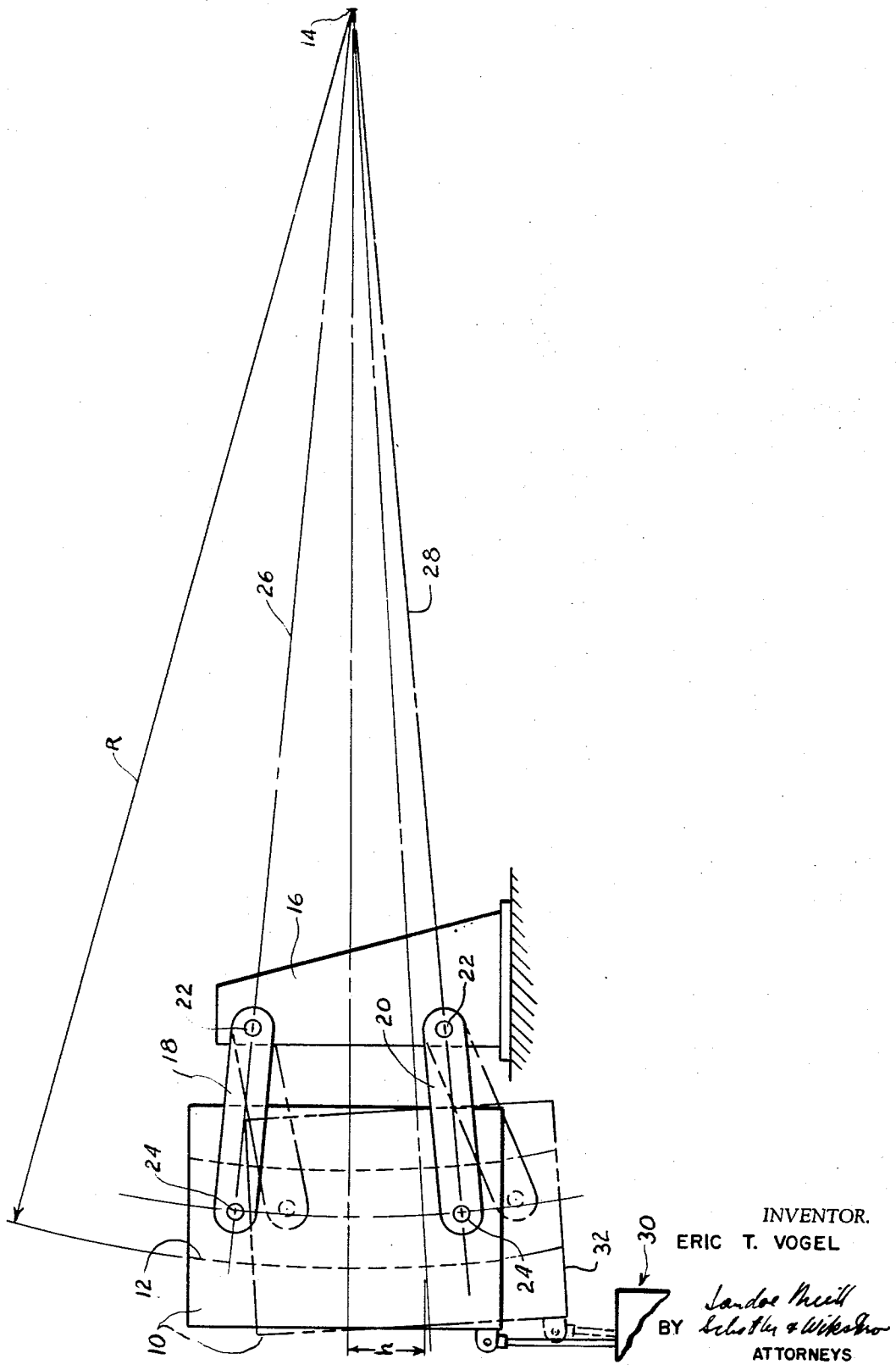
Sept. 26, 1967 E. T. VOGEL 3,343,592

RECIPROCATING CONTINUOUS CASTING CURVED MOLD MOUNTING SYSTEM

Filed Sept. 22, 1965



INVENTOR.
ERIC T. VOGEL

BY Landon Russell
Schlatter & Wilkerson
ATTORNEYS

United States Patent Office 3,343,592 Patented Sept. 26, 1967

3,343,592

RECIPROCATING CONTINUOUS CASTING CURVED MOLD MOUNTING SYSTEM

Eric T. Vogel, Elmhurst, N.Y., assignor to Concast, Inc., New York, N.Y.

Filed Sept. 22, 1965, Ser. No. 489,247
3 Claims. (Cl. 164—260)

This invention relates to continuous casting of metals and, more particularly, relates to an improved mold mounting arrangement for a reciprocated curved mold used in such continuous casting plants.

In recent years, increased emphasis has been given to casting of a continuous strand by a curved mold. The mold is fashioned as an open-ended mold which is cooled to solidify the periphery of molten metal poured therein, permitting continuous extraction of the strand cast thereby. By curving the mold shaft, the strand cast thereby issues in the form of a curved strand having the same radius as the radius of curvature of the mold. The curvature of the strand permits certain reductions in the height of the continuous casting plant and is, thus, advantageous.

However, it has been found that, to avoid problems of sticking of the skin of the strand to the mold which might result in rupture of the thin skin and resultant breakthrough of the molten core of the strand, that the mold should be reciprocated over a predetermined throw during casting. The curved mold must be reciprocated along the radius of curvature of the shaft thereof in order to avoid the application of impact shocks to the skin of the strand.

