

[54] **DUMMY BAR FOR CONTINUOUS CASTING**

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[51] **Int. Cl.** **B22d 11/08**

[58] **Field of Search** 164/274

[56] **References Cited**

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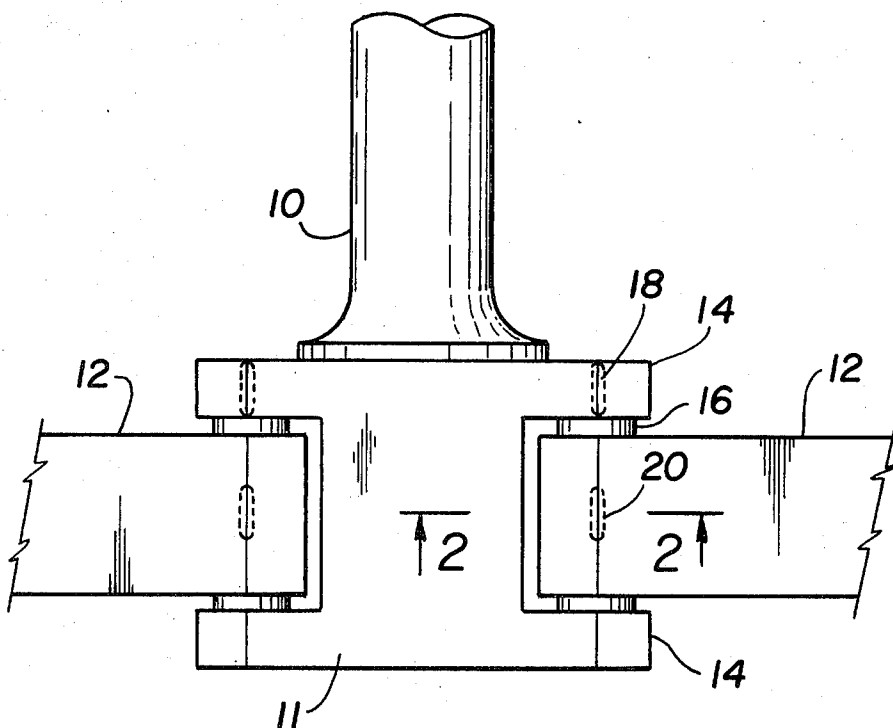
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[57]

ABSTRACT

A dummy bar for use in a continuous casting operation is comprised of a series of parts which are linked together to pivot about parallel axes. Each joint between adjacent parts includes an end of one of the parts and a pivoting axle mounting the other adjacent part pivotally on the one part. A peg or pin is affixed to either the end of the one part or the pivoting axle and is received in a closed seat of either the pivoting axle or the end of the one part with sufficient play to permit a limited angular movement between the parts transversely of the pivoting axis.

