APPARATUS FOR INTRODUCING A LAUNCHING ROPE IN A CONTINUOUS CASTING INSTALLATION FOR METAL

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ABSTRACT

A launching rope for use in a continuous casting installation particularly for steel is transferred, before the start of casting, by moving its one end to a position closing the continuous mold. The other end is positioned into the zone of force-transmitting feed rolls. The method of transportation is characterized by the fact that the launching rope is lowered into the extrusion guide way from above in the zone of the casting platform level or a little lower. The launching rope which is selected is either one which is present from the preceding casting operation or one or several which are present in the supply of the casting installation. The apparatus, in one embodiment, comprises ordinary hoisting means in the form of a crane having a hook which is engaged with the head of the launching rope. Alternatively, the apparatus comprises a car arranged at the platform level and with means at the casting delivery level which forms a cage for the rope which is lifted upwardly to the platform level and placed on the car. The car is then movable along the platform to a position at which the rope may be directed downwardly over a conveyor on the car so that its one end is fed into and through the continuous mold into engagement with the feeding rollers for the casting.

2 Claims, 1 Drawing Figure
APPARATUS FOR INTRODUCING A LAUNCHING ROPE IN A CONTINUOUS CASTING INSTALLATION FOR METAL

SUMMARY OF THE INVENTION

This invention relates, in general, to the construction of continuous casting equipment and to a method of handling this equipment and, in particular, to a new and useful method and apparatus for introducing the launching rope in a continuous casting installation for metal such as steel.

It is known practice to employ a receiving device which is located outside the roll train for the feeding of the cast extrusion after the cast extrusion has run through the mold and to receive the launching rope which has been used in this receiving device. The receiving device then brings the launching rope back to a position for re-use with the next casting. For this purpose, the known devices for receiving the rope pivot first due to the zone of the roll train for the casting so that the launching rope begins to travel the path of the cast extrusion but in a reverse direction. In practice, the launching rope must first pass with its start-up head through the feed roll device which is usually in a horizontal position in order to receive a driving force to move forward. For this reason alone, it is undesirable and time-consuming to bring the launching rope from the receiving device into the zone of the feed device at which the feed rolls can grip the launching rope. As soon as the drive movement of the feed rolls is transmitted to the launching rope, there begins the admission of the launching rope with the start-up head thereon into the interior of the continuous mold. At approximately one-third of the height of the continuous mold, the launching rope is stopped and sealed between the continuous mold wall plate and the start-up head, and this area is sealed and insulated against casting material which may impinge later. The drive of the feed device is, of course, laid out for the casting process, that is, for casting speeds of a few meters per minute. Consequently, the speed of return of the launching rope to the continuous mold before the start of casting is correspondingly slow. In the known continuous casting installations, in particular of the category of the arc form, the introduction of the launching rope takes a considerable amount of time during which the entire casting installation produces no extrusion material. It is preferable that there is no interruption of the production of extrusion material by arranging the apparatus so that there can be an uninterrupted pouring of the metal to form the casting and there be a sequence of casting which is continuous. For this purpose, there is provided a small supply tank or so-called distributor gutter from which enough casting metal is available for a short time to bridge a ladle change. Such sequence casting can take place only when there is no change of the grade of steel to be poured or when no change of dimensions or form of the extrusion cross-section is demanded. In cases of change of steel grade, steel quality, or extrusion cross-section dimensions, therefore, the casting operation must be stopped and the end of the cast extrusion leaves the continuous mold and passes through the various stations of the casting installation until the installation is free of the extrusions. The reintroduction of the launching rope for a new extrusion cross-section dimension is now absolutely necessary.

In accordance with the present invention, there is provided an apparatus and method for operating the continuous casting apparatus in order to avoid the losses of time which are caused by the introduction of the launching rope and also to bring about improvements in the equipment used in the continuous casting installation. With the prior art constructions, the receiving and feed device for the launching rope requires considerable space above the discharge roll train.

