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(54) **A mold oscillation apparatus for curved-type continuous casting machines.**

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## Description

This invention relates to an apparatus for oscillating a mold for curved-type continuous casting machines, and more particularly to an apparatus for oscillating a mold having a small radius of curvature.

From FR—A—1 490 342 a mold oscillating apparatus is known including a base frame, an oscillation lever fixable to the mold and to the base frame and an oscillation drive means connected to the oscillation lever and to the base frame.

In order to prevent cast strands from sticking to molds in continuous casting, there have been conventionally employed measures in which a mold in curved-type continuous casting machines is caused to oscillate by a stroke along a locus having a radius R of curvature. In these measures, precision for the locus of oscillation having a radius R of curvature must be strict to some extent in order to reduce surface defects on cast strands to the minimum. To this end, it is necessary to devise constructions or mechanisms for ensuring precison of locus having a radius R of curvature in oscillation of molds. In the prior constructions or mechanisms, guide rolls or single lever are utilized. However, these prior art constructions or mechanisms involve various problems such as the reduction in precision due to abrasion of guide surfaces and the difficulty in ensuring precision of locus due to the fact that position of fulcrum for the single lever is shifted upon deformation of the building structure to a part of which the fulcrum of the single lever is secured. Another problem involved in the prior art constructions or mechanisms resides in that repair or maintenance of driving mechanism and the like must be performed in a small area within the continuous casting machine.

It is an object of the invention to solve the above problems involved in the prior art constructions or mechanisms.

It is another object of the invention to provide an apparatus in which precision of oscillation for a mold is ensured for a long period of time and which can be completely repaired from the outside.

The invention as claimed provides:

An apparatus for oscillating a mold for curved-type continuous casting machines with the features of claim 1.

An illustrated apparatus of the invention is basically a single lever type construction to ensure motion along a perfect circular arc, and comprises a base frame of adequate rigidity, an oscillation lever mounted at its fulcrum on said base frame, a cam mechanism for oscillation mounted on said base frame, and a drive motor mounted on said base frame, said base frame being detachably mounted on a structure which in turn is securedly supported on a concrete foundation.

An apparatus according to the present invention is incorporated into a curved-type continuous casting machine having a small radius of curvature since it becomes compact in construction due to the fact that the length of the oscillation lever is reduced with smaller radius of curvature.

In one aspect of the invention, the oscillation lever has its center of oscillation corresponding to the center of curvature of a mold, so that the mold oscillates about the center of curvature to provide an accurate circular arc, thereby saving the trouble of locating the center of curvature of the mold anywhere on the building where the continuous casting machine is mounted. According to the invention, the center of curvature of a mold is immune from any displacement which would be caused by distortion of the building in the prior art, so that the mold can oscillate along an accurate circular arc.

In another aspect of the invention, a mold having its center of curvature fixed thereto is attached to a continuous casting machine only by mounting a base frame on a structure, and various elements provided on the base frame can be completely repaired at a location away from the continuous casting machine to improve an efficiency of repair work.

One way of carrying out the invention is described in detail below with reference to the drawing which illustrates only one specific embodiment and is an elevational view of apparatus constructed according to the invention.

Referring now to the drawing, there is shown an apparatus for oscillating a mold 1 of a curved-type continuous casting machine (not shown). The apparatus is generally designated by numeral 10, and comprises an oscillation lever 2 for the mold 1, a base frame 3, a bracket 4 secured to said base frame, an oscillation cam shaft 5 rotatably mounted on said base frame, an oscillation drive lever 6 oscillatorily mounted on said cam shaft, a reduction gear 7 for oscillation drive, and a drive motor (not shown). These components constitute an integral oscillation unit. The mold 1 has a path 1a for cast strands, which path has a radius of curvature R, and is detachably secured to the oscillation lever 2 by bolts 11 such that a center $O_1$ of curvature of the path 1a corresponds to a fulcrum at which the oscillation lever 2 is pivotally mounted on the bracket 4. The oscillation lever 2 is also pivotally attached at a loading point $O_2$ to the oscillation drive lever 6 to oscillate about the fulcrum, that is, the center $O_1$ of curvature. The loading point $O_2$ is located on a line passing through the center $O_1$ of curvature. The oscillation drive lever 6 is swingingly driven by the oscillation cam shaft 5 which is in turn driven by the drive motor (not shown) through the reduction gear 7 for oscillation drive.

The oscillation unit thus constructed is provided at the underside of the base frame 3 with a plurality of positioning liners 3a, through which the unit is positioned on top support surfaces 8a of a structure 8 and is detachably secured to the structure 8 by means of cotter pins 12. The structure 8 is rigidly mounted on a concrete foundation 9.

While this invention has been described in conjunction with a preferred embodiment thereof, it is obvious that modifications and changes therein may be made by those skilled in the art without departing from the spirit and scope of this invention, as defined by the claims appended hereto.

**Claims**

1. In an apparatus (10) for oscillating a mold (1) for curved-type continuous casting machines, including a base frame (3), an oscillation lever (2) fixable to the mold (1) and having its one end pivotally mounted to said base frame (3), and an oscillation drive means (5, 6, 7) operatively connected to the other end of said oscillation lever (2) and fixed to said base frame (3); an improvement wherein said base frame has a fulcrum ($O_1$) corresponding to a center of curvature of a path (1a) of cast strands in the mold (1), and wherein there is provided means which serves to detachably mount said base frame (3) on a structure (8) and includes cotter pins (12) and positioning liners (3a, 8a) interposed between said base frame (3) and said structure (8), so that said base frame (3) with the mold (1), oscillation lever 2 and said oscillation drive means (5, 6, 7) mounted thereon can be removed as a whole.