3 Claims, 5 Drawing Figures



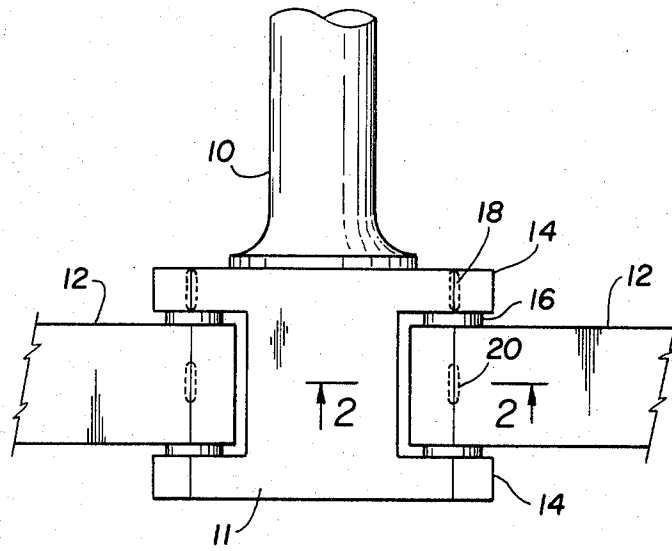


FIG. 1

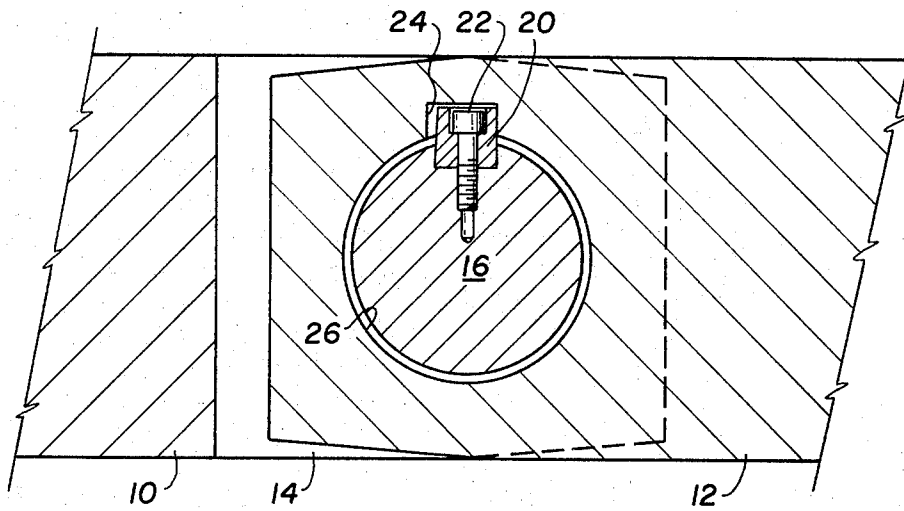
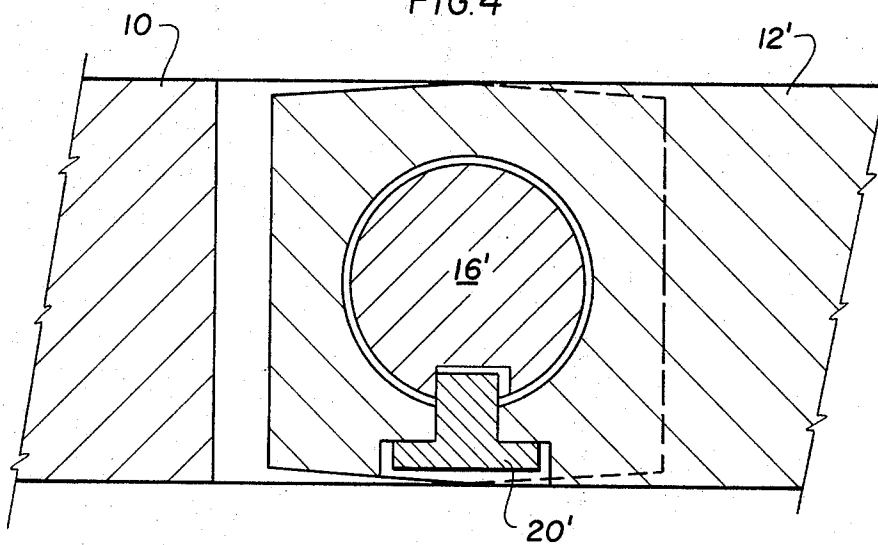
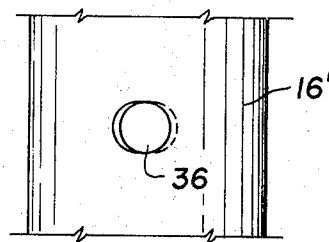
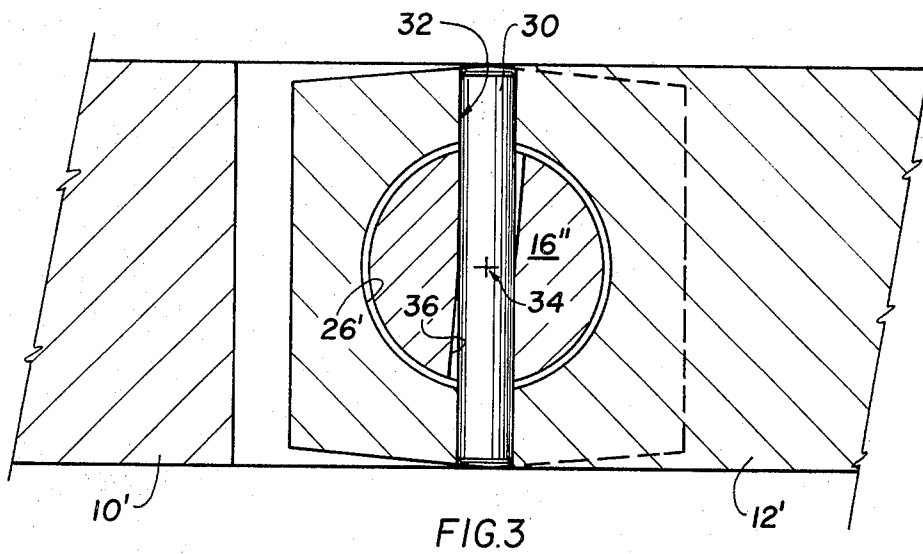


