United States Patent [19]

Hirata et al.

[11] **3,775,180**

[45] **Nov. 27, 1973**

[54] **METHOD FOR DESCALING STEEL**

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[22] Filed: **Aug. 22, 1972**

[21] Appl. No.: **282,831**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 95,855, Dec. 7, 1970, abandoned.

[30] **Foreign Application Priority Data**

Dec. 8, 1969 Japan 44/98175

[52] **U.S. Cl.** **134/7,** 15/321, 134/17

[51] **Int. Cl.** **B21b 45/00,** B24c 1/00

[58] **Field of Search** 134/7, 16, 17; 51/319, 321

[56] **References Cited**

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[57] **ABSTRACT**

Steel is descaled by spraying a mixture of a solid such as aluminum oxide and silicon carbide, water and a gas such as air under specified conditions onto the steel.

3 Claims, 3 Drawing Figures

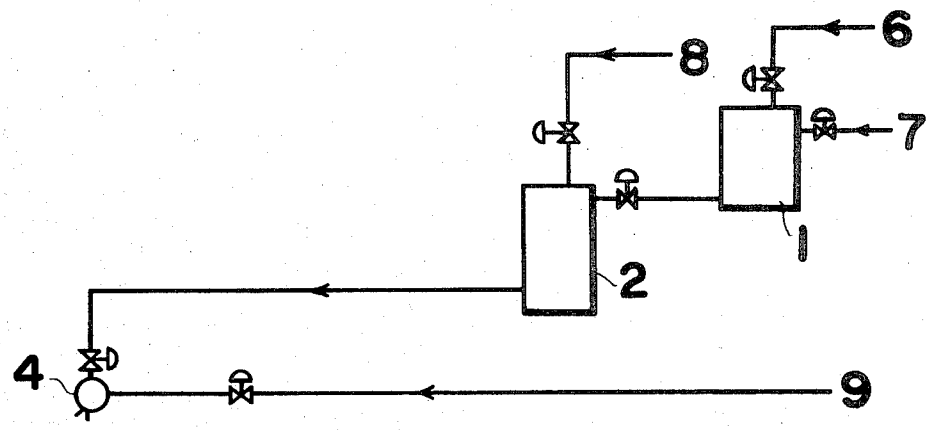


FIG. 1.

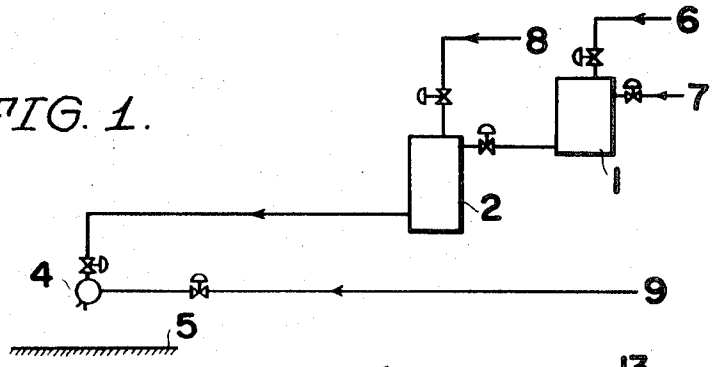


FIG. 2.

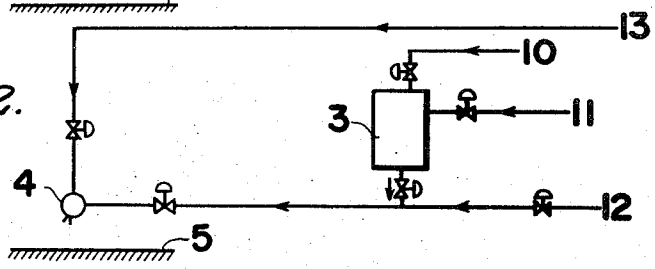
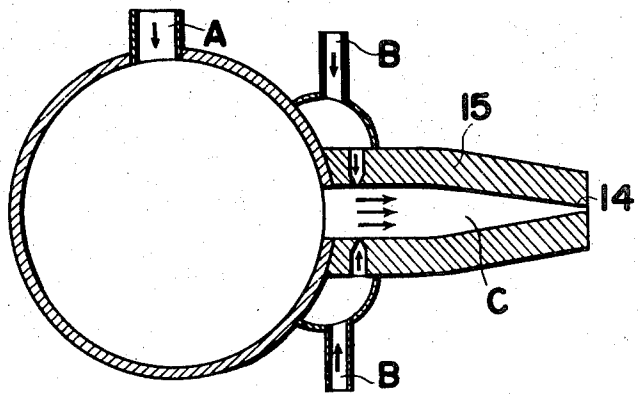


FIG. 3.



METHOD FOR DESCALING STEEL

RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 95,855, filed Dec. 7, 1970, which application has been abandoned.

The present invention relates to a method for cooling and descaling steel sheets simultaneously and highly efficiently.

It is a main object of the present invention to provide a process of spraying a mixture of liquid and solid in gas under pressure onto a surface of a billet.

Of prior known methods for descaling steel sheets, there is a method wherein a descaling process is conducted during a rolling process, and a method wherein a descaling process is conducted out of a rolling line. For instance, there are methods such as one wherein descaling is conducted by spraying high pressure water of approximately 100 kg/cm² through a nozzle at the high temperature stage during a rolling process; a method of eliminating scale by providing grooves on a surface of a roll, and a method wherein an edger is arranged in front of a mill, scale on the surface being floated up by reduction of said edger said scale being blown away with high pressure water. On the other hand, as for methods conducted out of a rolling line, shot blasting or sand blasting have been used.

