is shown, said device can be placed in a continuously cooled casting duct, indicated by numeral 11. Said duct 11 is, for example, a copper duct having hollow walls wherein a cooling liquid is circulated, e.g. water or the like.

The device 10 comprises basically a box-shaped portion, having a square section in the example case and side walls 12, a first base formed by a closed front wall 13 and the other base formed by an opening 14. The side walls 12 of the box-shaped element define an element which is used as a cooling element.

An engagement portion 15 extends from the front closed wall 13, said portion can be attached to a pulling group or to a fake billet (not shown), which are utilized to pull forward the device. In the shown example, this engagement portion 15 is realized by means of a round bar with a side notch 16 suitable to engage the pulling group.

Further, above said closed front wall 13 a gasket 17 is placed, said gasket has a central hole 18 which can be inserted on the engagement portion 15. This gasket has dimensions much greater than the closed front wall 13 so as to extend beyond said wall edges. The corners of the gasket 17 have cut areas 22 suitable to facilitate the bend of the gasket around the side walls 12 of the box-shaped portion. This gasket 17 is preferably made of flexible material, e.g. felt.

Further, at least one side wall 12 has an additional through opening 19 suitable to connect the inner side of the box-shaped portion with an annular space 20 defined outside the box-shaped portion.

In fact in figure 1, a head casting device 10 for a

continuous casting process is shown, said device is positioned within a duct 11 with larger outer dimensions.

The side overall dimensions of the box-shaped portion are smaller than the inner dimensions of the duct and therefore the box-shaped portion can be put inside the duct, thus defining said annular space 20 around said box-shaped portion.

When the device of the invention is put into the duct 11, the flexible material of the gasket 17 can be inserted in said annular space in order to realize a seal between the outer surfaces of the device and the inner surfaces of the duct.

As already said, when it is necessary to start a continuous casting process, the head casting device 10 is put in the duct from the side of its closed wall 13. In this way, the gasket bends over a portion of the side surfaces of the box-shaped portion, fills the annular space 20 and realises a seal. The device is pulled until the engagement portion 15 is connected to the pulling group.

At this moment, the continuous casting begins through the introduction of melted liquid steel, indicated by numeral 21, said steel flows into both the box-shaped portion of the device and into the annular space 20 defined by the device outer walls and the duct inner walls. The liquid steel can not flow ahead of the front portion of the duct because of the presence of the gasket 17 which fits into the space 20 and guarantees an optimum seal.

Further, the steel also flows inside the additional opening 19 and realises, in this way, a bridge between the steel inside the space 20 and the steel inside the box-shaped portion.

The small dimensions of the space 20 and the presence of the side walls 12 of the box-shaped element allow a quick cooling of the steel therein contained and also allow the formation of a good engagement to the device of the invention. Such stable situation is further enhanced by the steel that flows into the additional opening 19 which is connected to the more fluid steel, contained in the box-shaped portion. At any rate, the bridge of material present in the opening improves the engagement of the continuous casting head to the pulling device.

The specific geometry of the device according to the present invention causes an optimum distribution of the resisting sections and of the cooling sections so as to obtain a high rate of cooling on all the outer surfaces of the device.

Advantageously, such a device, since it has a simple construction realised with very low cost materials, can be of the disposable type and therefore be substituted at every start of the continuous casting process. Such a device, always new and perfectly good, further improves the guarantee of an optimum transfer of the pulling force and of a steady and perfect engagement of the head of the developing billet to the pulling device.

The possibility of using said device just once accel-

erates the restoration operations of the casting plant at each start and drastically reduces the dead times of the manufacturing cycle.

The self-matching of the gasket positioned on the front portion of the device is also a positive factor for the reliable start of the continuous casting process. Such self-matching feature avoids the need of an initial accurate positioning of the gasket with further significant reduction of the plant setting time.

Claims

1. A head casting device for a billet continuous casting process, said device can be placed in a casting duct (11) continuously cooled, characterized by comprising a box-shaped portion which can be put longitudinally inside said duct (11), said portion is provided with an opening (14) in correspondence to a base which is parallel to a cross section of the duct (11) and with an engagement portion (15) extending from the closed wall (13) of the box-shaped portion which is opposite the opening (14), and a gasket (17) can further be associated to the closed wall (13), said gasket is inserted between said closed wall and the inner surfaces of the duct (11).
2. A head casting device according to claim 1, characterised in that at least one side wall (12) of said box-shaped portion has an additional opening (19) facing said inner surfaces of said duct (11).
3. A head casting device according to claim 1, characterised in that said gasket (17) is made of flexible material.
4. A head casting device according to claim 3, characterised in that said flexible material is felt.
5. A head casting device according to claim 1, characterised in that the outer dimensions of said box-shaped portion are smaller than the inner dimensions of said duct (11).
6. A head casting device according to claim 1, characterised in that said flexible material of said gasket (17) can be bent within an annular space (20) defined between the inner surfaces of said duct and the outer surfaces of said box-shaped portion.
7. A head casting device according to claim 1, characterised in that said engagement portion (15) has a notch (16) suitable for the engagement with the pulling group.