FIG. 2



DUMMY BAR FOR CONTINUOUS CASTING

The present invention relates to improvements in dummy or starting bars used in continuous metal casting operations and of the type comprising a series of parts linked together so that the dummy bar may pass readily through a curved path while the dummy bar parts pivot about axes substantially parallel to each other.

In the continuous casting of metals, the liquid metal is poured into the top of a tubular mold which is open at the bottom and the solidified or partly solidified casting is withdrawn from the bottom of the mold and passed through a curved apron below the mold. In starting the casting operation, the open end of the mold is sealed by a dummy or starting bar which is gripped by withdrawal rolls mounted along the apron to pull the casting out of the mold while it remains attached to the dummy bar. At the start, the positioning of the dummy bar is facilitated by limiting the angular movements of the dummy bar links in such a manner that the dummy bar can be curved or articulated only in one direction, beginning from a rectilinear position, with a minimal radius of curvature which is only slightly less than that of the apron.

To provide this limitation of respective angular movements of the dummy bar parts, their adjacent ends have been provided with abutments which prevent angular movements beyond a selected limit. However, while the dummy bars are stored between starts of casting runs and/or while they are handled, foreign bodies may enter and become lodged between the abutments. These foreign bodies will then interfere with the angular movements of the dummy bar parts and prevent them from assuming their desired position. They may even create shearing stresses in the pivoting axles joining the adjacent dummy bar parts when the same are pivoted in respect of each other during their passage over the curved apron.

It is the primary object of this invention to overcome this disadvantage by providing interior abutments closed off from the outside and which, therefore, permit no access of foreign bodies thereto.

The above and other objects are accomplished by the invention with joints interconnecting each two adjacent dummy part, each of the joints including as a first element an end of one of the adjacent parts and as a second element a pivoting axle extending in a respective one of the parallel pivoting axes. The pivoting axle mounts the other adjacent part pivotally on the one adjacent part. According to the present invention, a member, such as a peg or pin, is affixed to one of the elements and is received in a closed seat in the other element with sufficient play to permit a selected angular movement between the parts transversely to the pivoting axis.

The above and other objects, advantages and features of the present invention will become more apparent from the following detailed description of now preferred embodiments thereof, taken in conjunction with the accompanying drawing wherein

FIG. 1 is a partial plan view of a dummy bar according to one embodiment of this invention;

FIG. 2 is a section along line 2—2 of FIG. 1;

FIG. 3 is a similar section showing another embodiment of the invention;

FIG. 4 shows a plan view, from below, of the pivoting axle of FIG. 3; and

FIG. 5 is a sectional view of a modification of the embodiment of FIGS. 1 and 2.

Referring now to the drawing and first to FIGS. 1 and 2, the dummy or starting bar used in a continuous casting operation is comprised of a series of jointed links or parts of two alternating types, similar to a link chain, as shown in the partial view of FIG. 1. One type of the links is constituted by bars 10 whose two ends are H-shaped to define respective recesses receiving the ends of the other type of links which are constituted by simple rods 12. The rod ends are received in the recesses with a slight play and are pivotally mounted therein by means of respective pivoting axles 16 journaled in the jaws of the H-shaped ends of bar 10 to provide an articulated joint between the bars and the rods. Two successive bars are joined together by two rods, each at one end.

As shown in FIG. 1, each pivoting axle 16 is mounted in the jaws 14, 14 of the H-shaped ends of bar 10 by mounting pins 18.

FIG. 2 illustrates the connection between the pivoting axle 16 and the rod 12 which the axle articulately joins to bar 10. As shown, the axle carries a peg 20 projecting radially from the circumference of the axle and fixed thereto by screw 22. A groove or keyway 24 extends in a direction parallel to the axle in the wall of bore 26 of rod 12 wherethrough the axle is journaled. The peg 20 projects into keyway 24 but the width of the keyway exceeds that of the peg whereby the play between the peg and keyway permits a limited rotation of rod 12 about axle 16. The relative dimensions between the peg 20 and keyway 24 are so selected that engagement of the peg with one side wall of the keyway corresponds to the rectilinear form of the dummy bar while the engagement of the peg with the opposite side wall of the keyway corresponds to the smallest radius of curvature to which the jointed dummy bar must be flexed during the operation.