In accordance with the present invention, the launching rope is lowered into the extrusion guide way from above in the zone of the casting platform level or a little lower. A new launching rope, or one which has been used in the preceding pouring operation, is supplied at this location. The procedure results in considerable savings of time. The slow working of the feed device need no longer be taxed. Special measures for adapting the contact pressure to the properties of the launching rope inside the feed device are likewise eliminated. In particular, when extrusion dimensions are changed, the launching rope needed for the following casting operation is immediately available and only needs to be lowered. The operation of the continuous casting installation as a whole, thus becomes more productive.

In the application of the concept indicated above, the launching rope is threaded in an extended hanging position, or it is guided to run around a point of deflection from the horizontal position above the mold so that it may be fed directly into the mold. As it may be assumed, the launching rope is smaller, at least in one dimension, than the aperture of the continuous mold. Therefore, it suffices to pay some attention to the lowering of the start-up head of the rope into the continuous mold where only two thirds of the distance is to be travelled.

According to a further inventive procedure, the launching rope is introduced between the extrusion guiding members from above after the continuous mold has been removed from the extruding section. If, therefore, the introduction of the launching rope through the continuous mold is not desired, the mold may be designed so that it may be moved or pivoted out of the way. If, however, a change of the extrusion dimension is provided anyway, then the continuous mold must be exchanged so that the launching rope can get into the extrusion guide way particularly advantageously and rapidly.

A simple method favorable for all cases comprises, according to a further feature of the invention, in the threading of the launching rope through the extrusion guide way laterally below the continuous mold with or without the start-up head. Depending on the flexure of the individual link chains of the launching rope, such a procedure may likewise be advantageous.

Lastly, a process step according to the invention comprises, for successive pouring operations, with the same cross-sectional dimensions of the extrusion, but of a different steel grade, the introduction of a launching rope section into the still liquid cast metal of the preceding pouring. Thus, a method is provided for bringing about almost a continuous pouring or sequence casting of different quality grades. This proposal includes the general idea of bridging any interruption during pouring simply by interposing a blind piece of cold rope or extrusion which can later be read-
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3

ily cut out of the extrusion by a flame-cutting device. Disturbances in the pouring operation on the continuous casting installation as well as changes of the material properties, therefore, no longer require a new start of casting but can simply be bridged. The introduction of a launching rope from above, therefore, extends in principle at this point up to the system of the sequence casting.

An apparatus for the execution of the method is designed so that the launching rope is transported by hoisting means which serve, if necessary, as a turning device and moved into a position necessary for the threading operation. Such hoisting means may comprise a bay crane having a load engagement hook and which may provide a turning device. The hook is engaged with the start-up head of the rope which, thus, positions the rope with the head portion at the top in the lowering position and the correct end side of the launching rope is at the bottom where it may be lowered into the mold and engaged with the feeding rolls of the casting feeding mechanism.

In another arrangement of the invention, the apparatus includes a cage for accommodating one or more launching ropes into which the ropes are fed after they are used for a casting operation. The cage with the ropes is liftable to the level of the casting platform and means are provided on the casting platform for transporting the cage with the ropes to a position directly over the continuous mold. This means advantageously includes a car having conveyor means thereon for transporting the rope into the mold. The cage in such a way is placed on the feeding rol train for the finished continuous casting and the launching rope is conveyed into the cage with the aid of the driven rolls of the roll train. The cage can then be lifted to the level of the casting platform by a crane or by means of a simple hoist. The cage is then conveyed by a car device which also includes conveyor means for feeding the chains one after the other into the continuous mold as their use is required.

A turning device may be dispensed with in certain cases. Instead, it is provided that the launching rope has at both ends articulated fastened thereto start-up heads which, if necessary, are detachable from their connecting joint with the rope. It is then immaterial which side of the launching rope is seized by hoisting means, while the other side is to be used without the start-up head. The solution of the turning device as well as the second proposed solution with two start-up heads constitute advantageous uses depending on the acceptable cost.

In a further development of the invention, the launching rope is of a length which, in the start-up operation, extends from the exit of the continuous mold to the feed rolls, which rolls only serve to drive the launching rope. While it is possible to arrange driven rolls of the feed device very close to the continuous casting mold, a very short length of the launching ropes can be attained in this manner. Especially light, and hence small drives can be arranged closer to the continuous mold exit. The feed rolls for the cast extrusion itself, however, can as is known be provided but only at some distance from the continuous mold because of the lack of strength of the extrusion which is still liquid in its interior. It is therefore advantageous to provide special launching rope feed rolls which, if desired, can be disengaged during passage of the cast extrusion.