Fig.1

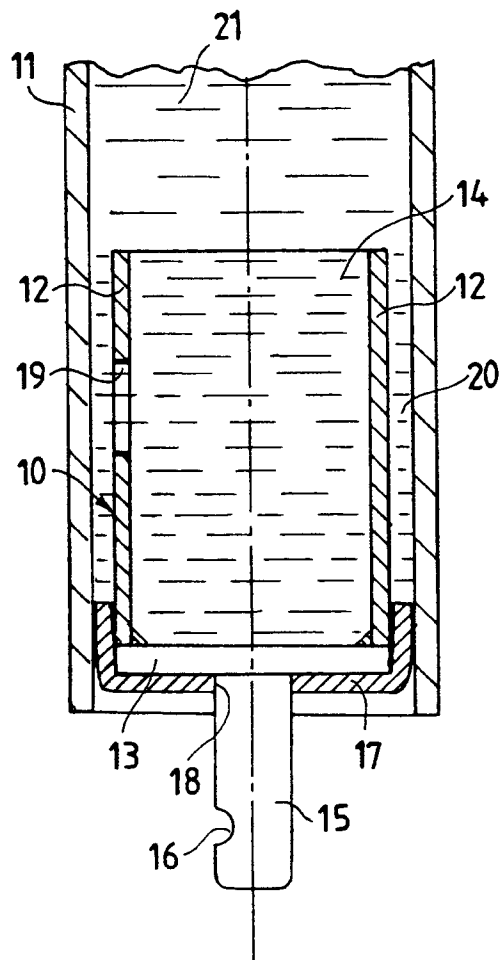


Fig.2

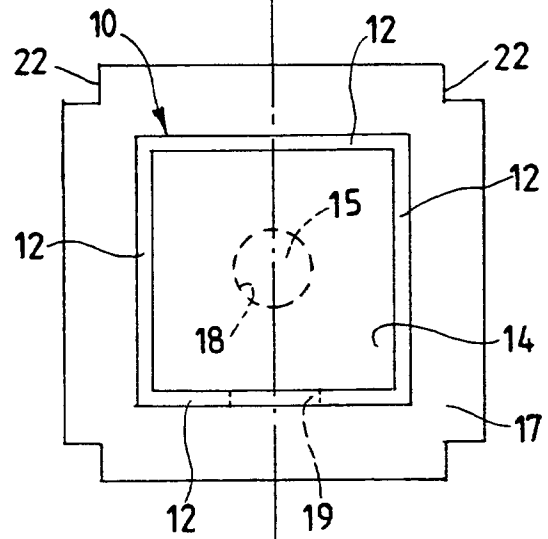
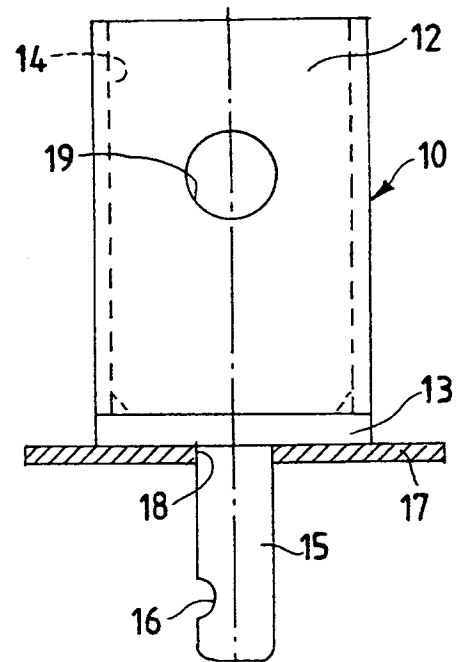


Fig.3



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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 1376

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.6)
X	DE 195 03 911 A (CONCAST STANDARD AG) 24 August 1995 * column 3, line 32 - column 4, line 35; figures 1-7 *	1-3,5,7	B22D11/08
X	DE 39 16 287 C (DISLICH M.) 9 August 1990 * column 5, line 11 - column 7, line 12; figures 2,3 *	1-7	
X	EP 0 231 520 A (DISLICH MARGRIT) 12 August 1987 * figure 6 *	1,2,5,7	
X	PATENT ABSTRACTS OF JAPAN vol. 016, no. 129 (M-1228), 2 April 1992 & JP 03 291148 A (SUMITOMO METAL IND LTD), 20 December 1991 * abstract *	1,5	
A	GB 2 144 660 A (OB URALMASH PROIZV) 13 March 1985 * the whole document *	1	
A	FR 1 310 964 A (CONCAST AG) 29 March 1963 * figures 1,2 *	1	
A	DE 88 03 181 U (BÜCHELE E.) 28 April 1988 * the whole document *	1-7	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 August 1998	Examiner Mailliard, A
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