Accordingly, such molds have been mounted on a beam corresponding to the radius of curvature of the mold shaft and pivoted at the center of curvature. The mold is mounted at the other end of the pivoted beam and is reciprocated or oscillated. The rather long beam lengths involved, however, introduce the disadvantage of unduly increasing the size of the continuous casting plant and also introduces many mechanical difficulties particularly the problems associated with changes in beam length with temperature change.

It is, therefore, an object of the present invention to provide an improved arrangement for mounting of a reciprocated curved continuous casting mold.

In accordance with this object, there is provided, in a preferred embodiment of this invention, a continuous casting mold having a curved shaft extending therethrough. A mounting support is positioned adjacent the mold on the side of the mold towards the center of curvature of the curved shaft. Short supporting links are used to supportably couple the mold to the support. A short link is provided at the top and the bottom of the mold and each of the links is pivotably coupled to both the support and the mold at the respective ends thereof.

The links are so positioned as to lie along radii extending from the center of the radius of curvature of the mold shaft when in the rest position. Means are provided to oscillate the mold over the desired throw and, as the mold oscillates, it will be carried along a circular path which follows the absolute circular path described by the radius from the center of curvature of the mold so closely as to enable casting of the curved strand by the reciprocated mold without damage to the fragile skin thereof.

Having briefly described this invention, it will be described in greater detail along with other objects and advantages in the following portions of the specification, which may best be understood by reference to the accompanying figure which is a side elevation in diagrammatic form of a curved continuous casting mold arranged in accordance with the present invention.

In the single figure, there is shown a continuous casting mold **10** which may, for example, comprise a copper mold having an open-ended substantially centrally disposed mold shaft **12** extending therethrough. The mold shaft may, for example, be rectangular in configuration. The mold **10** may be provided with cooling water circulated through the mold in conventional manner to chill the mold and thereby to provide means for chilling the periphery of molten metal poured into the open shaft of the mold. The peripheral skin is formed within the mold shaft and contains the molten metal in the core of the strand. The strand is continuously extracted from the exit end of the mold shaft **12** as it accrues.

The mold shaft **12** is curved about a center of curvature **14** having the radius R. In this manner, the strand cast by the mold is curved, permitting reduction in the overall height of the continuous casting plant as is now well known to the art.

The mold is pivotably carried by a support **16** coupled to the mold by upper control links **18** and lower control links **20**. In the usual application, the links will be applied to both sides of the mold. The ends of both the upper control links and the lower control links are pivotably coupled to the support and to the mold by pivot pins **22** and **24**. The pivot points are so positioned that, in the rest position of the mold, both the upper control link **18** and the lower control line **20** lie along radii **26** and **28** respectively extending from the center of curvature **14** of the mold shaft **12**. Means **30** are provided to reciprocate the mold from its rest position over the desired stroke h in a reciprocation cycle, the stroke and the velocity of which is determined by the material to be cast and the desired quality of the surface of the cast strand.

During reciprocation of the mold from its rest position to its maximum deflection indicated by the dotted outline **32**, the mold follows a generally circular path coinciding with the arc of the curved shaft. There is a slight deviation from the circular path about the pivot point **14** since in the lowest position, the links will be fixed about a pivot point displaced from the original pivot point **14**. However, the deviation from the true circular path about pivot point **14** can be held to such a small deviation from the exact circular path that casting can be achieved. It will be noted that there is some contraction of the strand which permits a certain amount of deviation from the path without impacting the skin. Further, the extremely slight deviation from a truly circular path is less than the deviation caused by temperature responsive changes in length of a long beam pivoted about the pivot point **14**.

For example, in a typical installation, the radius R to the center of curvature would be 36′. The control links were 32″ long. The oscillation stroke h was ¾″. The distance between pivot pins on the mold was 20″. With such arrangement, the deviation from a true circular path was less than 0.005-in. As can be seen, the deviation is very small even with a great reduction in size from 36′ to 32″.

Thus, with the present arrangement, a close coupled, rigid mounting arrangement can be achieved to both support and controllably guide the massive equipment utilized in such processes without significant deviations from the theoretically desired circular oscillation path.

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

What is claimed is:

1. In combination, a continuous casting mold, said mold having an open-ended mold shaft extending therethrough, said mold shaft being curved about a center of curvature, a mold support positioned adjacent said mold and on the same side of said mold as lies said center of curvature, an upper and lower control link extending between said mold and said support and being pivotably coupled to said support and to said mold at the respective ends of each of said control links, said upper control link and said lower control link lying along radii extending from said center of curvature of said mold shaft to said mold shaft.

2. A combination in accordance with claim 1 which includes means for reciprocating said mold in a reciprocation stroke.

3. A combination in accordance with claim 1 which includes a second upper control link and a second lower control link, said first and second upper control links being positioned astraddle said mold, said first and second lower control links being likewise positioned astraddle said mold.

References Cited

UNITED STATES PATENTS

2,818,616	1/1958	Rossi	164—260
2,871,530	2/1959	Wieland	164—83 X
2,946,100	7/1960	Baier et al.	164—83
2,947,075	8/1960	Schneckenberger et al.	164—89 X
3,200,456	8/1965	Harter et al.	164—83
3,253,473	4/1966	Chisholm	74—96
3,258,815	7/1966	Reinfeld et al.	164—38 X
3,313,006	4/1967	Barbe et al.	164—283

OTHER REFERENCES

Marks' Mechanical Engineers' Handbook, Sixth Edition, McGraw-Hill, N.Y., 1958, TJ 151 M 37, p. 8–3 (copy in Group 320).

J. SPENCER OVERHOLSER, *Primary Examiner.*

R. S. ANNEAR, *Assistant Examiner.*