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[54] **METHOD FOR SURFACE TREATMENT OF INTERMEDIATE PRODUCTS WHICH ARE BEING FLAME SCARFED**

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[52] **U.S. Cl.** ..... **148/9.5,** 266/23 H

[51] **Int. Cl.** **B23k 7/06**

[58] **Field of Search** ..... 148/9.5; 266/23 R, 23 H

[56] **References Cited**

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[57] **ABSTRACT**

Steel products are flame scarfed at low temperatures followed by wetting and immediate force drying by air jets blowing wetness and scale off the surface of the product. Product or jet producing nozzles move during this descaling whereby particularly the air jet has a component towards the, relatively speaking, oncoming product. Descaling can be carried out in the same run as flaming or immediately thereafter following, for example, reversal of movement of the product.

9 Claims, 3 Drawing Figures

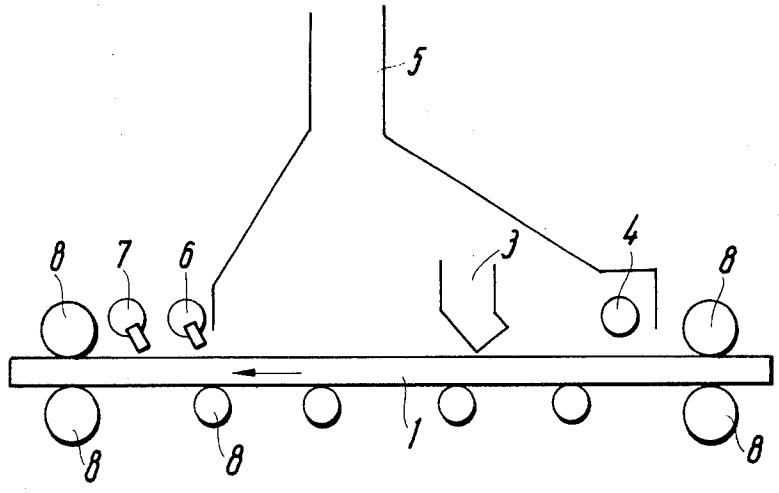


Fig.1

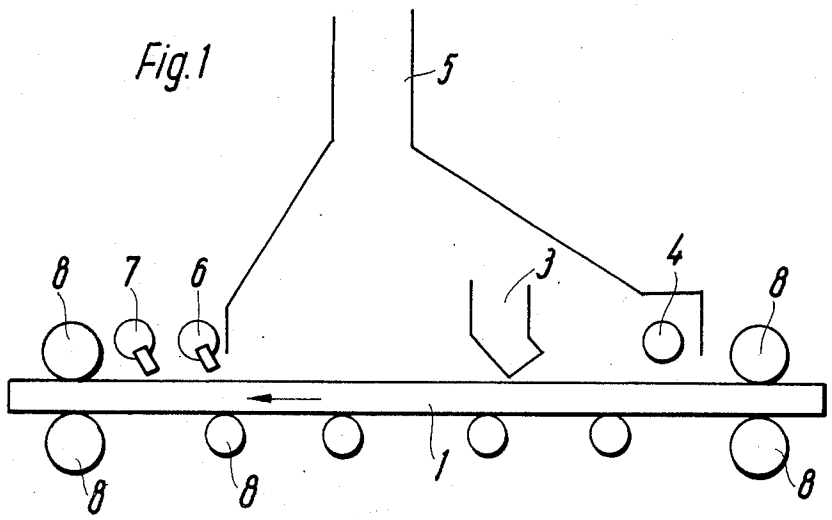
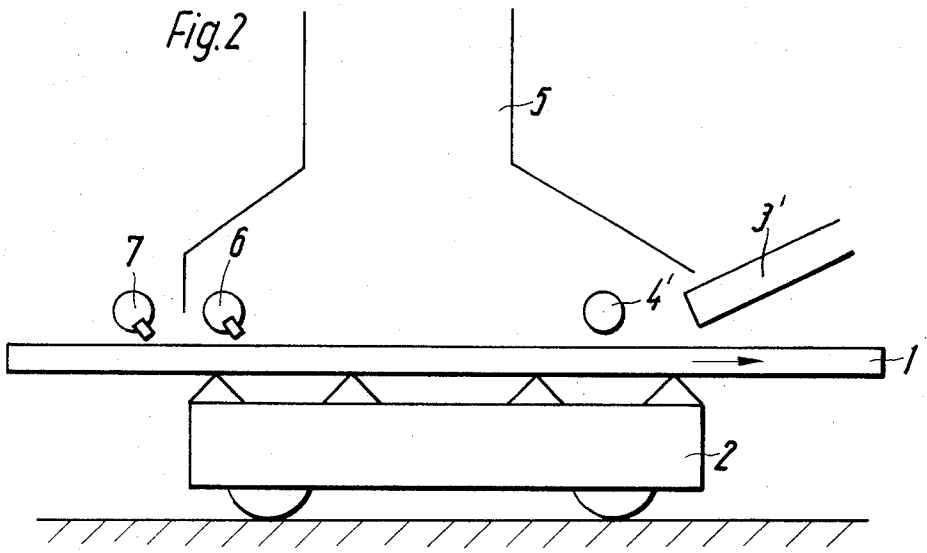


