CONTINUOUS CASTING PLANT WITH DEFLECTION OF THE CASTING

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This invention relates to continuous casting and, more particularly, relates to an improved method and apparatus for intercepting lengths of castings cut from the vertical cast strand and guiding such intercepted lengths to a horizontal delivery conveyer.

When casting strands of large cross sectional dimensions in a vertical continuous casting plant, it is impossible to remove short lengths cut from the strand without means for holding the cut strand. With large castings, the weight of the cut length compounds the difficulty of properly grasping a freshly cut strand length.

For example, it is common practice to provide a casting plant for casting of selectable strand sizes, e.g., a large slab of 1800 x 200 mm. in cross section and small slabs 500 x 150 mm. in cross section. In such arrangements, it is necessary to dimension the ladle capacity for the smaller sizes so that the time for pouring the ladle contents does not become excessive with possible solidification of the melt in the ladle. Thus, when large slabs are cast, the ladle empties before the slab length is long enough to reach the strand straighteners, which support the slab weight, and the slab will drop into the discharge chute causing great difficulties.

The same problem of guiding a short strand exists when the casting is interrupted for other operating reasons.

It is, therefore, an object of the present invention to provide a chute for receipt of the cut length. A supporting trolley, consisting of a roller mounted chain assembly, is controllably driven within the chute to support the strand length as it is cut and to guide the cut length down the chute to the delivery conveyer.

The supporting chain preferably consists of individual chain links which are held together by means of axle bolts or pins, and which are rockable upwards about these axle bolts.

According to one embodiment of this invention, some of the axle bolts uniting the chain links carry running wheels, by means of which the supporting chain can roll upon rails on the chute.

A preferred embodiment of the invention is illustrated by the accompanying drawings, in which:

FIG. 1 is a diagrammatic plan view of the plant, comprising casting equipment, extractor or driver, bending means for the continuous casting, chute, straightening-roller bed, and delivery conveyer.

FIG. 2 is a side view of a cross section through the chute on the line II—II in FIG. 1.

FIG. 3 is a side view of the supporting chain, with its head-piece.

FIG. 4 is a plan view of the supporting chain shown in FIG. 3.

FIG. 5 shows a detail of the supporting chain on a larger scale, illustrating the union of two abutting links of the supporting chain with the axle-bolts connecting these links and the running wheels mounted thereon.

FIG. 6 shows a plan view of part of the delivery roller bed, with the supporting chain arranged beside the same in the inoperative position, as well as the pull or device for the engagement of the supporting chain on the running rollers of the roller bed.

FIG. 7 is a sectional view according to the line VII—VII of FIG. 6.

The metal flowing out of the casting ladle a passes into the chill-mould 1, which is arranged vertically in a stand 2 of the continuous casting plant, and from which the casting 3 issues into a cooling chamber 4. The casting length is guided vertically downward by an extractor or driver 5. Beneath the driver there is secured to one of the working platforms 2a a bending member 6, which deflects the on-coming casting to one side and guides it onto a chute 7, from which it passes, over a straightening-roller bed 8, onto a delivery conveyer 9. A cutting machine 10 can divide the casting 3, the parts of which may be brought aside by further rollers 24.

A common problem in practice is that the strand 3 issuing from the mould is of a length shorter than the distance between the straightening device 8 and the rollers of the extractor 5. This occurs in casting of large slabs when the ladle empties prior to casting of a slab of the length required to reach from the straightening-roller bed 8 to the extractor. Also, this occurs when the casting is interrupted. In such cases, a strand will drop into chute 7 causing great difficulty. To provide for guidance of the strand, the arrangement discussed in the following paragraphs is advantageously employed.

