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A METHOD FOR REDUCING ALLIGATORING DURING THE HOT ROLING PROCESS OF ALUMINUM INGOTS

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[0001] Hot rolling of aluminum ingots often requires heavy gauge shearing due to the presence of an alligatoring defect. Alligatoring is a defect occurring during hot rolling characterized by the longitudinal splitting of ingot slabs as they pass through the rolls. As this splitting generally occurs in the center, it frequently appears as the jaws of an alligator. Existing solutions to address the alligatoring defect include filling the shrinkage cavity of an ingot at the end of casting.

[0002] The solutions described herein improve on existing solutions by adding a distinct alloy to the head of the ingot. In certain cases, this distinct alloy may have different mechanical properties than the parent alloy of the ingot, which may allow it to behave differently in the hot mill. In particular, modelling efforts have shown that the introduction of a softer alloy into the head of an ingot can reduce the amount of alligatoring during hot rolling. For example, by introducing a softer alloy into the head of an ingot, any cracks are blunted by the more ductile material effectively "gluing" the two halves together. Based on the modelling, there are several efforts underway to add a new distinct alloy into the head of an ingot. Various ingot/alloy combinations are discussed below.

[0003] One embodiment may include supplementing the softer alloy with a solidifying ingot. In this embodiment, a separate crucible (furnace) and trough may be charged with this softer alloy. At the end of the cast, as the final metal is about to solidify, the softer alloy metal is poured into the head of the ingot. This alloy forms a solid metallurgical bond with the solidifying ingot, due to both alloys being at least partially molten at the time of casting. The inherent metallurgical bond allows for the softer alloy to remain in the head of the ingot even during the intense stresses present during hot rolling.

[0004] An additional embodiment uses the propensity for certain elements to selectively oxidize/react within a molten bath. For example, as these elements react, they are no longer found within the molten aluminum, which then alters the chemistry of the bath. In this embodiment, by selectively activating this reaction, the alloy being added to the ingot can be diluted. As the

elements being removed are commonly referred to as “hardeners”, their removal renders the alloy “softer”.

[0005] As another embodiment, at the end of a cast, where it has been shown that it is advantageous to add a softer alloy, certain elements can be selectively oxidized, which then allows for the addition of a “softer” alloy into the head of an ingot without having to prepare a separate charge. One such example of this embodiment may be to selectively oxidize Mg through the introduction of Cl, for example.

[0006] The embodiments described herein rely on the ability to cast a distinct alloy into the head of an ingot, and to secure a reliable metallurgical bond between the parent alloy of the ingot and the softer alloy. The timing of the addition of the distinct alloy and the composition of the distinct alloy are important for success, and in turn reduction in the alligatoring defect.