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METHOD OF PREVENTING EDGE CRACKING IN THE ROLLING OF STAINLESS STEEL

Filed April 2, 1954

FIG. 1.

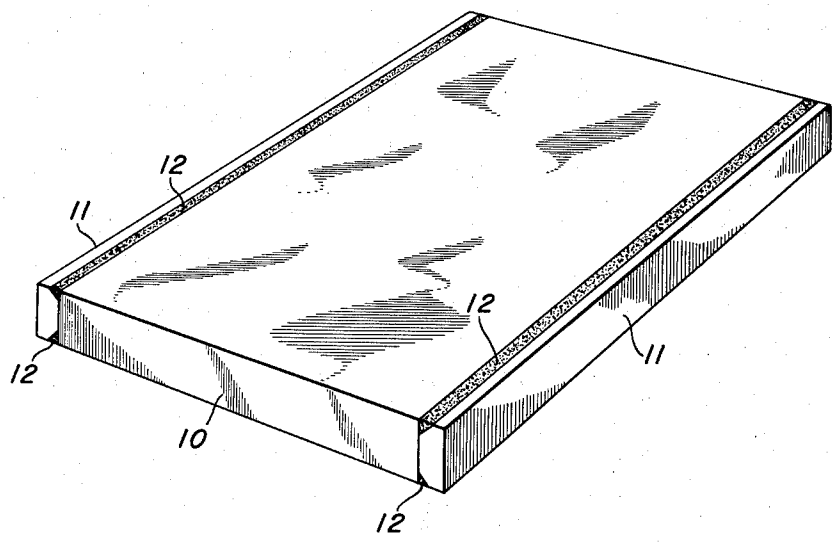
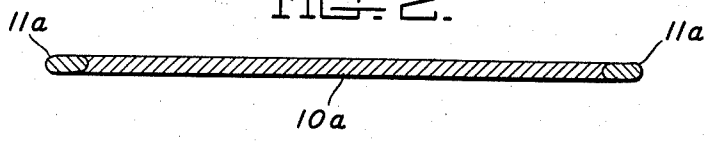


FIG. 2.



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METHOD OF PREVENTING EDGE CRACKING IN THE ROLLING OF STAINLESS STEEL

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1 Claim. (Cl. 29—18)

This invention relates to the hot-rolling of stainless-steel slabs into strip or sheets and, in particular, to a method of preventing the cracking of the slab edges during such rolling.

It is well known that, except for hot-shortness in some steels, the stress required to produce plastic flow during hot rolling is related to temperature, i.e., the hotter the steel, the less stress required for plastic flow. The rolling-temperature range of a steel generally extends from the temperature below which a steel may not be deformed without rupturing, to the temperature above which incipient fusion or severe oxidation in the grain boundaries occurs.

Large additions of alloying elements sometimes narrow the rolling-temperature range markedly, as in certain types of stainless steel. In hot-rolling slabs to plates and sheets, particularly when the steel is reduced to thin sections, the edges lose temperature more rapidly than do other areas of the steel. When the edges become chilled below rolling-temperature range, severe edge cracks occur. Because the other portions of the steel are within the rolling-temperature range, they do not develop serious cracks.

Edge cracking is so severe in certain grades of stainless steel, such as Types 310 and 316, that sheets must be rolled to widths considerably greater than specifications call for so as to allow for edge trimming. Such a procedure involves a serious scrap loss and reduces the yield. Consequently much effort has been directed toward methods of eliminating edge cracking. No proposal yet made to this end, so far as we are aware, has proved consistently successful.

We have invented a novel method of preventing rapid heat losses along the edges during the rolling of stainless-steel slabs. By this novel method, both edge cracking and the scrap loss incident to the edge-trimming practice are avoided. Our improved method, generally speaking, consists in welding bars of plain carbon steel to the side edges of a stainless-steel slab and then rolling the slab in a direction parallel to the length of the bars. When the slab has been reduced to the desired thickness of sheet or plate, the bars are correspondingly reduced in thickness, forming marginal strips which are sheared from the main body of the product. No cracking of the edges of the slab or the exposed surfaces of the bars occurs.

A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating the present preferred embodiment. In the drawings,

Figure 1 is a perspective view showing a slab prepared for rolling in accordance with our invention; and

Figure 2 is a cross section through the product rolled from the slab.

Referring now in detail to the drawing, a slab **10** of stainless steel, e.g., A.I.S.I. Type 310, is produced in the usual manner. Carbon-steel bars **11** are attached to the side edges of the slab by welds **12** on the top and bottom. The width of the bars approaches the thickness of the slab and their length is the same as that of the slab. The welds are preferably continuous for the full length of the slab. The slab may for example be about 20″ x 40″ x 2″ and the bars about 40″ x 2″ x ½″. The weld is preferably a deposit weld and may be made with welding rod of plain carbon steel.

When the bars have been welded to the side edges of the slab, the latter is heated to the desired temperature and rolled in the usual manner, between plain rolls, in the direction of the length of bars **11**, to the desired final thickness. Figure 2 shows the result of such rolling. The bars **11** are reduced to narrow marginal strips **11***a* as the slab is reduced to plate **10***a* having a length many times that of the slab. The marginal strips may then be sheared from the main body of the plate with very little loss of material from the latter. The presence of the bars **11** has the effect of preventing rapid heat loss from the side edges of the slab and the resultant cracking thereof. Thus this procedure makes it unnecessary to trim off any substantial width of stainless steel from the finished plate. The carbon-steel strips **11***a*, of course, become scrap but the cost thereof is so low that no great loss is involved.

Although we have disclosed herein the preferred embodiment of our invention, we intend to cover as well any changes or modifications therein which may be made without departing from the spirit and scope of the invention.

We claim:

In the rolling of a stainless steel slab into flat plates, the method of preventing edge cracking of the slab by welding to opposite edges of such slab, in direct surface-to-surface contact therewith, carbon-steel bars of a width about equal to the thickness of the slab and a length substantially equal to the length of the slab, leaving the top and bottom of the slab exposed, heating the slab to rolling temperature, passing it between plain rolls in a direction parallel to said edges, thereby converting said slab into an elongated plate and said bars into marginal strips united to the edges of the plate, then shearing said marginal strips from the plate, producing a stainless-steel plate with smooth edges free from cracks.

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