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FLEXIBLE DUMMY BAR FOR CONTINUOUS CASTING MACHINES

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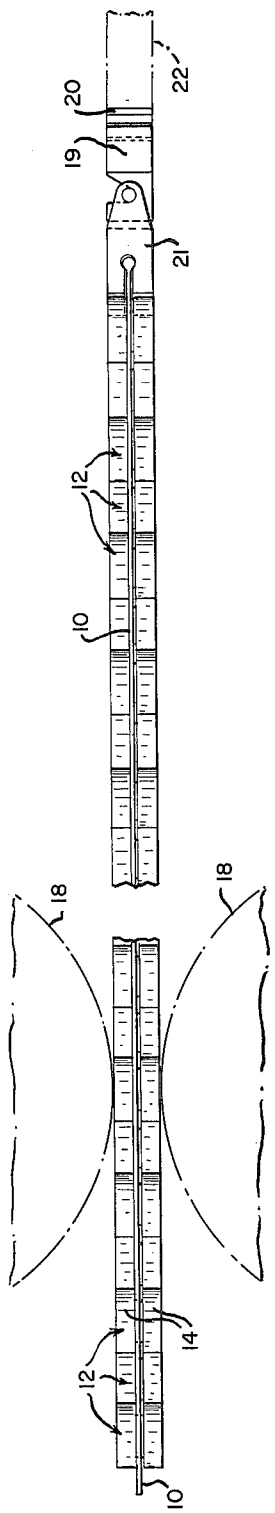


Fig. 2.

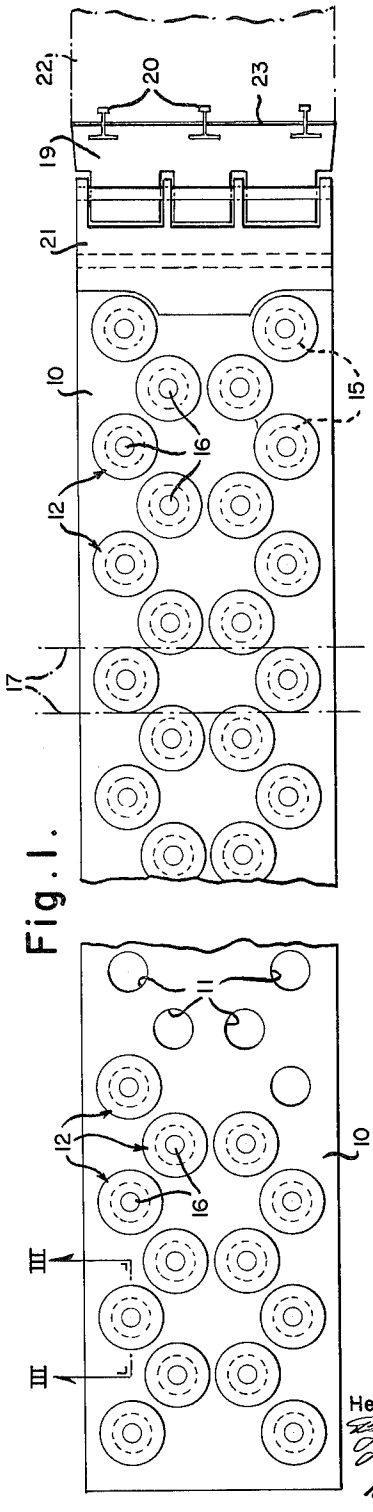


Fig. 1.

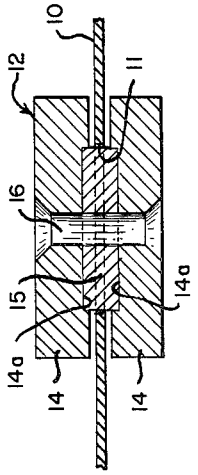


Fig. 3.

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FLEXIBLE DUMMY BAR FOR CONTINUOUS CASTING MACHINES

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This invention relates generally to starting bars for continuous casting machines, and more particularly relates to a flexible starting bar which will operate as well in continuous casting machines wherein the metal body being cast is bent through a radius from a vertical position to a horizontal position, as in continuous casting machines wherein the metal body being cast is not bent at all.