2. An apparatus as set forth in claim 1 wherein said oscillation drive means comprises an oscillation drive lever (6), to which the other end of said oscillation lever (2) is pivotally mounted.

3. An apparatus as set forth in claim 1 or 2 wherein said base frame (3) comprises a bracket (4), to which the one end of said oscillation lever (2) is pivotally mounted.

**Revendications**

1. Amélioration d'un dispositif (10) pour faire osciller un moule (1) pour machines de coulée continue de type courbe, comprenant un support de base (3), un levier oscillateur (2) fixable au moule (1) et ayant un de ses extrémités montée de façon pivotante sur ledit support de base (3) et un mécanisme d'entraînement oscillateur (5, 6, 7) relié de façon opérationnelle à l'autre extrémité dudit levier oscillateur (2) et fixé au dit support de base (3), caractérisé par le fait que ledit support de base a un point d'appui ($O_1$) qui correspond au centre de courbure d'un passage (1a) de brins moulés dans le moule (1), et caractérisé par le fait que des moyens sont fournis pour monter de façon amovible ledit support de base (3) sur une structure (8) et qui comprennent des goupilles (12) et des pièces de positionnement (3a, 8a) interposées entre ledit support de base (3) et ladite structure (8), de sorte que ledit support de base (3) avec le moule (1), le levier oscillateur (2) et ledit mécanisme d'entraînement oscillateur (5, 6, 7) montés sur celle-ci, peuvent être retirés sous forme d'un ensemble.

2. Dispositif selon la revendication 1, dans lequel ledit mécanisme d'entraînement oscillateur comprend un levier d'entraînement oscillateur (6) auquel l'autre extrémité dudit levier oscillateur (2) est assemblé de façon pivotante.

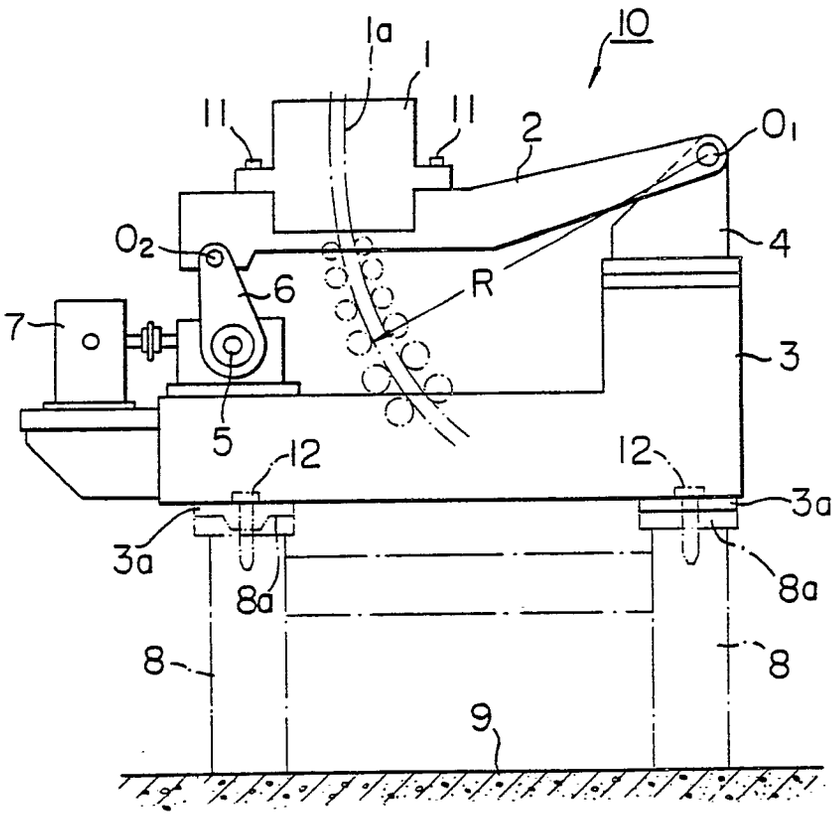
3. Dispositif selon les revendications 1 ou 2, dans lequel ledit support de base (3) comprend une console (4) à laquelle l'une des extrémités dudit levier oscillateur (2) est assemblée de façon pivotante.

**Patentansprüche**

1. Einrichtung (10) zum Schütteln einer Kokille (1) für Bogenstranggußanlagen mit einem Grundrahmen (3), einem an der Kokille (1) befestigbaren Schüttelhebel (2), dessen eines Ende am Grundrahmen (3) angelenkt ist, und einem mit dem anderen Ende des Schüttelhebels (2) treibend verbundenen und am Grundrahmen (3) befestigten Schüttelantrieb (5, 6, 7), einer Verbesserung, wobei der Grundrahmen einen einem Krümmungsmittelpunkt einer Strecke (1a) gegossener Stränge in der Kokille (1) entsprechenden Drehpunkt ($O_1$) aufweist und wobei eine Vorrichtung vorgesehen ist, welche dazu dient, den Grundrahmen (3) an einem Gestell (8) abnehmbar anzubringen und Splinten (12) und zwischen dem Grundrahmen (3) und dem Gestell (8) angeordnete Halteeinsätze (3a, 8a) aufweist, so daß der Grundrahmen (3) mit der daran befestigten Kokille (1), dem Schüttelhebel (2) und dem Schüttelantrieb (5, 6, 7) als Ganzes entfernt werden kann.

2. Einrichtung nach Anspruch 1, wobei der Schüttelantrieb einen Schüttelantriebshebel (6) aufweist, an welchen das andere Ende des Schüttelhebels (2) angelenkt ist.

3. Einrichtung nach Anspruch 1 oder 2, wobei der Grundrahmen (3) einen Träger (4) aufweist, an welchen das eine Ende des Schüttelhebels (2) angelenkt ist.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1a
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