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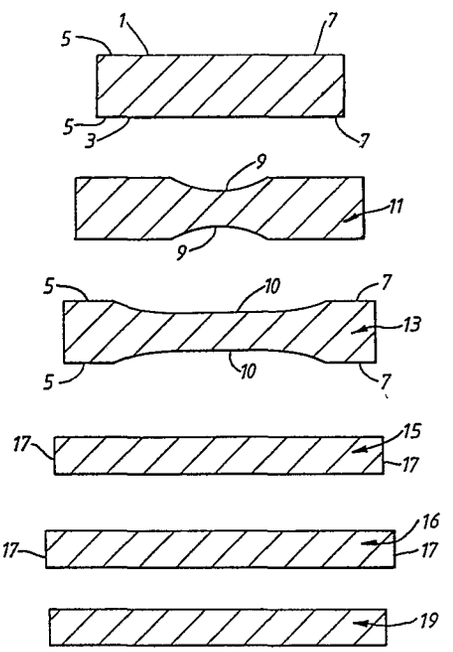
(54) Method of rolling metal slab.

(57) In a method of hot rolling a metal slab in order to increase its width, a pair of opposite faces of the slab are hot rolled to produce a groove in each of the faces but the lateral edges of the faces are not rolled and, thereafter, the slab is passed between a pair of cylindrical rolls in order to reduce the slab to uniform thickness. Preferably, an additional step is included in which the initially formed grooves are widened by additional rolling before the thickness of the slab is reduced to a uniform value.



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METHOD OF ROLLING METAL SLAB

The present invention relates to a method of rolling metal slab in order to increase the width thereof.

It is known, from pages 99 and 100 of the book "Roll Pass Design" by B. Orr, to roll a 6 inch square bloom to a 10 inch wide flat by close-pass rolling. This is brought about by hot rolling both of a pair of opposite faces of the bloom to provide light reduction at the lateral edges of the two faces but a considerably greater reduction over the central part of each face. This brings about an increase in the width of the bloom and the formation of a groove in each face. In a second stage, the bloom is again hot rolled in order to widen the grooves in the opposite faces but, again, with a reduction at the outer edges of the two faces of the bloom. This stage also increases the width of the bloom and, finally, the bloom is rolled successively between pairs of cylindrical rolls in order to produce a flat of substantially uniform thickness. It will be appreciated, therefore, that, although initially a considerable reduction takes place over the central part of each of the two faces of the bloom, there is also a light reduction at the edges of the two faces.

According to the present invention, a method of increasing the width of a metal slab comprises the steps of hot rolling a part, but not the lateral edges, of a pair of opposite faces of the slab to form a groove in each of the faces and to increase the width of the slab; and to hot roll the slab including the said lateral edges of said faces to reduce the slab to substantially uniform thickness.

It will be seen, therefore, that, initially, in accordance with the present invention, the lateral edges of the pair of opposite faces of the slab are not rolled while the grooves are formed in the slab and it is only subsequently that the lateral edges of the faces are rolled in order to reduce the slab to substantially uniform thickness.

The advantage of this method is that the rolls which are required to produce the grooves do not have a surface which engages with the full width of the slab and the depth of the grooves so formed can be varied. The amount of increase in slab width depends upon the depth of groove formed in the slab and this is determined by the distance set between the mill rolls. Thus, by adjusting the roll gap and, hence, the depth of the groove, the required final width of the slab can be achieved.

In accordance with a preferred embodiment of

the invention, a method of increasing the width of a metal slab comprises the steps of hot rolling a part, but not the lateral edges, of a pair of opposite faces of the slab to form a groove in each of the faces and to increase the width of the slab; hot rolling said pair of opposite faces of the slab, but not the lateral edges thereof, to widen the groove in each of the faces and to increase the width of the slab; and hot rolling the slab, including the said lateral edges of the faces, to reduce the slab to substantially uniform thickness.

Again, the rolls which are employed to widen the grooves do not have a surface which engages with the full width of the slab.

In order that the invention may be more readily understood, it will now be described, by way of example only, with reference to the accompanying drawing which shows the cross-section of a metal workpiece following a succession of rolling operations.

A metal slab, conveniently formed by a continuous casting operation, is of generally rectangular cross-section and has a pair of opposite faces 1, 3. The slab is heated to rolling temperature and is passed between a pair of rolls in a rolling mill which act on the opposite faces 1, 3 of the slab but the rolls only engage with a central portion of each

face and the lateral edges 5, 7 of each face are not in engagement with the rolls. This causes the slab to widen and for a groove 9 to be formed in each of the pair of opposite faces. This slab, given the reference 11, may then be hot rolled between a pair of conventional horizontal cylindrical mill rolls which reduce the thickness of the slab and, at the same time, increase its width. Such a slab is indicated by reference 15.

In a preferred arrangement, however, the grooves 9 are widened by a second rolling action before the slab is passed between the cylindrical rolls. To this end, the slab 11 is hot rolled between a pair of rolls which are shaped to widen the grooves 9, to form grooves 10, without the rolls engaging with the lateral edges 5, 7 of the faces of the slab. This slab with the widened groove is indicated by reference 13. This slab 13 is then passed between the pair of cylindrical rolls which engage with the entire width of the pair of opposite faces to produce a slab 16. It is convenient for the mill stands having the rolls for producing the grooves 9 and the grooves 10, respectively, to be arranged in tandem with the pair of cylindrical rolls so that the initial grooves 9 are first formed, then the wider grooves 10 are formed, and then the thickness of the strip is reduced and made uniform during one

pass of the slab through the mill stands.