The advantages of a flexible starting or dummy bar over solid bars of soft metal have long been appreciated in the continuous casting art. Flexible bars have been invented heretofore for continuous casting machines, for example, the chain type and/or the segmented type such as disclosed in United States Patent No. 2,920,359. These flexible starting bars have, however, been heavy, complex units that are very expensive to manufacture and repair. Their weight alone has made them extremely cumbersome and difficult to handle.

Accordingly, I have invented a flexible dummy bar that is much lighter, simpler and less expensive to manufacture, simpler to repair and easier to handle than flexible starting bars heretofore known.

I provide a flexible dummy bar comprising an elongated flexible band member of greater breadth than thickness having a multiplicity of gage block elements loosely mounted thereon such that equal portions of each gage block element are disposed in opposing relationship on either side of said member, said gage block elements being of a thickness equal to the thickness of the continuous body to be cast, said gage block elements being spaced from each other and arranged on said flexible band member such that a constant thickness over the length of said member is presented to pinch rolls disposed across the path of said flexible band member when passing through said continuous casting machine normal to the longitudinal axis thereof and dummy bar head means for engaging the molten metal slab as it is initially formed in the mold of the continuous casting machine.

The flexible band member is of a width equal or less than the width of the continuous body to be cast. Where the continuous casting machine is being utilized to cast slabs of different widths, the width of the flexible band member should be no more than the narrowest of the slab widths to be run. On the other hand, if the continuous casting machine is used only to cast slabs having the same width, then preferably the flexible band member is of the same width as that of said slabs.

I also prefer that the dummy bar head means include connecting means for selectively engaging and disengaging the dummy bar from the slab.

Preferably, said gage block elements comprise a pair of flat button elements separated by and rigidly fastened to a spacer element, said spacer element being thicker than said flexible band member and being disposed in an opening in said flexible band member larger than said spacer element and smaller than said button elements whereby said gage block elements are loosely mounted on said flexible band member and said member may be flexed with said gage block elements mounted thereon. It is preferable also that the size of the spacer element, with respect to the size of the opening it is disposed in and the thickness of said flexible band member, provides sufficient clearance between said button and spacer elements and said flexible band member to permit

said flexible band member to bend at least to any radius of curvature to be formed in the metal body being cast.

I further preferably provide that the gage block elements be spaced with respect to each other so that tangents to the horizontal extremities of each gage block element drawn perpendicular to the longitudinal axis of said flexible band member overlap the horizontal extremities of each adjacent gage block element.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention in which

FIGURE 1 is a top plan view of a flexible dummy bar for continuous casting machines embodying the present invention;

FIGURE 2 is a side elevational view of FIGURE 1 as viewed from the lower edge thereof; and

FIGURE 3 is a cross-sectional view taken on the line III—III of FIGURE 1.

Referring now to the drawings, and initially to FIGURE 1, I provide an elongated flexible band **10** having a multiplicity of openings **11** therein over the length thereof in which are loosely disposed gage blocks **12**. Preferably, flexible band **10** is as long as the distance of the path of travel of the slab or metal body to be cast from the mold station to the cut off station of a continuous casting machine, but is at least as long as the distance from the mold station to the pinch rolls of the withdrawal equipment.

As best shown in FIGURE 3, gage blocks **12** are comprised of a pair of flat washer-like buttons **14** separated by a spacer **15** to which they are rigidly fastened as by the rivet **16**. As there illustrated, spacer **15** is disposed in an opening **11** of band **10** which is somewhat larger in diameter than spacer **15** and smaller in diameter than buttons **14**. Thus gage block **12** is loosely secured in band **10** with the buttons **14** thereof disposed one on each side of band **10** in opposing relationship. It should be noted too that spacer **15** is thicker than band **10** so that there is clearance not only between the sides of spacer **15** and opening **11** but also between band **10** and buttons **14**. These clearances should be of such an amount that band **10** can be flexed in both directions without any permanent deformation thereof to a radius at least as tight as any radius of curvature that the metal body to be cast will be subjected to in the continuous casting operation. It should be further noted that spacer **15** is tightly fit or seated in cavities **14***a* provided in buttons **14** to eliminate the shear effect that would otherwise operate on rivet **16** if spacer **15** and buttons **14** were simply flush against each other.

