Sept. 8, 1970 A. MEITZ 3,527,286

CONTINUOUS CASTING APPARATUS HAVING A STRAND GUIDING ASSEMBLY WITH A TRACKWAY ALONGSIDE

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FIG. 1

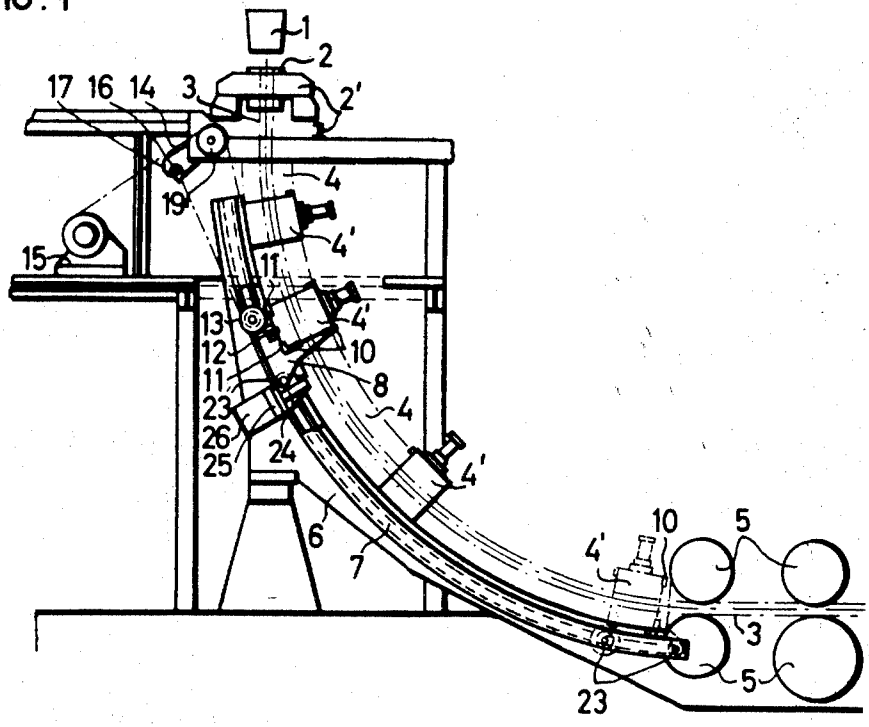


FIG. 2

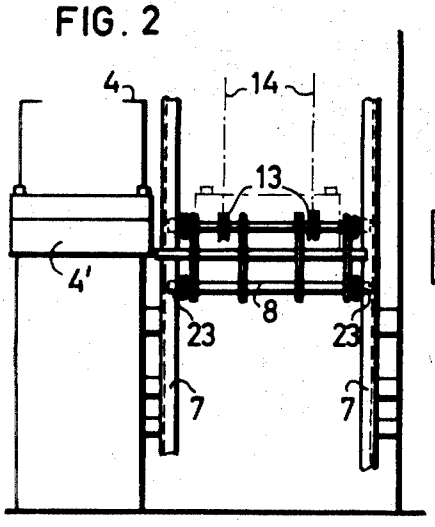
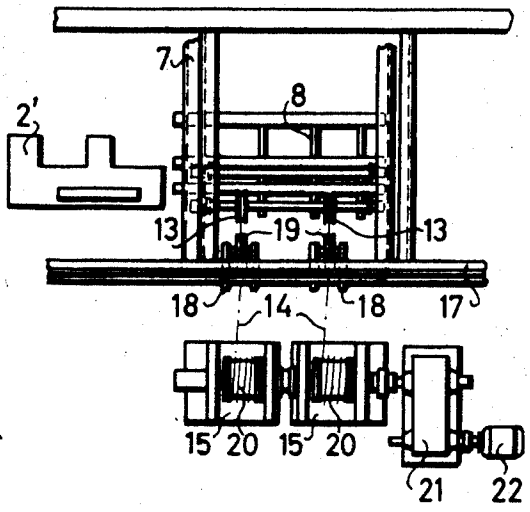