The keyway 24 extends the entire length of the bore 26 and its ends may be closed by washers interposed between jaws 14, 14 and rod 12 to form a closed seat for peg 20.

In the modification of FIG. 5, which functions in an equivalent manner, the peg 20' is fixed to rod 12' and an axially extending keyway in axle 16' receives the peg with the same type of play as described hereinabove. In this case, the peg is provided with a head which may be received in a matching recess in the outer wall of rod 12' so that the peg may be mounted in place from the outside after the parts have been assembled, which permits the keyway in the axle to be shorter than the axle. After the peg has been emplaced, access to the axle and the bore receiving it has been completely closed so that no foreign bodies may enter the joint. The peg may again be fixed by screws and like fasteners.

In the embodiment of FIGS. 3 and 4, the end of rod 12'' carries pin 30 which is force-fit into diametrically opposed bores 32 in the rod, bores 32 being aligned with a diameter of bore 26' which receives the pivoting axle 16''. The axle has a diametrically extending transverse bore 36 through which pin 30 extends, the axle 16'' again being journaled in the jaws of the end of bar 10' in any suitable manner, for instance as shown in FIG. 1.

The transverse bore 36 has a central straight section at the level of the axis of articulation 34, whose diameter is substantially equal to that of pin 30, and flares

outwardly towards the ends of the bore to permit an angular movement of the pin in respect of the axle so that the rod 12'' may be correspondingly pivoted in respect of bar 10'. No foreign bodies can penetrate into bore 36, which forms a closed seat for pin 30, so that the angular movements of the joined dummy bar parts will not be impeded.

If desired, the axle 16'' may be integral with rod 12'' and the pin 30 may be integral with bar 10'.

The invention may be used in connection with any dummy bar used in continuous casting operations wherein the bar is constituted by a series of jointed links or parts for use if casting in a curved path.

What is claimed is:

1. A dummy bar for use in a continuous casting operation and comprised of a series of parts linked together, a joint interconnecting each two adjacent ones of the dummy bar parts for enabling the parts to pivot about an axis, and the pivoting axes of all joints being substantially parallel to each other, each of the joints including an end of one of the adjacent parts and a pivoting axle fast with the end of the other adjacent part and extending in a respective one of the axes, the pivoting axle passing through a bore in the one adjacent part and mounting the one adjacent part pivotally on the other adjacent part, a peg affixed to the pivoting axle and received in a keyway in the bore extending in an axial direction, the width of the keyway exceeding that of the peg with sufficient play to permit only a selected angular movement between the parts transversely of the pivoting axis, and means for closing the ends of the keyway from the outside.

2. A dummy bar for use in a continuous casting operation and comprised of a series of parts linked together, a joint interconnecting each two adjacent ones of the dummy bar parts for enabling the parts to pivot about

an axis, and the pivoting axes of all joints being substantially parallel to each other, each of the joints including an end of one of the adjacent parts and a pivoting axle fast with the end of the other adjacent part and extending in a respective one of the axes, the pivoting axle mounting the one adjacent part pivotally on the other adjacent part, a peg affixed to the one adjacent part and received in a keyway in the pivoting axle, the width of the keyway exceeding that of the peg with sufficient play to permit only a selected angular movement between the parts transversely of the pivoting axis, and the keyway ending short of the ends of the pivoting axle whereby it is closed from the outside.

3. A dummy bar for use in a continuous casting operation and comprised of a series of parts linked together, a joint interconnecting each two adjacent ones of the dummy bar parts for enabling the parts to pivot about an axis, and the pivoting axes of all joints being substantially parallel to each other, each of the joints including an end of one of the adjacent parts and a pivoting axle fast with the end of the other adjacent part and extending in a respective one of the axes, the pivoting axle mounting the one adjacent part pivotally on the other adjacent part, a pin affixed to the one adjacent part and extending transversely to the pivoting axis through a diametrical bore in the pivoting axle, the transverse bore having a central straight section at the level of the pivoting axis whose diameter is substantially equal to that of the pin, and the transverse bore being closed off from the outside and flaring outwardly towards the ends thereof with sufficient play between the outwardly flaring ends and the pin to permit only a selected angular movement between the parts transversely of the pivoting axis.

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