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(54) **METHOD FOR SEPARATING ROLLING OF STOCK MATERIAL**

(57) The present invention relates to rolling process, particularly to the methods of double feed rolling with its following slitting in the rolling mill line and its following two-strand rolling, and can be implemented at two-high reversing and billet mills.

The object of the present invention is to provide simultaneous double feed rolling in square passes, to improve finished product quality, particularly its macrostructure, giving a heavy reduction to ingot core part, to improve mill performance characteristics.

Technological effects of the present invention are elimination of the feed twisting round its longitudinal axis in diagonal square passes, decrease of the ingot macrostructure defects due to axial porosity compacting and complete elimination of segregation.

Slitting method of billet rolling is the method whereby a heated ingot is successively rolled in box, rhombic and diagonal square passes of the rolling mill.

The method is different from the previously known methods because after the box pass the feed is rolled in a forming slitting pass having the shape of two ovals connected by a bridge and after that in rhombic and diagonal square passes it is further rolled into two feeds connected by a bridge, whereby the double diagonal square feed is slit at a breaking pass by means of round

groove ridges having the radius $R = (0,3...0,45)a$, where "a" is a square billet side. 1il.

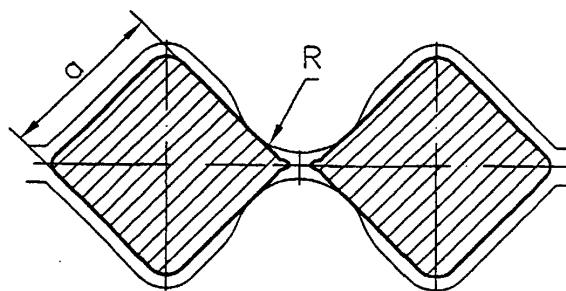


Fig. 3

Description

Field of the invention

[0001] The present invention relates to rolling process, particularly to the methods of rolling at reversing mills, roughing mills, continuous billet mills and heavy section mills chiefly for billet production.

Description of the prior art

[0002] The following methods are already known: billet rolling at roughing and billet mills by means of successively arranged box passes, a square box pass, rhombic and diagonal square passes.

[0003] The method of billet rolling at a reversing roughing mill [1] which includes applying of successive flat box passes with the groove bottom surface bent relative to its vertical axis towards the sidewalls situated on the body of the roll along its length, a square box pass with the groove sidewalls taper, a rhombic pass and a diagonal square pass was taken as a prototype.

[0004] The disadvantage of this method is the tendency of the feed coming from the rhombic pass to twist in the diagonal square pass which results in a worse quality of the finished product. This happens because the feed coming from the square box pass loses its diagonal symmetry during the operation (e.g. this may be caused by a wear of the pass). Due to this reason the feed coming from the rhombic pass loses its rhombic shape, i.e. the rhomb made in this pass loses its diagonal symmetry. When such feed goes through the diagonal square pass, it twists round its longitudinal axis and, besides the impairment of the quality of the finished product, this causes feed handling problems (e.g. manipulating, cross motion, etc.), it also makes the rolling cycle longer and lowers mill performance characteristics.

[0005] Other disadvantages of this rolling method are:

- Impossibility to improve the ingot macrostructure having internal melting defects concentrated in its core part (e.g. central porosity, carbon segregation);
- Worse quality of the finished product and lower mill performance characteristics caused by the feed coming from the rhombic pass tendency to twist in the diagonal square pass due to the loss of the feed diagonal symmetry while passing through the box passes during the operation (e.g. due to the pass wear);
- low production rate of the mill.

Summary of the invention

[0006] The object of the present invention is to provide simultaneous double feed rolling in square passes, to improve finished product quality, particularly its macrostructure, giving a heavy reduction to ingot core part,

to improve mill performance characteristics.

[0007] Technological effects of the present invention are elimination of the feed twisting round its longitudinal axis in the diagonal square passes, decrease of ingot macrostructure defects due to axial porosity compacting and complete elimination of carbon segregation.

[0008] The object of the present invention is achieved because in the slitting method of billet rolling according to which a heated feed is rolled successively in box, rhombic and diagonal square passes of the rolling mill, after the box pass a feed is rolled in a forming slitting pass having the shape of two ovals connected by a bridge and after that in rhombic and diagonal square passes it is further rolled into two feeds connected by a bridge, whereby double diagonal squares are slit in a breaking pass by means of round groove ridges having the radius $R = (0,3...0,45)a$, where a - a square billet side.

[0009] The difference between the method of the present invention and its prototype is that after the box pass the feed is rolled in the forming slitting pass having the shape of two ovals connected by a bridge and then in rhombic and diagonal square passes in the form of two grooves connected by a bridge, whereby the dual diagonal squares are slit in the breaking pass by means of round groove ridges having the radius $R = (0,3...0,45)a$, where a - a square billet side.