Fig.2



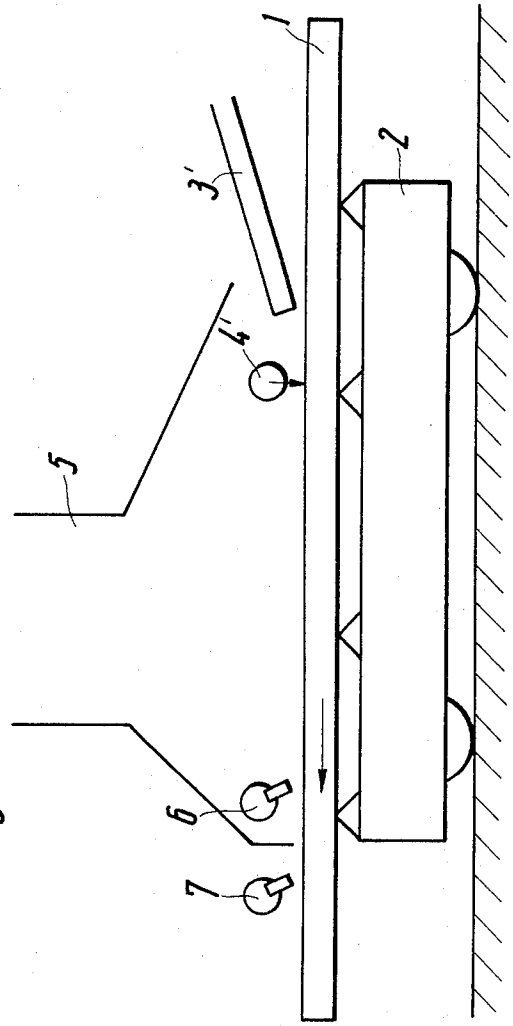


Fig.3

METHOD FOR SURFACE TREATMENT OF INTERMEDIATE PRODUCTS WHICH ARE BEING FLAME SCARFED

BACKGROUND OF THE INVENTION

The present invention relates to method and apparatus for treating the surface of blanks, blooms or other intermediate metal products which have been or are being flame scarfed in a machine.

Rolled or continuous casts products are, for example, either hot flamed at about 1,200° C, or warm flamed at about 800° C, or low temperature flamed at temperatures up to 600° C. The hot and warm flame scarfing always results in subsequent scaling of the flamed surface, but no such scaling occurs during cooling from a relatively low flaming temperature (below 600° C) to room temperature. Nevertheless, it was found that even during "cold" flame scarfing at temperatures up to 600° C, a fine thin scale coating was formed on the surface of the product, right behind the flame nozzle in the machine. This thin layer of scale impedes clear recoginition of any flaw in the material when inspected subsequently. This layer adheres more strongly if one waits with its removal.