According to a further feature of the invention, it is provided that the launching rope or ropes be transferred by means of a cage to a car running on tracks of the casting platform. These tracks, therefore, can extend at a suitable place oriented for the operation of the casting platform. Existing trackways may be used on which, for example, the cars for the distributor gutters run. Such a car advantageously carries a driving conveying device provided with deflecting rollers for transporting the flexible launching ropes into the mold when desired. The car may be moved along the trackway for positioning over the mold or positioned at a remote location therefrom at which it may receive a single launching rope or a cage containing a number of such ropes. Such a device is recommended for use with heavy launching ropes, such as are used, for example, at slabling installations. Lighter launching ropes for billet installations can be lowered between the extrusion guiding elements by manual operation.

An especially simple arrangement for conveying the launching rope into the extrusion guide way in a hanging position comprises the use of the hoisting means at the bay frame in the form of cranes which may lower hoisting hooks without interfering with any of the other crane operations and which may engage and suspend the launching rope directly over the axis of the mold, and need be lowered only into the extruded section lying in the alignment below them.

Accordingly, an object of the invention is to provide an improved method for introducing the launching rope in a continuous casting installation wherein the rope is transferred before the start of casting by its one end to a position closing the continuous mold and its opposite end is oriented in the range of the force transmitting feed rollers for the continuous casting and wherein the launching rope is lowered into the extrusion guide way from above in the zone of the casting platform level, or a little lower, and the launching rope, which is employed, is either the one from a previous casting operation or a new one.

A further object of the invention is to provide a device for introducing the launching rope into a continuous casting apparatus which comprises means for collecting the casting rope at the end of the casting operation, and hoist means associated with the operation for lifting the casting rope upwardly, preferably at its head, and for moving it into orientation above the continuous casting mold for deposit therein.

A further object of the invention is to provide an apparatus for introducing a launching rope into a continuous casting mold and feed mechanism which includes the collecting cage adapted to be positioned at the location where the casting is delivered onto roller feed ways for feeding away from a straightening device and hoist means associated with the cage for transferring the cage onto a car carried at the casting platform level, the car being movable along the casting platform to position its end over the casting mold; and including conveyor means thereon for delivering the launching rope from the cage, into the mold and for feeding the lowermost end into association with the feed roll and for orienting the head within the casting mold.

A further object of the invention is to provide a device for transferring a casting launching rope which is simple in design, rugged in construction and economical to manufacture.
The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The only FIGURE of the drawings is a schematic side elevational view of a casting plant constructed in accordance with the invention and with an alternate embodiment of casting level platform and associated equipment shown in dotted lines.

**GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to the drawings, in particular, the invention embodied therein comprises a casting apparatus which includes a casting platform 1 of an arcuate continuous casting installation. A mold lift table 2 with a continuous mold 3 is arranged at one end of the platform 1 and the platform 1 rests on posts 4 and 5 which, in turn, rest on a foundation 6 of the casting bay. During the casting operation, the extrusion 7 leaves the bottom of the continuous mold 3 and is guided in the lower region between slide shoes 8 and between individual supporting roller segments 9 which are arranged one after the other in a curved guide passage. This curved guide passage is also defined by the slide shoes 8 and the individual opposed rollers 10 and 11 of the individual roller segments 9. The slide shoes 8 and the supporting rollers 10 form supporting elements and constitute the first section of the secondary cooling zone 12. The extrusion 7 is also delivered from this section 12 into a conveying device 13 and thereafter into a straightening device 14. Immediately after the straightening device 14, there is located a flame-cutting device (not shown) which effects the cut-off of the casting.

In accordance with the invention, the launching rope 16 is brought into association with the continuous casting mold 3 from the level of the casting platform 1. After the rope 16 is inserted into the mold, the end opposite the head portion 20, extends downwardly far enough to be gripped by the first pair of feed rollers 17, 17 for feeding through the section 12.