Brief description of the drawings

[0010] The following drawings are given to illustrate the invention.

[0011] Fig. 1 illustrates a roll pass design consisting of five passes.

[0012] Fig.2 schematically represents the pass consisting of two diagonal squares connected by a bridge.

[0013] Fig.3 schematically represents a breaking pass, providing the bridge breaking and the double feed splitting into two separate billets.

Preferable embodiments of the invention

[0014] The process of rolling using the system of passes according to the present invention is done as follows. The original ingot with square or rectangular cross-section is heated in the reheating furnace of a roughing mill and is rolled first in a box pass 1 with the groove bottom surface bent about the pass vertical axis. After the box pass the feed is rolled in a forming (slitting) pass 2 having the shape of a twin feed, both parts of which have similar sectional areas of an oval or rhombic shape connected by a bridge. In the process of deformation in pass 2 incoming rectangular feed centers itself in the pass at the moment of nipping due to simultaneous four - angle contact with the sidewalls of the pass and after slitting by means of the pass grooves ridges situated on the central vertical axis of the pass, two feeds with the same cross-section connected by a

bridge are formed. The following feed forming is carried out in two passes representing double passes with rhombic (pass 3) and rectangular (pass 4) cross-sections connected by bridges, where deformation occurs in a rhombic - square roll pass design without twisting round the longitudinal axis as distinct from the previously known rhomb - square pass design method (1).

[0015] The rolling method of the invention allows a greater degree of deformation of the original ingot core part where casting defects - central porosity and carbon segregation - are concentrated. For instance, diagonal square height total reduction coefficient in pass 4 is 1.8, and bridge total reduction coefficient in this pass is 75. High degree of the feed core part deformation allows to eliminate the original ingot central porosity. Due to the rolling method of the invention carbon segregation (casting defect) moves to the bridge area connecting two diagonal squares (fig.2).

[0016] The double feed being rolled in pass 5 is slit into two square billets by means of slitting ridges having the radius $R = (0,30-0,45)a$, where "a" is square billet side (Fig.3), separating the double diagonal square to the distance l_2 (fig.2), which is 1,1 - 1,3 times as long as the distance l_1 .

[0017] Separated square billets having remains of the bridge at the point of slitting are dressed with a grinding machine removing bridge remains where carbon segregation is concentrated.

Industrial application

[0018] The method of the invention is implemented at a roughing two-high reversing rolling mill 850 at the Republican Unitary Enterprise "Byelorussian Steel Works" in manufacturing of high carbon steel st80 cord square billet 125x125 mm used for cord rod production.

[0019] The original ingot with square or rectangular cross-section is heated in the heating furnace of a roughing mill and is rolled first in a box pass 1 with the groove bottom surface bent about the pass standing axis. After the box pass the feed is rolled in a forming (slitting) pass 2 having the shape of double feed, both parts of which have the same sectional areas of an oval or rhombic shape connected by a bridge. In the process of deformation in pass 2 the incoming rectangular feed centers itself in the pass at the moment of nipping due to simultaneous four-angle contact with the sidewalls of the pass and after slitting by means of the pass grooves ridges situated on the central vertical axis of the pass, two feeds with the same cross-section connected by a bridge are formed. The following feed formation is carried out in two passes representing double passes with rhombic (pass 3) and rectangular (pass 4) cross-sections connected by bridges, where deformation occurs without twisting round the longitudinal axis as distinct from the previously known rhomb-square pass design method.

[0020] The double feed being rolled in pass 5 is slit

into two square billets by means of slitting ridges having the radius $R = (0,30-0,45)a$, where "a" - a square billet side (Fig.3), separating double diagonal squares to the distance l_2 (fig.2), which is 1,1 - 1,3 times as long as the distance l_1 .

[0021] Separated square billets having bridge remains at the point of slitting are dressed with a grinding machine, thus, bridge remains where segregation is carbon concentrated are removed.

[0022] The method of the invention implemented under the conditions of the roughing rolling mill 850 allows to eliminate diagonal square twisting round the longitudinal axis, to improve mill performance characteristics due to simultaneous two square billets 125x125 mm rolling in the last pass and improve the billet macrostructure quality due to axial porosity compacting and complete elimination of carbon segregation.

Source of information

[0023] 1. Filippov I.N. and others. Roll pass designs atlas. - M.: Chermetinformatiya, 1965. - pp. 11 - 12 (prototype).

Claims

1. The slitting method of billet rolling according to which heated ingot is rolled successively in box, rhombic and diagonal square passes of the rolling mill distinguished by rolling of a billet in a forming slitting pass having the shape of two ovals connected by a bridge after the box pass and after that in rhombic and diagonal square passes it is further rolled into two feeds connected by a bridge, where the double diagonal squares are slit in a breaking pass by means of round groove ridges having the radius $R = (0,3...0,45)a$, where "a" is a square billet side.