Flaming machines as they are used today have a flame producing burner nozzle, and pressurized water removes the scale as produced ahead of the burner by washing the scale away, transversely to the direction of flaming, whereby the scale is granulated. During flaming, a new layer of scale is produced just behind the burner nozzle, and this layer usually has thickness of about 0.5 mm. It is also known to cool a newly flamed product by means of water, e.g. down to room temperature, whereby usually this water treatment continuous for some time. Accordingly, the scale is formed irregularly and chips off in parts. On the other hand, the heat content of the product after flaming causes some of this water to evaporate and already loosened scale may adhere again upon too rapidly occurring, local evaporation. Evaporated residual water leads to rust and leaves calcium and other deposits on the flamed surfaces which again impedes quality inspection of the product.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide for a method and apparatus for removing the scale produced during low temperature (up to 600° C) flame scarfing to obtain a scale free surface which permits ready recognition of flaws during subsequent inspection.

The invention refers specifically to improvements in flame scarfing processes and machines, wherein the surface which has been flame treated, is wetted subsequently by means of water. In accordance with the specific improvement, it is suggested to blow air against the surface of this product for removing water and drying the surface completely. Specifically and by way of example, the product is flame scarfed first as is known per se, and immediately thereafter water is sprayed onto and across the surface for about one minute, whereupon the water and the dissolved scale is blown off that surface by means of an air jet until the surface is completely dry.

For carrying out the method of the invention, the water and air nozzles must be inclined towards the product with respect to relative movement of the treated product. The product and these nozzles move relative to each other, and nozzles spray and blow in direction opposite the direction of movement of the product relative to the nozzles. The air flow must be dimensioned that indeed no water remains on the surface of the product. Air and water jets run preferably parallel to each other and/or the air is directed towards the product as well as transverse to the direction of movement thereof. In either case, the flamed surface is being completely satisfactorily dried and cleaned in that manner. In lieu of water spraying one could dip the product shortly into a water filled tank followed by air blowing for removing scale and water. In either case, it was found that the surface of the product is scale free and clear and can be inspected without difficulties.

For specifically practicing the present invention, equipment which is known in parts is used, such as a gas-oxygen burner with a spray nozzle disposed close to the burner and applying water to a surface portion of the product to be flame scarfed just before that portion is subjected to the flame of the burner. Additional spray water or water spraying nozzles as well as the air nozzles are disposed at a distance from the burner to affect that surface portion somewhat later. These latter nozzles should be directed towards the product surface with a component of jet flow in direction of movement of the product, assuming that the product moves during the treatment. However, spray water and air blowing nozzles could be mounted on a movable unit, and moves past the, relatively speaking, stationary product. Still alternatively, the nozzles may direct the spray water and drying air from a direction laterally against the surface of the product.

The method and equipment in accordance with the present invention permits descaling of the intermediate product, following the flame treatment, either directly immediately or somewhat delayed but still immediately thereafter, depending on the physical separation as well as on the operational sequence of flaming on one hand and wetting and air blowing on the other hand.

DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects and features of the invention and further objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a schematic sideview of a flaming apparatus with scale removal equipment operating in the same run; and

FIGS. 2 and 3 are schematic sideviews of a flaming apparatus with scale removal equipment following a reversal of movement of the workpiece.

Proceeding now to the detailed description of the drawings, all figures show an intermediate steel product 1 to be flamed or flame scarfed. FIG. 1 shows the product 1 as being moved through the machine by means of a roller track 8. FIGS. 2 and 3 show a carriage 2 for that purpose. The arrow on product 1 indicates in each case the direction of movement of the product as it passes through the flaming machine, and other equipment.

