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# (54) Hot roughing mill installation

Warmwalzanlage

Installation pour laminer à chaud

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## Description

**[0001]** The present invention relates to a hot roughing mill installation. Known hot roughing mill installations are described for example in the JP-A-53-26759 or the JP-B-61-3561. The former is directed to a large-scale production facility according to the pre-characterising part of Claim 1 having a sizing press for achieving higher production efficiency and the latter to a medium-scale production facility having a coil box, i.e. a coiling device, for winding up the roughed metal strip to reduce the length of the roughing mill line.

**[0002]** The installation described in the former publication has a very long roughing mill line, whilst the latter installation does not achieve good production efficiency. There is at present no hot roughing mill installation which has both high production efficiency and a relatively short roughing mill line. The object of the present invention is therefore, amongst other things, to provide an installation with a short roughing mill line and which operates at a high production efficiency.

**[0003]** According to the present invention, a hot roughing mill installation, which, in use, receives from a furnace a slab of hot metal which passes through the installation in a working direction, comprises a first roughing mill and a sizing press upstream of the roughing mill and is characterised in that the first roughing mill is a reversing roughing mill, that a coil box is provided downstream of the roughing mill which, in use, receives and coils a metal strip from the roughing mill, that edgers are provided upstream and downstream of the first roughing mill, which edgers, in use, form a thickened portion on each side of the slab and that a two-high rolling mill is located between the sizing press and the roughing mill.

**[0004]** The sizing press drafts the slab to a desired width before it passes through the roughing mill.

**[0005]** The thickened portion or "dog bone" on each side of the slab ensures that portions of reduced thickness, or "edge drops" are not created during roughing in the roughing mill.

**[0006]** The two-high rolling mill is included in the installation in order to flatten the thickened portions produced by the sizing press or edgers, should these portions be too pronounced.

**[0007]** It is possible for a second reversing roughing mill to be included in the installation, downstream of the first. In this case, further edgers may be incorporated immediately upstream and/or immediately downstream of the second roughing mill.

**[0008]** The following description of a specific embodiment of the present invention is given by way of example only, with reference to the single accompanying drawing which is a highly schematic side view of a hot roughing mill installation in accordance with the invention.

**[0009]** The drawing shows a first embodiment of the present invention in which reference numeral 1 represents a furnace for heating a slab S; and 2, a sizing press for drafting, or reducing the width of, the slab S when it has been taken out from the furnace 1. Numeral 3 represents edgers upstream and downstream of the roughing mill 4 for forming a "dog bone", or thickened portion, on each side of the slab S. Because edgers are situated upstream and downstream of the roughing mill, the sides of the metal strip P can be drafted by the edger 3 immediately prior to entering the roughing mill 4, regardless of the actual direction of travel of the strip P at that time. A two-high rolling mill 6 is arranged between the sizing press 2 and the upstream edger 3 so that, even if the thickened portions generated on each side of the slab S or metal strip P when it is drafted by the sizing press 2 or by the edger 3 are too big, they can be crushed by the two-high rolling mill 6. Downstream of the roughing mill 4 is a coiling device, 5, specifically a coil box for winding up the roughed strip P. The two-high rolling mill 6, sizing press 2, upstream edger 3, roughing mill 4, downstream edger 3 and coil box 5 are arranged on the exit side of the furnace 1 in that order in the direction D of travel of the slab. The direction D is the working direction in which the slab moves; that is to say it is the direction in which the slab progresses through the installation, although it may in fact also have a reciprocating motion, and the direction of travel at any instant may not be the same as the working direction D. A mill (not shown) for finishing the metal strip P is arranged downstream of the coil box 5 with respect to the direction of travel D.

**[0010]** The slab S is heated in the furnace 1 to a predetermined temperature and is then taken out of the furnace 1 and drafted to a predetermined width in the sizing press 2. Then, the slab S is reverse rolled several times in the reversing roughing mill 4 and is thereby formed into a metal strip P with the desired thickness.

**[0011]** The strip P is then wound up into a coil in the coil box 5. The metal strip P is thereafter uncoiled to be sent to the finishing mill (not shown) for finishing.

**[0012]** It is possible that edge drops, or portions of reduced thickness, on each side of the slab S can be created during the reverse rolling process in the roughing mill 4. This is prevented, in an installation according to the invention, by initially drafting the slab S in the edger 3 to generate dog bones, or portions of increased thickness, on the sides of the slab. Accordingly, no edge drops may be observed on the metal strip P after roughing in an installation according to the present invention.