It may be that the sides or outside edges 17 of the slab are rather irregular and so the slab 15, 16 can be passed between a pair of vertical edger rolls which will "square-up" the edges 17 and, in doing so, will cause a slight reduction in the width of the slab. Reference 19 shows the slab after it has been passed through a pair of edger rolls. In fact, a slab may be widened considerably by the formation of one or more grooves and the subsequent rolling between a pair of cylindrical rolls with the final width of the slab being determined by the separation of the edger rolls. As an alternative, the ouside edges can be squared up by a pair of edger rolls after the grooves have been formed but before the slab is rolled between the pair of cylindrical rolls to reduce it to the required thickness.

A conventional rougher mill may be used to produce the slab 15 of reduced thickness.

When the grooves are produced, and subsequently widened, it is convenient for the rolls to act on not more than 70% of the width of the two faces when the grooves are initially formed and, during the second rolling step, for the rolls not to act on more than 90% of the width of the faces of the slab as the grooves are widened.

Claims:

1. A method of increasing the width of a metal slab comprising the steps of hot rolling a part, but not the lateral edges (5, 7), of a pair of opposite faces (1, 3) of the slab to form a groove (9) in each of the faces and to increase the width of the slab; and to hot roll the slab including the said lateral edges (5, 7) of said faces to reduce the slab to substantially uniform thickness.

2. A method of increasing the width of a metal slab comprising the steps of hot rolling a part, but not the lateral edges (5, 7), of a pair of opposite faces (1, 3) of the slab to form a groove (9) in each of the faces and to increase the width of the slab; hot rolling said pair of opposite faces (1, 3) of the slab, but not the lateral edges thereof, to widen the groove (10) in each of the faces and to increase the width of the slab; and hot rolling the slab, including the said lateral edges (5, 7) of the faces, to reduce the slab to substantially uniform thickness.

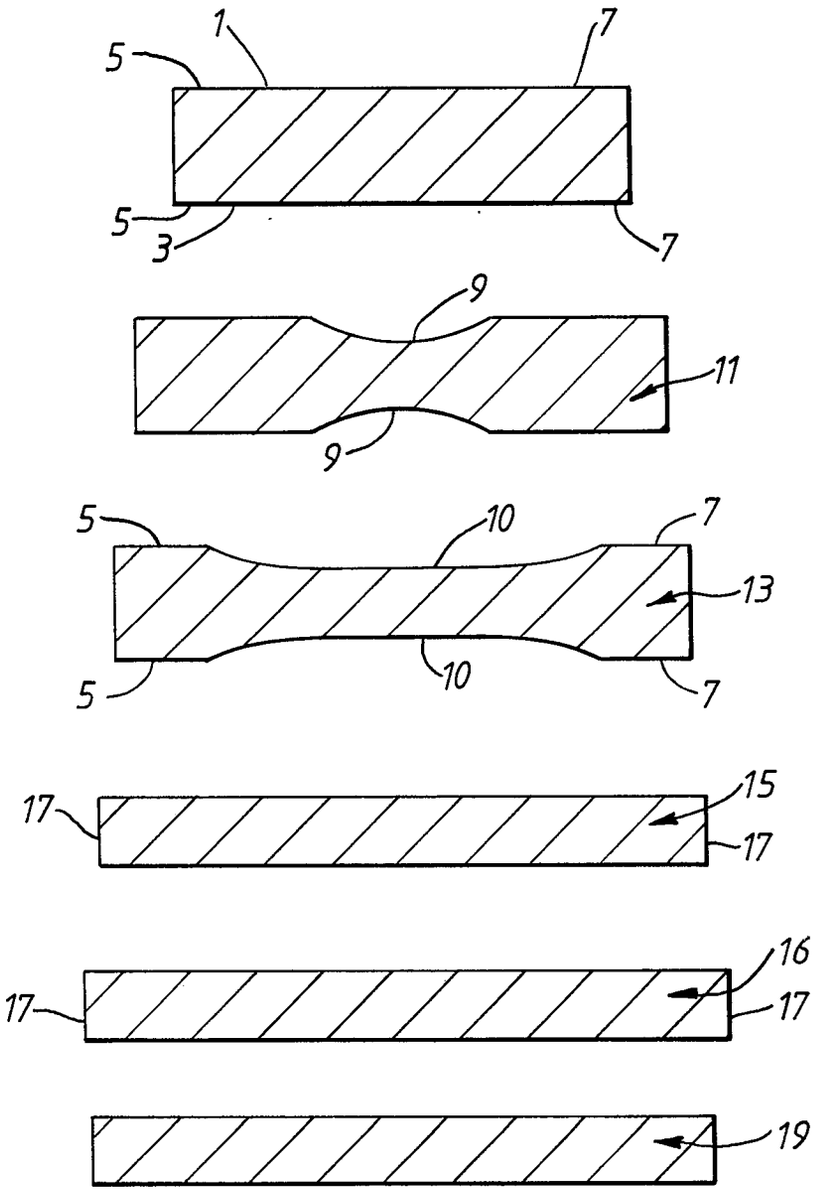
3. A method as claimed in claim 1 or 2, in which the grooves are formed centrally of the faces of the slab.

4. A method as claimed in claim 2, wherein, for the first step of the method, the rolls act on not more than 70% of the width of the two faces of the slab and, during the second step of the method, the rolls act on not more than 90% of the width of the two faces of the slab.

5. A method as claimed in any preceding claim, in which the roll gap and, hence, the depth of groove formed is adjusted in order to obtain the required change in slab width.

6. A method as claimed in any preceding claim, in which, subsequent to the hot rolling of the slab including the said lateral edges of the faces, the edges of the slab are engaged by a pair of vertical edger rolls.

7. A method as claimed in any of the claims 1 to 5, in which, subsequent to forming grooves in the slab, the edges of the slab are engaged by a pair of vertical edger rolls before the slab is finally rolled to uniform thickness.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