A descaling method wherein grooves are provided on a surface of a roll, descaling being conducted during the process of rolling, presents problems on the surface of steel sheets, and requires high installment cost. A method of descaling by arranging an edger in front of a mill also involves a high installment cost. Accordingly, said methods are rarely applied.

At present, the principal method used is one wherein scale is blown away with high pressure water. Said method, however, not only requires a large amount of high pressure water, but also is disadvantageous in that descaling cannot always be performed sufficiently.

On the other hand, such methods as sand blasting and shot blasting conducted out of a rolling line have operational and sanitation problems, so that improvement and development thereof are greatly demanded.

The present invention aims to obviate such drawbacks as aforementioned.

The present invention is described in greater detail with reference being made to the accompanying drawings in which:

FIGS. **1** and **2** show a process of admixing vapor, liquid and solid, respectively; and

FIG. **3** shows an embodiment of a jet nozzle employed in the present invention.

FIGS. **1** and **2** illustrate one example of a process of admixing a solid, liquid (water) and gas (e.g. air) according to the novel method of the present invention. **1** denotes a mixing tank of solid and liquid, **2** a high pressure surging tank for mixed solution of solid and liquid, **3** a tank for solid powder, **4** a nozzle, and **5** a billet, respectively. In accordance with the process illustrated in FIG. **1**, solid powder **6** and liquid **7** are put into said admixing tank **1**, high pressure gas **8** (e.g. air) being added to said surging tank **2**, said solid powder and liquid being carried as a mixed solution to a nozzle **4** to be mixed with high pressure gas **9**. The resulting mixture is then jetted to a steel sheet **5** through said nozzle.

In accordance with the process illustrated in FIG. **2**, solid powder **10** is carried from a tank **3** to a nozzle **4** with high pressure gas **11** and **12**, high pressure water **13** being added thereto, to be jetted against a steel sheet **5**.

An embodiment of a nozzle in FIGS. **1** and **2** is illustrated in FIG. **3**. Subsequent treatments are conducted in order to jet a mixture of solid, liquid and gas in accordance with the process shown in FIG. **1**; for example, high pressure gas **9** is carried into a nozzle from A, mixed solution of solid and liquid from B, respectively, said gas and solution being admixed at a position of area C and the resulting mixture being jetted through a nozzle opening **14**.

In accordance with the process illustrated in FIG. **2**, a mixture of high pressure gas and solid powder is carried from A, and liquid **13** from B, respectively, to be mixed at a position of area C in the same manner as in the former process, said mixture being jetted to a steel sheet. When jetted, it is required to use a nozzle of Laval type or simple drawing type, of which part drawn **15** is drawn as smoothly and gradually as possible, so that solid and liquid will obtain a velocity as high as that of vapor flow.

Jet conditions of descaling steel sheet in accordance with the present invention are as follows:

1. A flow velocity when a mixed jet of solid, liquid and gas comes into collision with a steel sheet should exceed 30 m/sec.;
2. As a solid used, Alundum powder (aluminum oxide) or Carborundum powder (silicon carbide) having a diameter of less than 0.5 mm should be employed;
3. A flow ratio of liquid to gas is preferably 1.0:1 to 5.0:1 by weight;
4. A flow ratio of solid to gas is preferably equivalent to 5.0:1 to 15:1 by weight.

EXAMPLE 1

A steel sheet before a rolling process was maintained at a high temperature (approximately 1,200°C) and a mixture of solid, liquid (water) and gas was jetted to said steel sheet for the purpose of descaling under the foregoing conditions.

As a result, excellent descaling was obtained by use of only a small amount of water and the cooling effect was excellent, thereby resulting in a remarkable decrease in disfigurement by rolling, and the improvement of properties of the steel.

EXAMPLE 2

While a steel sheet after rolling was maintained at a low to medium temperature (ranging from 300° to 600°C), the novel method of the present invention was conducted. As a result, it was proved that inspection of a steel sheet to detect the surface flaws thereof can be done easily in addition to the effect shown in Example 1. A great improvement in operational efficiency can be obtained.

As is clear from the foregoing, various effects can be expected when the process for descaling a steel sheet in accordance with the present invention is employed. As described by way of the foregoing examples, it is possible to descale with high efficiency a steel sheet maintained at high temperatures before or after a rolling operation. Further, the inspection of steel sheet to detect the surface flaws thereof can be performed eas-

ily In addition, an excellent cooling effect is obtained Improvement in steel properties is realized. Moreover, it is possible to apply the novel method of the present invention as a descaling process at normal temperature out of a rolling process in lieu of a shot blasting or a sand blasting process. In this case, excellent operational and sanitation effects can be obtained. Furthermore, the novel method of the present invention can be applied in such diverse uses as blast cleaning, cleaning for preliminary treatment such as plating, enamelling and the like, sand strip of moulding, strip of skin, scale, rust, coating agent and the like of a forging billet.

What is claimed is:

1. A method for descaling steel comprising forming a mixture of aluminum powder or silicon carbide powder having a diameter of less than 0.5 mm., air and water, and spraying the mixture onto a steel at a flow velocity in excess of 30 m/sec., the weight flow ratio of water to air being from 1:1 to 5:1 and the weight flow ratio of said powder to air being from 5:1 to 15:1.

2. The method of claim **1**, wherein the powder is aluminum oxide.

3. The method of claim **1**, wherein the powder is silicon carbide.

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