FIG. 3



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CONTINUOUS CASTING APPARATUS HAVING A STRAND GUIDING ASSEMBLY WITH A TRACKWAY ALONGSIDE

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ABSTRACT OF THE DISCLOSURE

A continuous casting apparatus includes an open ended mold, into which molten metal which is to be cast is directed and means for withdrawing a strand of the cast metal from the mold and a guiding assembly between the mold and the withdrawing means. The guiding assembly includes a curved guiding support upon which is placed a plurality of individual guide sections. Such individual guide section usually includes strand and guiding means such as rollers and means for cooling the strand, for example water spray nozzles. A plurality of these sections are spaced along the guiding assembly and positioned at those locations which are necessary in order to provide proper guiding of the strand. When it is desired to shift the position of one or more of the guiding sections, this may be done with a trackway which extends substantially parallel to the central line for the strand guiding. A wheel carriage is movable along the trackway and its movement is controlled by means of a pulley and winding drum lifting system. Each carriage has means for lifting the individual guide sections onto the carriage or off of the carriage and such means may comprise any well known lifting device such as a hydraulic lifting element.

SUMMARY OF THE INVENTION

This invention relates in general to the continuous casting of metal and in particular to a new and useful method and apparatus for replacing individual guide sections for guiding the newly cast metal of an assembly of a plurality of such sections and wherein the guiding section assembly includes at least a portion defining a curved strand guiding path.

Continuous casting plants include a water cooled open-ended mold into one end of which the molten metal is poured and continuously withdrawn from the opposite end as a partly solidified strand which is simultaneously cooled in a secondary cooling zone provided in a strand guiding means. The path of the strand may be either an entirely curved or straight path or one composed of curved and straight sections. The sections must be aligned relatively to each other in a very accurate manner. This is essential because the crust of the solidifying strand of cast metal is relatively thin and any misalignment could cause the molten metal inside the strand to break through the crust of the strand.

Normally the sections of the strand guiding means are replaced by a hoisting device through openings located above the strand guiding means on the casting platform. The covers of these openings have to be removed before any replacement can be made. This method is not very effective and leads to considerable difficulty when the strands to be formed are of relatively large dimension and require heavy guiding sections, for example, since this method is very difficult to effect and time consuming and, in addition, alignment of the sections is both difficult to achieve and likely to produce inaccuracies in the guiding of the strand.

In accordance with the present invention there is provided a simple and accurate method and apparatus for replacing the individual sections of the strand guiding section assembly in a rapid and effective manner. At least one section of the guide section assembly is displaced out of its working position in a direction transverse to the axis of the strand and thereafter is moved substantially parallel to the axis of the strand to a location at which it may be replaced. The apparatus for performing the method according to the invention includes a trackway defined on one side of the strand guiding means along which a carriage for the strand sections is movable. The carriage advantageously includes means for lifting the strand section out of the assembly and for displacing it laterally onto the carriage so that it may be wheeled parallel to the strand axis for removal or relocation.

Accordingly it is an object of the invention to provide a method of replacing a strand guiding section from an assembly of such guiding sections comprising displacing the section in a direction lateral to the axis of the strand and thereafter moving the section parallel to the strand for replacement.

A further object of the invention is to provide an apparatus for use in assembling and disassembling sections to define a strand guiding path which includes a support for mounting the sections in a position along the strand guiding path and a trackway defined alongside the support for moving a carriage for the sections in a direction parallel to the axis of the guide for the strands, and wherein the carriage is advantageously provided with means for lifting the individual sections laterally and for supporting the sections for movement on the carriage along the trackway.