Turning now more specifically to the example of FIG. 1, the roller track 8 passes product 1 under a flue hood 5, under which here is provided, first in direction of advance of the product, a nozzle or set of nozzles 4 for ap-

plying pressurized water to the surface of product 1 and just ahead of application of heat by a burner 3 of the gas-oxygen variety. The product is flame scarfed this way, and the scale is granulated immediately.

The product 1 continues to be moved under hood 5 for a certain distance, and just outside thereof, i.e. spaced-apart from the flaming equipment, there are provided spray water nozzles 6, and pressurized air nozzles 7 are located just behind nozzles 6. As shown somewhat schematically, the nozzles 6 and 7 are oriented so that they eject the respective jets parallel to each other and in an inclined direction with respect to the direction of advance, i.e. at less than 90° to the surface normal of the product to blow and spray with a component directed towards the oncoming product.

It can be seen that the apparatus depicted in FIG. 1 practices the method of the invention as part of one continuous operation as far as flaming is concerned. The product 1 is flame scarfed and descaled in one continuous run, because burner 3 as well as nozzles 4, 6 and 7, are simultaneously in operation.

The example of the preferred embodiment of the invention as shown in FIGS. 2 and 3 refers to alternating operations of flame treatment and descaling of the surface of product 1 as per the inventive improvement. FIG. 2 shows the equipment during the flaming step. Only a burner 3' as well as water nozzle 4' operate presently to obtain flame scarfing as well as granulation of the resulting scale. The carriage 2 moves the intermediate product 1, to the right in the drawing during a run for flame scarfing the product.

After the workpiece 1 has been flame scarfed, the carriage 2 reverses, and now only nozzles 6 and 7 operate for applying water and air to the product 1, whereby the directions of action of the respective nozzles are similar to the corresponding directions as per FIG. 1. The Figures could also be interpreted as illustration of laterally displaced nozzles with a direction of blowing that includes a component transverse to the plane of the drawings.

FIGS. 2 and 3 show that particularly the inventive descaling could be carried out through inversion of movement. The product 1 could remain stationary while water spray nozzles 6 and air blowing nozzles 7 move over the surface of the product, whereby the direction of blowing has also a component towards the, relatively speaking, oncoming product. One will chose this mode of operation, for example, when nozzles 6 and 7 are disposed on a carriage that moves in laterally displaced relation along the product whether held on a carriage 2 as in FIGS. 2 and 3 or on a roller track as in FIG. 1.

The invention is not limited to the embodiments described above but all changes and modifications thereof not constituting departures from the spirit and scope of the invention are intended to be included.

We claim:

1. In a method for flame scarfing the surface of an intermediate product, wherein the product is subjected to a flame followed by wetting the surface with water, the improvement comprising a step, succeeding the wetting, of blowing the surface by means of an air jet until completely dried.

2. In a method as in claim 1, wherein the wetting results by spraying water onto the surface for about one minute.

3. In a method as in claim 1, wherein there is relative movement between the product and the blowing against the surface of the product to affect progressive portions of the product, and wherein the blowing has a component opposite the direction of relative movement.

4. In a method as in claim 1, wherein the product is moved past the air jet or vice versa, and the air jet is directed towards the surface and with a component laterally transverse to the direction of relative movement of the product.

5. In a method as in claim 1, wherein the product is moved past the air jet, and the air jet is directed with a component towards the oncoming product.

6. In a method as in claim 1, wherein the product is flame scarfed while moving in one direction, and wetted and dried while moving in the opposite direction.

7. In a method as in claim 1, wherein the product is flame scarfed, wetted and dried in continuous sequence and during a continuing relative movement of the product in the same direction.

8. In a method as in claim 1, including providing for relative movement in a particular direction, between the product and the wetting, and wherein the wetting results from spraying water onto the surface at an angle to the direction of moving.

9. In a method as in claim 1, including providing for relative movement in a particular direction, between the product and the blowing, and wherein the blowing is carried out by blowing air at an angle to the direction of moving.

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