METHOD FOR INHIBITING ROLL PICKUP IN CONTINUOUS ANNEALING OF STEEL STRIP
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METHOD FOR INHIBITING ROLL PICKUP IN CONTINUOUS ANNEALING OF STEEL STRIP

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1 Claim. (Cl. 148—16)

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

Figure 1 is a central longitudinal section, largely diagrammatic, through a strip-annealing furnace embodying the apparatus adapted for carrying out the method of our invention.

Figure 2 is a partial vertical section taken along the plane of line II—II of Figure 1; and

Figure 3 is a transverse section through one of the conveyor rolls and its associated gas supply pipe, taken along the plane of line III—III of Figure 2.

Referring in detail to the drawings and, for the present, to Figure 1, a strip-annealing furnace indicated generally at 10 comprises a refractory-lined enclosure laid up within a conventional binding fabricated from steel plate and rolled sections (not shown) in the known manner. The furnace has an entrance opening 11 at one end and an exit opening 12 at the other, adapted to permit the passage of strip here- through from an uncoiler at the entrance end to a recoller at the exit end. The furnace may be heated by any suitable means, i. e., electric resistors, radiant combustion tubes or the like. A controlled atmosphere, usually decarburizing, is supplied to the furnace chamber by any convenient means (not shown).

In order to maintain each point along the strip at the temperature necessary to produce decarburization, for the required length of time, the strip is trained alternately over conveyor rolls 13 in an upper series designated 13a and a lower series designated 13b. The rolls 13 have shafts 14 extending through the side walls of the furnace and journaled in any suitable bearings carried thereby. The shafts are driven in the known manner by any convenient mechanism. The arrangement of the rolls in the two series as shown is such that the strip, when properly trained thereover is caused to make a plurality of passes upwardly and downwardly throughout substantially the full height of the chamber. The cylindrical bodies of rolls 13 may be fabricated from steel plate. Instead of a unitary cylinder, the roll bodies may consist of a plurality of discs spaced along the shaft.

A manifold or nozzle pipe 15 is disposed adjacent each roll 13, preferably in the V between the cylindrical roll body and the portion of the strip 16 approaching it. The manifolds 15 are...
connected by piping to any suitable source of reducing gas (not shown) and are provided with outlet ports 11 spaced therealong. The manifolds are preferably of heat-resistant alloy and are positioned so that their ports discharge jets of reducing gas onto the surface of the strip ahead of the point of contact thereof with the rolls. Any suitable means may be provided for supporting the manifolds in the proper position relative to the conveyor rolls 13, such as brackets of heat-resistant metal.

The reducing gas may be of any desired character depending on the available sources. Hydrogen is particularly effective. Carbon monoxide and methane may also be used where their carburizing property is not objectionable. Cracked ammonia gas containing about 75% hydrogen and 25% nitrogen serves very satisfactorily but the gas must have a net reducing effect since tests with neutral gas such as nitrogen do not give the desired result in preventing roll pick-up.

The reducing gas appears to exert a two-fold effect in that it tends to reduce any oxides present on the strip which are the source of roll pick-up, and also locally cools any unreacted oxides below the temperature at which they adhere to the rolls. The reducing gas should not be supplied in sufficient quantity to alter the normally slightly oxidizing character of the furnace atmosphere as a whole, which is necessary to effect the decarburization desired in the case of silicon steel strip.

Experience indicates that the invention permits furnace rolls to operate without objectionable pick-up for periods up to one hundred times as great as those in which pick-up would otherwise occur to such an extent as to cause dimpling of the strip. The invention thus has the advantage of greatly reducing the loss of production and the expense involved in shutting down strip annealing furnaces for cleaning pick-up from the conveyor rolls thereof.

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

We claim:

In a method of annealing silicon-steel strip which, at annealing temperatures, leaves accumulations of mixed oxides of iron and silicon adhering to conveyor rolls over which it travels, the steps including passing the strip through a heating zone containing a normally oxidizing atmosphere, over supporting rolls, and introducing a reducing gas directly into the V-shaped spaces between the surfaces of the rolls and the portions of the strip approaching them, at a plurality of points spaced across the width of the strip, thereby inhibiting the deposit of oxides on the rolls by the strip, and controlling the amount of reducing gas supplied so as to leave the atmosphere of said zone generally oxidizing in character.

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