**[0013]** As described above, the sizing press 2 is used to width-draft the slab S so that the amount of width drafting of the slab S which may be carried out can be increased in comparison with an installation not including a sizing press. Therefore, the range of widths of slab which may be cast by a continuous casting machine upstream of the installation and fed to the furnace 1 may be large. The number of different types of slab which the casting machine must produce is accordingly lowered, and as a result, the frequency with which the moulds on the casting machine must be changed is also reduced,

resulting in an enhancement of the production efficiency.

**[0014]** Since the metal strip P, after roughing, is wound up in the coil box 5, the length of the production line from the roughing mill 4 to the finishing mill can be shortened, which leads to the installation being smaller than if the coil box were not included.

**[0015]** It is to be understood that the present invention is not limited to the above-described embodiment and that various modifications may be made within the scope of the invention as defined in the appended claims.

## Claims

1. A hot roughing mill installation which, in use, receives from a furnace (1) a slab (S) of hot metal which passes through the installation in a working direction (D), the installation comprising a first roughing mill (4) and a sizing press (2) upstream of the roughing mill (4), characterised in that the first roughing mill is a reversing roughing mill, that a coil box (5) is provided downstream of the roughing mill (4) which, in use, receives and coils a metal strip (P) from the roughing mill (4), that edgers (3) are provided upstream and downstream of the first roughing mill (4), which edgers, in use, form a thickened portion on each side of the slab, and that a two-high rolling mill (6) is located between the sizing press (2) and the roughing mill (4).

2. An installation as claimed in Claim 1 characterised by a second roughing mill (4) located downstream of the first roughing mill (4).

3. An installation as claimed in Claim 2 characterised by an edger (3) immediately upstream of the second roughing mill (4).

4. An installation as claimed in Claim 3 characterised by a further edger (3) immediately downstream of the second roughing mill (4).

## Patentansprüche

1. Warmwalzanlage, die im Betrieb aus einem Ofen (1) eine Bramme (S) heißen Metalls empfängt, welche die Anlage in einer Arbeitsrichtung (D) durchläuft wobei die Anlage ein erstes Warmwalzgerüst (4) und eine dem Warmwalzgerüst (4) vorgeschaltete Kalibrierpresse (2) umfaßt, dadurch gekennzeichnet, daß das erste Warmwalzgerüst ein Reversier-Warmwalzgerüst ist, daß dem Warmwalzgerüst (4) ein Coilkasten (5) nachgeschaltet ist, der im Betrieb einen Metallstreifen (P) aus dem Warmwalzgerüst (4) aufnimmt und aufwickelt, und weiter gekennzeichnet durch dem Warmwalzgerüst (4) vor- und nachgeschaltete Stauchgerüste (3), welche im Betrieb einen verdickten Abschnitt auf jeder Seite der Bramme formen, und daß ein Duo-Walzgerüst (6) zwischen der Kalibrierpresse (2) und dem Warmwalzgerüst (4) angeordnet ist.

2. Anlage nach Anspruch 1, gekennzeichnet durch ein zweites, dem ersten Warmwalzgerüst (4) nachgeschaltetes Warmwalzgerüst (4).

3. Anlage nach Anspruch 2, gekennzeichnet durch ein dem zweiten Vorwwalzgerüst (4) unmittelbar vorgeschaltetes Stauchgerüst. (3).

4. Anlage nach Anspruch 3, gekennzeichnet durch ein weiteres, dem zweiten Warmwalzgerüst (4) unmittelbar nachgeschaltetes, Stauchgerüst (3).

## Revendications

1. Installation de laminoirs dégrossisseurs à chaud qui, en utilisation, reçoit d'un four (1) une brame (S) de métal chaud qui traverse l'installation dans une direction de travail (D), l'installation comprenant une première cage dégrossisseuse (4) et une presse calibreuse (2) en dont de la cap dégrossisseuse (4), caractérisée en ce que la première cage dégrossisseuse est une cage dégrossisseuse réversible, en ce qu'une cage bobineuse (5) est prévue en aval de la cage dégrossisseuse (4) qui, en utilisation, reçoit et enroule une bande de tôle (P) provenant de la cage dégrossisseuse (4), en ce que des cages refouleuses (3) sont prévues en amont et en aval de la première cage dégrossisseuse (4), cages refouleuses qui, en utilisation, forment une partie épaissie sur chaque rive de la brame et en ce qu'une cage dégrossisseuse duo (6) est située entre la presse calibreuse (2) et la cage dégrossisseuse (4).

2. Installation selon la revendication 1, caractérisée par une seconde cage dégrossisseuse (4) située en aval de la première cage dégrossisseuse (4).

3. Installation selon la revendication 2, caractérisée par une cage refouleuse (3) immédiatement en amont de la seconde cage dégrossisseuse (4).

4. Installation selon la revendication 3, caractérisée par une cage refouleuse supplémentaire (3) immédiatement en aval de la seconde cage dégrossisseuse (4).

Fig.