At one side of the rollers 9 are situated rollers 25. Chain 11 rests in readiness on these rollers 25. It may be moved in a direction perpendicular to its length by a pulling device to move the chain onto the rollers 9. The pulling device has two sets of chain wheels or gears 26 and 27. The chain wheels 26 are affixed to a common shaft 28 and each moves an endless chain 29, which runs over the drive gear 26 and idler gear 27. The shaft 28 is driven by an electric motor 30. Each pulling chain has two cams 31 and 32. The cams 31 push, at a convenient turning of the shaft 28, the chain 11 to the right (FIG. 7) until the chain 11 is positioned in the middle of the rollers 9. The rollers 9 are then rotated to move the chain 11 to the right hand (FIG. 6) until its head-piece 21 passes through the straightening-roller bed 22 and enters the lower end of the chute 7. If pressure rollers 22a of the straightening-roller bed 22 are now pressed down onto the supporting chain 11, the supporting chain 11 is impelled upwards by the positively driven rollers of the straightening-roller bed 22 in the chute 7 until its head-piece 12 comes into contact with the length of casting.

The direction of rotation of the rollers of the straightening-roller bed 22 and of the delivery-roller bed 9 is then reversed, and the length of casting, the upper end of which is leaving the driver 5, is guided downwards, with the supporting chain 11, right on to the delivery-roller bed 9.

The supporting chain is composed of individual chain side bars 11a, bolts or pins 13, and connecting pieces 14. The distance between the side bars is fixed by screw bolts 11b with screw-threaded portions at both ends and a thinned centre portion; and the side bars 11a are limited in pairs by the nuts 19 mounted on the threaded ends of the screw bolts 11b. The bolts or pins 13 connect the side bars 11a with the connecting pieces 14. The side bars 11a are rockable to a limited extent about the bolts 13, the extent of the relative rocking of the chain side bars 11a being adapted to the curvature of the chute 7.

In order to render possible a rolling movement of the supporting chain 11 upon rails 16 provided on the chute 7, running wheels 15 are mounted upon opposite ends of two adjacent axle bolts 13, so as to provide a pair of wheels, each bolt carrying only one wheel.

The chute 7 accommodating the supporting chain 11 is preferably constructed as a tunnel 19 within an insulating brick lining, so that any cooling of the length of casting is as far as possible avoided. Moreover, by this means both the casting 3 and the supporting chain are substantially protected against falling out the chute. In
addition, the chute 7 is provided with a cover 20. The head-piece 12 has a guide-piece 18, with which it guides itself along a rail 24a in the cover 20 of the chute 7.

This invention may be modified and embodied within the scope of the subjoined claims.

What is claimed is:

1. A continuous casting plant comprising a vertical open-ended mold adapted to cast molten metal poured therein into a strand, a cooling chamber positioned below said mold and adapted to cool said strand issuing from said mold, drive rolls positioned below said cooling chamber to engage said strand and to extract said strand from said mold, bending means positioned below said drive rolls and cooperating therewith to arcuately bend said strand from the vertical to a horizontal course, a horizontally disposed strand straightening bed to receive said strand and to straighten said strand, a delivery conveyor to receive the straightened strand, a chute extending between said bending means and said straightening bed and being curved in an arc corresponding to the arc of said bent strand, said chute being provided with rails extending the length thereof, a supporting chain movable along said rails in said chute, means for driving said supporting chain upwardly into said chute to contact the end of the bent strand within said chute and to support the weight of said strand, and means to withdraw said chain while supporting said strand so that a strand which is shorter than the distance between said straightener and said drive rolls will not be unsupportably dropped during traverse of the distance between the drive rolls and the straightener.

2. A continuous casting plant in accordance with claim 1 in which supporting chains comprise a plurality of individual lengths coupled together so as to permit rotation about said coupling only in one direction and only to the extent required for the chain to traverse the arc of said chute.

3. A continuous casting plant in accordance with claim 2 in which said coupling includes axles, wheels rotatably supported on said axles, said wheels engaging said rails in said chute during movement of said supporting chain.

4. A continuous casting plant in accordance with claim 1 which includes a head-piece coupled to the end of said supporting chain, said headpiece having a concave surface to engage the end of said strand and to ensure that the engagement is in supporting relationship to said strand.

5. A continuous casting plant in accordance with claim 1 in which said chute is thermally insulated to prevent heat loss from said strand during movement through said chute.

6. A continuous casting plant in accordance with claim 1 in which said supporting chain is arranged adjacent the delivery conveyor and which includes means for moving said supporting chain on to said delivery conveyor and displacing said chain into said chute to engage the end of the strand.

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