In accordance with a first embodiment of the invention, the launching rope 16 is transported through the path indicated by the solid-headed arrows 18. For this purpose, the casting rope 16 may be one which has been used in a previous casting sequence and in which case it is engaged by a hook 19 of hoisting means in the form of a crane 21 which is only schematically designated by the hook 19. The hook 19 is engaged with the start-up head 20 and thereby lifts the launching rope 16 upwardly as indicated by the arrows 18 until it comes into alignment above the extruding section of the cast extrusion 7. As indicated by the length of the launching rope 16 which lies on the discharge roll train 15, it is of such a short length that the conveying roller 17 of the feeding section 12 can easily be engaged therewith after the head is aligned within the mold 3. The hoisting means 21 may, for example, comprise a bay crane and the hook 21 is usually pivotally supported at the lower end of the hoisting supporting cable 26 so that, if desired, the launching rope 16 may be rotated or pivoted for changing its orientation position.

In accordance with another embodiment of the invention, in which case the launching platform 1 is continued outwardly as indicated in dotted lines to 24 and supported by an extra supporting column 24a, the launching rope 16 is transported while it is in a horizontal position. In one arrangement, the launching ropes 16 are permitted to feed along the roll train 15 into the cage 22 and the cage 22 along with the one or more ropes 16 is lifted upwardly in a direction of the arrow 23 and then delivered onto the top of a carrier or car 25. In the embodiment shown, the car 25 includes wheels mounted on legs 31 to permit it to run along the platform to position the one end thereof at a location in which it is centered over the mold 3. Any conveying means such as the car 25 may be employed to transfer the launching rope 16, for example, in a horizontal position along the platform 1 in a direction of the arrow 23. Instead of the car, a series of roll drums may be provided for transferring the launching rope 16.

In some instances, a roll drum (not shown) is provided for winding the flexible launching rope thereon and this drum is again unwound when the rope is to be lowered along the axis 26 into the mold 3. The winding of the launching rope is advisable for launching ropes for billet casting while the cage 22 is suitable for slab launching ropes.

The launching rope 16 is improved by making it with two joints 28 at the ends 29 and 30 which permit the release of the start-up head 20.

The car 25 includes the wheel bases 31 which permit it to run along the tracks 32 up to the continuous mold 3. In this position, the launching rope is again central with the axis 26 when it is lowered off the left-hand end as shown in the drawings over guide rolls 33 and 34. One of the guide rolls 33 and 34 is driven or is drivable and both rolls are interconnected by a conveyor belt 35.

The invention is not limited to the examples of equipment shown, but requires only the transference of the launching rope either vertically or horizontally in the two paths 18 or 23 as shown. It would also be possible to have a conveying device for the launching rope which permits the division of the rope into individual members or groups of members.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. An apparatus for introducing a launching rope into a continuous casting installation comprising a continuous casting mold, feeding means below said mold for feeding the continuous casting therefrom, a discharge roll train connected to said feeding means for receiving the continuous casting and advancing it away from said feeding means, a launching rope adapted to be positioned in the mold for launching the casting, and hoisting means associated with the continuous casting installation for lifting the launching rope from the discharge roll train and for moving it above the mold and for subsequently lowering the rope into the casting installation for engagement thereof with the feeding means, said hoisting means comprising a cage adapted to be positioned along said discharge roll train in a position to re-
ceive the launching rope, means for lifting said cage, a casting platform at the level of said mold, conveyor means along said platform for conveying the launching rope therealong to said casting mold, said conveying means comprising a car having a conveyor thereon for moving said launching chain off the end of said car and into said casting mold.

2. An apparatus for introducing a launching rope into a continuous casting installation comprising a continuous casting mold, feeding means below said mold for feeding the continuous casting therefrom, a discharge roll train connected to said feeding means for receiving the continuous casting and advancing it away from said feeding means, a launching rope adapted to be positioned in the mold for launching the casting, and hoisting means associated with the continuous casting installation for lifting the launching rope from the discharge roll train and for moving it above the mold and for subsequently lowering the rope into the casting installation for engagement thereof with the feeding means, said hoisting means including a car movable to and from said mold, said car having a conveyor thereon for receiving said launching rope in a horizontal position and being adapted to be positioned adjacent said mold for feeding such launching rope off the end of said car into said mold.

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