A further object of the invention is to provide a continuous casting guiding apparatus 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 is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a partial side elevational view of a continuous casting plant having an apparatus for replacing the cast metal strand guiding sections constructed in accordance with the invention;

FIG. 2 is a partial bottom plan view of the upper portion of the strand guiding assembly shown in FIG. 1; and

FIG. 3 is a partial plan view of the hoisting device for the carriage for transporting each guide section.

DETAILED DESCRIPTION

Referring to the drawings in particular, the invention embodied therein comprises a continuous casting plant including a tundish 1 from which the molten metal is poured into a cooled open-ended mold 2 which is secured within a recess of a mold table 2'. The molten metal which is poured into the open-ended mold 2 solidifies in the outer zones of the mold cavity and it is continuously withdrawn from the mold 2 by forming a strand 3 which is guided and cooled in a strand guiding means or strand guiding assembly generally designated 4. The strand 3 is straightened and withdrawn by a straightening and withdrawing device, the rollers 5 of which are indicated at the lower right-hand portion of FIG. 1. After straightening, the strand is directed into association with a cutting device (not shown) to cut the strand into the desired length.

In accordance with a feature of the invention, the strand guiding assembly 4 is divided into a plurality of individual replaceable sections 4'. In the drawings, the complete assembly 4 is designated in dotted lines and only three of the strand guiding sections 4' are indicated in solid lines. Each section 4' is secured to a support or supporting beam structure 6 such as by bolts (not shown).

In accordance with a further feature of the invention, a transport system for installing and removing the individual strand guide sections 4' is provided which includes a trackway mounted alongside the support 6 and comprising spaced rail members 7, 7. A carriage 8 is provided with wheels 23 which run over the tracks 7, 7 which are arranged parallel to the axis of the strand 3, particularly at the curved section thereof between the mold 2 and the straightening rollers 5.

In order to insure the positive support of the sections 4' with respect to the carriage 8, the carriage is provided with a flat top supporting surface 11 and a supporting surface 10 substantially perpendicular thereto which are defined by fitting members in order to support a section 4' in the position indicated for the location of the carriage in FIG. 1. For securing heavy sections 4', adjusting devices such as screws and clamps are arranged in the setting areas 10 and 11. In addition, these areas may be formed by rollers in order to ease the handling of the sections when they are displaced into and out of their transporting positions. The carriage is also advantageously provided with a lifting and/or displacing device schematically indicated at 12 which may, for example, comprise a hydraulic, pneumatic or electric lifting and moving system for engaging a selected section 4' of the guiding assembly 4 in order to lift it from the assembly and place it on the carriage.

Means are provided for moving the carriage along the trackway which advantageously includes a pull or lifting cable 14 which is guided around a reversing roller or pulley 13 and anchored in a block 16 in a securing device or frame member 17. A bearing piece 18 is mounted on the frame 17 and it carries a guide pulley 19 for guiding the cable 14 from the pulley 13 back to a winding drum 20.

In the embodiment illustrated, the carriage 8 carries two spaced pulleys 13, 13 and two sets of cables 14, 14 are employed, each being wound upon a separate cable winding drum 20 which are mounted on stands 15, 15. The winding drums are driven by a motor 22 through reduction gearing 21.

When the sections 4' are to be installed into a guiding assembly 4, each section 4' is positioned on the carriage 8 and the carriage is moved along the track 7 to the desired installment location. The cables 14 and the pulleys 13 and 19 are advantageously arranged such that the carriage speed will be approximately half the cable speed.

In the preferred arrangement releasable stops 24 are mounted along the trackway 7 at selected locations in order to provide means for accurately orienting the carriage 8 in a position at which the section is to be installed. The stops are advantageously retracted within a cylinder 26 by the movement of a piston 25 after the installation is complete in order to permit movement of the carriage.