Referring again to FIGURE 1, gage blocks **12** are spaced from each other and are arranged so that imaginary lines **17**, which are tangent to the horizontal extremities of any gage block **12** and parallel to the breadth axis (or perpendicular to the longitudinal axis) of band **10**, overlap a portion of the gage blocks **12** adjacent thereto whereby gage blocks **12** present a continuous thickness, much in the manner of a solid body, over the length of band **10**, whether band **10** is curved or straight, to pinch rolls **18** which are disposed across and normal to the longitudinal axis of band **10**, as diagrammatically shown in FIGURE 2.

Gage blocks **12** are of the same thickness as the body to be cast and preferably band **10** is of the same width as the body to be cast so that the metal body is started through the machine in perfect alignment.

As shown in FIGURES 1 and 2, I also preferably provide a dummy bar head **19** having T headed rails **20** to which the molten metal in the mold station of the machine freezes as indicated by the slab end **22** in starting

the cast body through the machine. As is known by those skilled in the art, a suitable divider **23** is disposed along the end surface of head **19** facing the molten metal so that head **19** can later be readily removed without damage from the slab for reuse. I preferably also provide a releasable connecting means **21** so that the dummy bar and slab can be quickly disconnected when the slab begins to advance into the cut off station. Dummy bar head **19** and connecting means **21** are both conventional and for this reason will not be further described other than to say that they are also preferably of the same thickness and width as the slab to be cast and are also arranged to present a continuous thickness to pinch rolls **18**.

As shown in FIGURE 2, pinch rolls **18** continuously bear on and draw gage blocks **12** therethrough to pull my flexible dummy bar and the metal body being cast through the machine until pinch rolls **18** engage slab end **22** itself. It should be noted that even though gage blocks **12** are loosely disposed on band **10** they continuously present a smooth surface of constant thickness to pinch rolls **18**.

It will be understood and readily appreciated by those skilled in the art that the flexible dummy bar I have shown an described is much lighter than earlier types which makes it much easier to handle, is much simpler in construction and thus less expensive to build or repair without any sacrifice in operability and is of strong and sturdy structural design.

While I have shown and described a present preferred embodiment of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. A flexible dummy bar for continuous casting machines comprising an elongated flexible band member of greater breadth than thickness, a multiplicity of gage block elements loosely mounted on said member such that equal portions of each gage block element are disposed in opposing relationship on either side of said member, said gage block elements being of a thickness equal to the thickness of the continuous body to be cast, said gage block elements being spacedly arranged on said flexible band member such that a constant thickness over the length of said member is presented to pinch rolls disposed across the path of said flexible band member when passing through said continuous casting machine normal to the longitudinal axis thereof and dummy bar head means for engaging the molten metal slab as it is initially formed in the mold of the continuous casting machine.

2. A flexible dummy bar for continuous casting machines comprising an elongated flexible band member of greater breadth than thickness, a multiplicity of gage block elements loosely mounted on said member such that equal portions of each gage block element are disposed in opposing relationship on either side of said member, said gage block elements being of a thickness equal to the thickness of the continuous body to be cast and said flexible band member being of a width no greater than the width of the continuous body to be cast, said gage block elements being spaced from each other on said flexible band member and arranged thereon such that a constant thickness equal to said body thickness over the length of said flexible band member is presented to pinch rolls disposed across and normal to the longitudinal axis of said flexible band member when passing through said continuous casting machine and dummy bar head means for engaging the molten metal slab as it is initially formed in the mold of the continuous casting machine including connecting means for selectively engaging and disengaging said flexible band member with said dummy bar head means.

3. A flexible dummy bar for continuous casting machines as claimed in claim **1**, wherein said gage block elements comprise a pair of flat button elements separated by and rigidly fastened to a spacer element, said spacer element being thicker than said flexible band member and being disposed in an opening in said flexible band member larger than said spacer element and smaller than said button elements whereby said gage block elements are loosely mounted on said flexible band member and said member may be flexed with said gage block elements mounted thereon.

4. A flexible dummy bar for continuous casting machines as claimed in claim **3**, wherein the size of the spacer element with respect to the size of the opening it is disposed in and the thickness of said flexible band member provides sufficient clearance between said button and spacer elements and said flexible band member to permit said flexible band member to bend without permanent deformation at least to any radius of curvature to be formed in the metal body being cast.

5. A flexible dummy bar for continuously casting machines as claimed in claim **1**, wherein the gage block elements are spaced so that tangents to the horizontal extremities of each gage block element drawn perpendicular to the longitudinal axis of said flexible band member overlap the horizontal extremities of each adjacent gage block element.

References Cited by the Examiner

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