Dec. 23, 1969 H. GROTHE 3,485,292

UNIVERSAL DUMMY BAR FOR CONTINUOUS CASTINGS

Filed Sept. 28, 1967 2 Sheets-Sheet 1

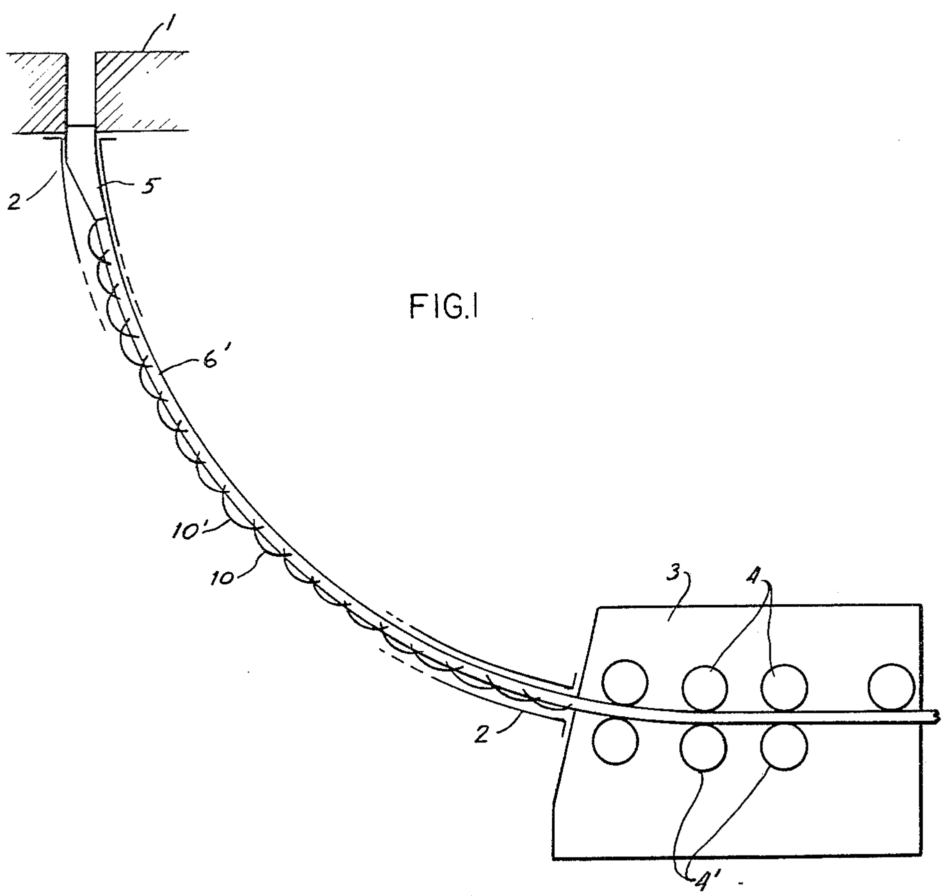

FIG.1

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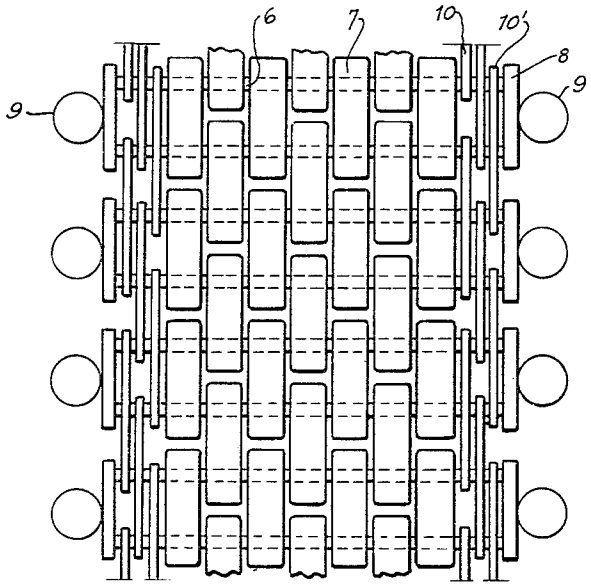

FIG.2

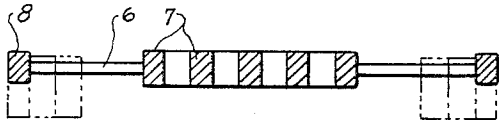

FIG.3

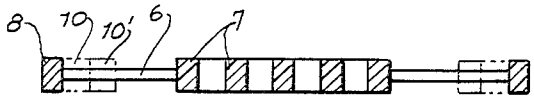

FIG.4

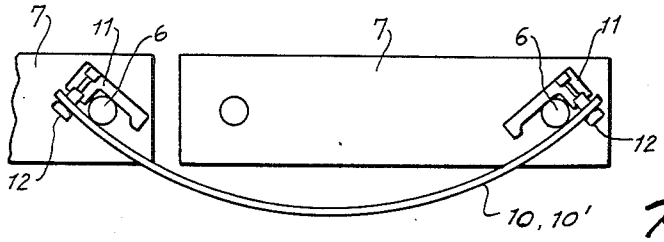

FIG.5

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UNIVERSAL DUMMY BAR FOR CONTINUOUS CASTINGS

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Int. Cl. B22d *11/08*
U.S. Cl. 164—274 7 Claims

ABSTRACT OF THE DISCLOSURE

A universal dummy bar for continuous casting machines for starting castings of different cross sections comprising a chain with links and springs to compensate for differences in thickness.