In accordance with the method of the invention, each section 4' is replaced by first disconnecting the selected section or sections from the supporting frame 6 so that it may be removed from the assembly 4. Thereafter, the displacement device 12 on the carriage 8 is employed for displacing the released section 4' onto the carriage. The carriage is then moved parallel to the axis of the strand to a location where there is easy access for a hoisting device, for example, a removal station as shown in the dotted line position of FIG. 1, so that the removed section 4' may be withdrawn from the carriage 8. The removal station, of course, may be at any station such as adjacent the top or the bottom of the strand guiding assembly 4.

In a further step according to the method of the invention, the carriage 8 with a replaced section on it is then moved parallel to the axis of the strand back to the location of the missing section and the new section is moved by the displacement device 12 into its working position in the assembly 4 and secured to the supporting frame 6.

It should be appreciated that the invention is not restricted to the embodiment described. For example, the sections of the strand guiding means need not necessarily be replaced by new ones. They can merely be repaired or adjusted when they are positioned on the carriage, for example. In addition, the carriage may be employed to transport more than one section in order to reduce the replacement time operation. When the sections are moved out of their position in the assembly, they do not necessarily have to be brought back into their original working position.

In the upper path of travel of the carriage 8, the supporting surface 10 forms the principal support, whereas in the lower position of the carriage, the supporting surface 11 forms the principal working support. A positive support of the sections 4' in respect to the carriage 8 is thus insured.

The rails 7 are advantageously made of a U-shaped configuration in order to provide a firm and definite support for the carriage wheels during their displacement operation. It should be appreciated that the trackway may be located in any desirable location alongside the strand guiding means and it may consist of tubes or T-bars.

While a specific embodiment of the invention has 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. In a continuous casting apparatus including an open-ended mold into which molten metal to be cast is directed, means for withdrawing a strand of the cast metal and a guiding assembly for guiding the strand including a plurality of individual guiding sections which are adapted to be positioned along said assembly, the improvement comprising means defining a trackway alongside said guiding assembly and substantially parallel to the axis of the strand guided by said guiding means, and a carriage movable along said trackway and defining means for supporting a guide assembly section and adapted to have lifting means for transporting at least one individual section out of the assembly and onto said carriage.

2. A continuous casting apparatus, comprising an open-ended mold into which molten metal to be cast is directed, means for continuously withdrawing a strand of the cast metal, a strand guiding assembly adjacent said mold for guiding the strand and including a plurality of individual guiding sections positioned in a stationary but laterally removable manner therealong, means defining a trackway alongside said strand guiding assembly, means for laterally moving said individual guiding sections between said guiding assembly and said trackway, and strand-guiding-section-supporting transport means movably associated with said trackway for moving a section of said guiding assembly substantially parallel to the axis of said assembly along said trackway.

3. A continuous casting apparatus according to claim 2, said transport means, including a carriage movable along said trackway, and means connected to said carriage to move said carriage along said trackway.

4. A continuous casting apparatus according to claim 2, said transport means, including a wheeled carriage movable along said trackway, means connected to said carriage to move said carriage along said trackway, and releasable stop means along said trackway for securing said carriage in a position alongside a section of said guide assembly to be displaced.

5. A continuous casting apparatus according to claim 4, including means on said carriage for displacing a guide assembly section in a direction transverse to the axis of the strand.

6. A continuous casting apparatus according to claim 4, wherein said means for moving said carriage comprises a cable connected to said carriage and means for winding said cable.

7. A continuous casting apparatus according to claim 4, wherein said carriage includes at least two supporting areas arranged at right angles to each other.

8. A continuous casting apparatus according to claim 2, wherein said transport means includes a carriage with wheels for moving said carriage over said trackway, a pulley rotatable on one end of said carriage, said means for moving said carriage including a cable guided around said pulley and secured at one end, a cable drum around which the other end of said cable is wound, and means for winding said cable around said drum, said carriage having at least two support areas disposed at right angles to each other and including means for lifting a guide section out of said guide section assembly for transporting said guide section laterally onto said carriage from said guide section assembly.

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