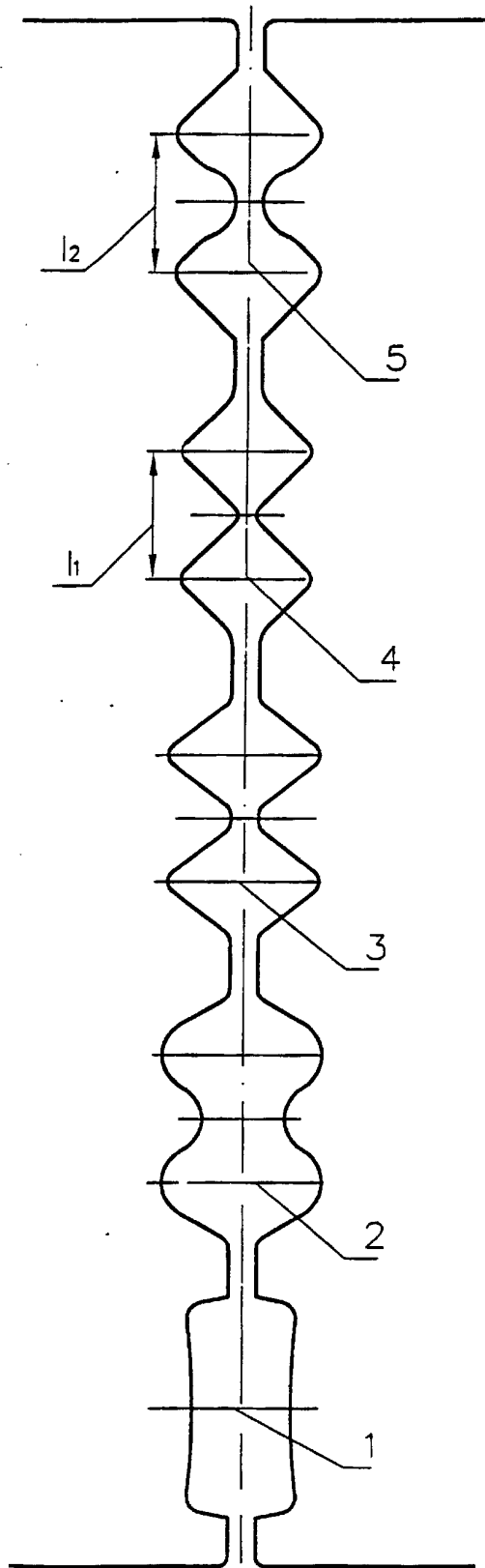


Fig. 1

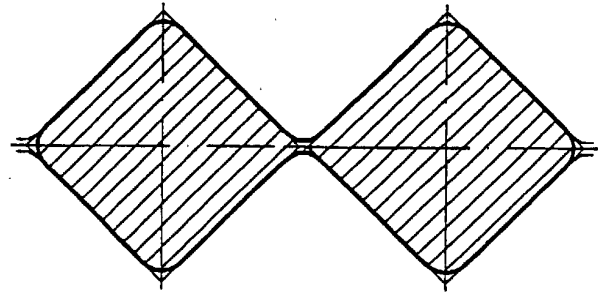


Fig. 2

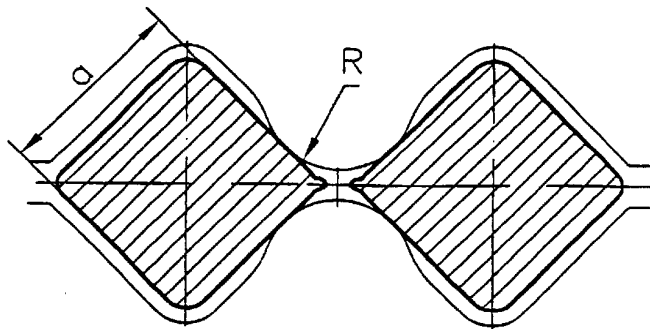


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BY01/00009

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7 : B21B 1/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC 7 : B21B 1/00, 1/02		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU 1061860 A (DONETSKY POLITEKHNICHESKY INSTITUT) 23 December 1983 (23.12.83), the abstract	1
A	RU 2126728 C1 (OTKRYTOE AKTSIONEKNOE OBSHESTVO « ZAPADNO – SIBIRSKY METALLURGICHESKY KOMBINAT ») 27 February 1999 (27.02.99), the abstract, figures 1-6	1
A	US 6050122 A (MARIO FABRIS) 18 April 2000 (18.04.00, the abstract, figure 1	1
☐ Further documents are listed in the continuation of box C. ☐ Patent family members are listed in annex.		
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Date of the actual completion of the international search 26 September 2001 (26.09.01)		Date of mailing of the international search report 04 October 2001 (04.10.01)
Name and mailing address of the ISA/RU		Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)