The invention relates to a universal dummy bar for continuous castings of different cross sections made with continuous casting machines, and particularly with those having a curved strand guide for the casting of billets and slabs.

As is known, a dummy bar is needed to start continuous casting, and it must be able to freely follow a predetermined path of the strand. To meet the latter requirement, the dummy bar is, in accordance with a proposal that is not part of the prior art, formed of chain links, a headpiece constructed as a dummy bar head being detachably fastened to the chain. This offers the advantage that only the dummy bar head has to have the cross section of the mold outlet while the chain itself need not be thicker than the thinnest continuous casting size. A changeover to other strand sizes then merely entails the replacement of the dummy bar head, which does away with the need for costly storage of and equipment for dummy bars of different thicknesses. However, when such a universal dummy bar is used, another difficulty is encountered in that the chain is unable to fill the gap between the guide rolls for the strand, which are set for maximum continuous casting thickness. A further proposal which likewise is not part of the prior art therefore calls for the use of filler plates attached to the chain so as to compensate for the difference in thickness. However, such filler plates must be detachably attached and must be replaced or reset with every change in continuous casting size. Upon leaving the strand guide, this dummy bar then has the requisite thickness to be driven by the withdrawal and straightening rolls which usually follow and which are adjustable to the size of the strand. A changeover thus entails considerable work. In addition, the chain links themselves must necessarily be kept relatively short, as required by the radius of curvature of the strand guide, and the chain is therefore formed of a great many links connected to one another by means of link pins, which makes them very heavy; and with overriding links the play of the link pins results in chain-length changes which are most objectionable. Now when the thickness compensation referred to above is dispensed with and curved strand guides are employed, the weight of the chain will at first, just below the mold outlet, cause it to hug the outer arc of the curved guide. Just ahead of the withdrawal and straightening mechanism, the chain comes to lie against the inside of the curved guide due to the pull of the set of drive rolls. Over the intervening path, however, the position of the chain is unstable and it may buckle at various points. This, in combination with the play of the link pins, may result in chain-length variations ranging from 80 to 120 mm. which will cause considerable trouble in the casting range of the strand.

The invention has as its object to overcome the drawbacks of prior art designs of universal dummy bars of the type described at the outset. The invention thus seeks to provide a universal dummy bar that has low weight, is of constant length in use, and can be manipulated readily and rapidly.

In accordance with the invention, this is accomplished essentially by constructing the dummy bar as a chain formed of links which are connected to one another by means of link pins, the thickness of the chain being not greater than the thickness of the smallest continuous casting size, and the chain assembly incorporating springs to provide resilient thickness compensation for the difference between the thickness of the gap or passageway through the strand guide and the thickness of the chain. The springs are advantageously disposed on the side of the chain which faces the outer arc of the curved strand guide. The springs are preferably constructed as lead springs whose ends are hinged to two link pins and whose backs are bowed outwardly to bear against guide rollers defining the outer arc of the curved guide.

The result is a dummy bar whose thickness corresponds at all times to the gap between the strand guide rolls and which can also be driven by the withdrawal and straightening rolls. Moreover, since the individual chain links need no longer fill the gap between the strand guide rolls directly or indirectly, they can be made correspondingly thinner, which permits them to be constructed longer in relation to the radius of curvature of the strand guide. As a result, fewer links are needed and a corresponding number of link pins can be done without. This, in turn, reduces the weight of the chain, and the forces which in the vicinity of the mold outlet tend to press the chain against the outer strand guide rolls thus are also minimized. Independently thereof, however, the contact pressure of the springs urges the chain with its links constantly against the inner strand guide rolls and, above all, prevents it from buckling. And lastly no changeover work is involved when the thickness of the continuous casting to be produced is changed.

Further details of the invention will now be described with reference to the drawings, which illustrate an embodiment of the invention and, in which,

FIGURE 1 shows the lower part of a continuous casting machine with the universal dummy bar in accordance with the invention.

FIGURE 2 is an enlarged fragmental plan view of the universal dummy bar.

FIGURES 3 and 4 are cross-sectional views of the universal dummy bar, and

FIGURE 5 is a side view on an enlarged scale of a part of the universal dummy bar.

The lower part of the continuous casting machine shown in FIGURE 1 comprises the mold **1**, which is followed by the curved strand guide **2**. The strand guide **2**, which is indicated diagrammatically, is customarily formed by guide rolls (not shown) spaced apart in pairs to define the opposite sides of a guide passageway for a strand of metal issuing from the mold. The strand guide **2** terminates in the withdrawal and straightening mechanism **3**, in which the strand is straightened and driven by means of top rolls **4** and bottom rolls **4'**. Shown in the bottom of the mold **1** is the top of the dummy bar head **5**, which is of wedge-shaped cross section and projects into the curved strand guide **2**. It is attached to the dummy bar **6'**, shown schematically. As may be seen in FIGURES 2 to 4, said dummy bar is formed of chain links **7** which are pivotally connected to one another by means of link pins **6**. The thickness of this chain, apparent from FIGURES 3 and 4, is not greater than the thickness of the smallest continuous casting size. The link pins **6** extend

on both sides beyond the links **7** and terminates in skids **8'** which are adapted to bear against fixed rollers **9**, defining the opposite edges of the strand guide, so as to prevent the chain from shifting sideways. Disposed side by side between the outer links **7** and the skids **8** are a plurality (in the embodiment illustrated, two) of leaf springs **10** and **10'**, arranged longitudinally of the drain. One end of each of the springs **10** and **10'** is slidably and rotatably connected to a link pin **6** of one link; the other ends of the springs are similarly respectively connected to link pins of other links, respectively forward and back along the length of the chain. As seen in FIGURES 1 and 5, the springs **10** and **10'** are arranged to bow resiliently outward from one side of the chain in order to project into and fill the portion of the thickness of the strand guide passageway that is not taken up by the thickness of the chain, and are preferably arranged in a continuous overlapping array with each spring connected to the link pin at one end of one link and spanning the other link pin at the other end of that link disposed in front and in back of them in the chain assembly. They are preferably arranged so as to alternately span, in a continuous array, a link pin disposed midway between their ends engaging non-contiguous link pins **6**. This arrangement assures a particularly uniform application of the pressures of the springs, which in one embodiment range from 2 to 4 tons. The forces so produced and acting within the dummy bar chain preclude the occurrence in the midsection of the curved strand guide of an unstable region which would otherwise occur and over which the dummy bar would alternately hug the inner and outer arcs of the strand guide. Instead, as shown in FIGURE 1, the dummy bar is evenly pressed against the inner arc of the strand guide over the entire length of the latter. As pointed out earlier, this also permits the individual chain links to be made longer and thus to further reduce their weight considerably.

In the withdrawal and straightening rolls which follow, which are yieldingly set for the size of the continuous casting, the leaf springs are substantially compressed. It is apparent from FIGURES 3 and 4 that the leaf springs **10** and **10'** are thus able to span an appreciable thickness range. FIGURE 3 shows the two leaf springs in a position which they may occupy, for example, in the case of a particularly thick slab while FIGURE 4 applies to the thinnest slab size.

To utilize the forces of said springs to best advantage both in the longitudinal and in the transverse direction of the dummy bar, the ends of the leaf springs **10** and **10'**, respectively, are provided by means of bolts **12** with bearing claws **11** in which the link pins **6** have a bearing play extending obliquely to the longitudinal direction of the links.

The use of the invention is not limited to the embodiment illustrated, in which leaf springs are employed which bear directly upon the outer arc of the curved strand guide. In place thereof, springs may be provided which engage filler plates which are attached to the chain and are displaceable between the links and the outer arc of the curved strand guide in the direction of the bending radius.

I claim as my invention:

1. A dummy bar for use with a continuous casting machine which has a guide passageway for a cast strand, said dummy bar comprising a chain of pivotally connected links, and a plurality of leaf springs arranged longitudinally and successively along the chain with their ends attached respectively to different links, said leaf springs being mounted to bow resiliently outward from one side of the chain with their ends slidably and rotatably mounted on said links for permitting the springs to be compressed toward the chain, whereby said springs project resiliently into the portion of the thickness of said passageway not taken up by the thickness of the chain.

2. The dummy bar of claim **1** in which successive links along the length of the chain are pivotally connected by link pins, respectively at the front and rear ends of successive links, pivotally connecting the adjacent front and rear ends of each two successive links to another link that is to one side of the successive links, and in which the ends of said springs are connected respectively to the link pins on successive links.

3. The dummy bar of claim **2** in which the ends of some of said springs are connected respectively to the link pins at the front ends of successive links and the ends of others are connected to the link pins at the rear ends of successive links, whereby each spring spans and intermediatae link pin on one of the links.

4. The dummy bar of claim **3** in which, on each link, a spring having an end connected to one link pin extends forward along the chain and another spring having an end connected to the same link pin extends back along the chain.

5. The dummy bar of claim **4** in which ends of at least two of said springs are connected to each link pin whereby successive springs along the chain overlap.

6. The dummy bar of claim **2** in which said link pins have portions outward from the sides of the links and the ends of said springs are slidably and rotatably connected to said link pins by elongated claw elements on the ends of the springs transversely encompassing said portions of the respective link pins and forming bearings for said portions for relative movement of the ends of the springs obliquely to the longitudinal direction of the link.

7. The dummy bar of claim **6** which includes skid members over the outward ends of said link pin portions for bearing against an edge of said guide passageway.

References Cited

UNITED STATES PATENTS

3,305,899	2/1967	Saunders.	
3,351,125	11/1967	Colombo	164—274
3,409,071	11/1968	Ciochetto	164—274

FOREIGN PATENTS

1,376,998	9/1964	France.	

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U.S. CL. X.R.

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