(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 067 911
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 81302769.5

(51) Int. Cl.³: B 21 B 45/06

(22) Date of filing: 19.06.81

(43) Date of publication of application:
29.12.82 Bulletin 82/52

(84) Designated Contracting States:
AT BE CH DE FR LI NL SE

(71) Applicant: THE HEAD WRIGHTSON MACHINE COMPANY LIMITED
Durham Street
Middlesbrough Cleveland TS2 1PN(GB)

(72) Inventor: Lawson, Kenneth Thomas
8 Moor Green Nunthorpe
Middlesbrough Cleveland(GB)

(74) Representative: Carpmael, John William Maurice et al,
CARPMAELS & RANSFORD 43 Bloomsbury Square
London, WC1A 2RA(GB)

(54) Removal of scale from steel strip.

(57) A scale breaker for removing scale from metal strip, particularly steel strip (11).

An object is to provide a scale breaker which will not clog up with scale. The scale breaker (Figure 2) comprises support rolls (1) and (2) carried in bearings (7) and (8) which are located outboard of the rolls to be clear of loose scale. A breaker roll (5) is supported by thrust bearings which allow radical movement relative to the support rolls, the breaker roll being retained by the strip as it passes under roll (1), over breaker roll (5) and under roll (2).

Water jets, rotating wire brushes and abrasive rolls or belts may be used to assist in scale removal.

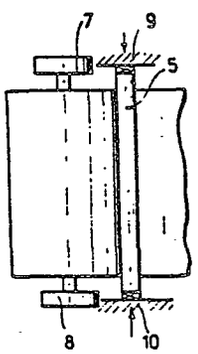


FIG.2.

EP 0 067 911 A1

REMOVAL OF SCALE FROM STEEL STRIP

At various stages in the manufacture of metal strip, such as steel strip, but particularly during and after the hot rolling process, and during the period while the strip cools down to room temperature, iron oxides form on the steel strip. This deposit of iron oxide, usually called scale, has to be removed before cold rolling. The strip is normally cold rolled to obtain the final thickness required and to obtain the required metallurgical properties and surface finish. It is therefore essential to remove iron oxides or scale, which are abrasive and which would spoil the surface of the strip during cold rolling. The oxides are normally removed by pickling the steel strip in acids, usually hydrochloric or sulphuric acids.

Stretch levellers are often incorporated in the entry end to pickling lines in order to flatten the strip, but we have found that the severe stretching and bending process involved in stretch levelling has the effect of loosening and removing some of the scale from the surface of the strip.

Stretch levellers currently used have small diameter bending rolls usually supported on short backing rolls such as are illustrated in Figs. 3 and 4 of our Patent Specification No. 1545114. This shows a typical arrangement of backing rolls to support a small diameter work roll.

If such a stretch leveller is used in a pickling line the loose scale or oxide from the steel strip must be washed away by water jets to prevent the scale from accumulating around the back-up rolls and also scale must be prevented from finding its way into the bearings of the backing rolls. This leads to serious practical problems and cleaning the roll assembly is a continuous maintenance problem in a steel works.

An object of this invention is to provide a new type of scale breaker for loosening and removing scale from metal strip, which overcomes the problems of scale disposal to a

large extent and also alleviates the problems of scale in backing rolls.

According to the invention, a scale breaker, for loosening and/or removing scale from metal strip of predetermined width, comprises a pair of backing rolls solely supported at their outer ends, outboard of said predetermind strip width, in bearings protected against scale, and a scale breaking roll of smaller diameter than the support rolls and free to move radially of the support rolls, being constrained by the strip which is being descaled.

The scale breaking roll may be supported at its ends in thrust bearings to hold the rolls laterally in position, but the thrust bearings again are outboard of the strip and may be well protected against the ingress of scale.

The backing rolls may be driven or undriven, and it may be arranged that the second roll of a pair of support rolls runs faster than the first roll in order to stretch the strip.

If the rolls are undriven bridle rolls may be used at entry or exit to the scale breaker for controlling the elongation and tension of the strip.

Water jets may be used if desired to ensure that all scale is flushed away from the scale breaker. Alternatively, an air suction system may be used to remove dust and scale or a combination of air suction and water jets. For instance, water jets may be used where the breaker roll is located above the support rolls and air extraction may be used where the breaker roll is located below the support rolls.

In addition, or alternatively, rotating wire brushes, abrasive rolls, or abrasive belts may be used to brush away the loosened scale.

If desired the scale breaker may be followed by an acid pickling apparatus and this in turn may be combined with or followed by a cold rolling mill so that the operations of descaling and cold rolling may be carried out on a continuous basis.

Conventional practice is to descale steel strip in a pickling line and recoil it. The cold rolling operation is normally carried out separately. By descaling and rolling together, it is possible to save a large amount of handling equipment and reduce the total time needed to process strip.

In the accompanying drawings,

Fig. 1 shows diagrammatically a scale breaker incorporating the present invention;

Fig. 2 is a plan view of the first and second support rolls and the breaker roll of the scale breaker shown in Fig. 1 and illustrates the bearings of the support and breaker rolls;

Fig. 3 illustrates a scale breaker using multiple support rolls and breaker rolls and having rotating wire brushes, abrasive rolls or abrasive belts to remove scale; and

Fig. 4 illustrates the combination of a scale breaker embodying the invention with an acid pickle line and cold rolling mill.

In Fig. 1 the scale breaker shown comprises support rolls 1, 2, 3 and 4 which support in pairs respectively scale breaker rolls 5 and 6 of smaller diameter than the support rolls.

As shown in Fig. 2 the support rolls 1 and 2 are carried on roll bearings 7 and 8 located well outboard of the predetermined strip width which can be descaled by the scale breaker. The strip width would be slightly less than the width of roll 1 shown in Fig. 2. The breaker roll 5 is supported by thrust bearings 9 and 10 which allow radial movement relatively to the support rolls.

The strip 11, as illustrated in Fig. 1, is wrapped around the breaker roll 5 and round successive support rolls. The strip itself, because tension is applied to it, pulls the breaker roll 5 towards the support rolls and thus the ends of the breaker roll do not have to be supported in bearings other than the thrust bearings shown in Fig. 2.

Water jets 12 and 13 are located so as to remove scale which is loosened by the scale breaker.

Alternatively, as shown in relation to rolls 3 and 4 and scale breaker roll 6 an air extraction system 14 may be used to extract scale and dust.

As illustrated in Fig. 3 there may be three or more pairs of the support rolls and these support rolls may support three or more breaker rolls. Rotating wire brushes or abrasive rolls or abrasive belts 14, 15 and 16 may be located so as to engage either the breaker rolls 5 and 6 or strip passing over the support rolls such as roll 4.

As shown in Fig. 4 the scale breaker which has the reference numeral 17 may be immediately followed by an acid pickle line 18 and a cold rolling mill 19, the strip 11 passing through the scale breaker 17, through the acid pickle bath 20 over suitable supporting rolls 21 and 24 and into the stands 25 and 26 of a cold rolling mill. The cold rolling mill may be of conventional design and may have any number of stands, two stands being illustrated for the sake of example.

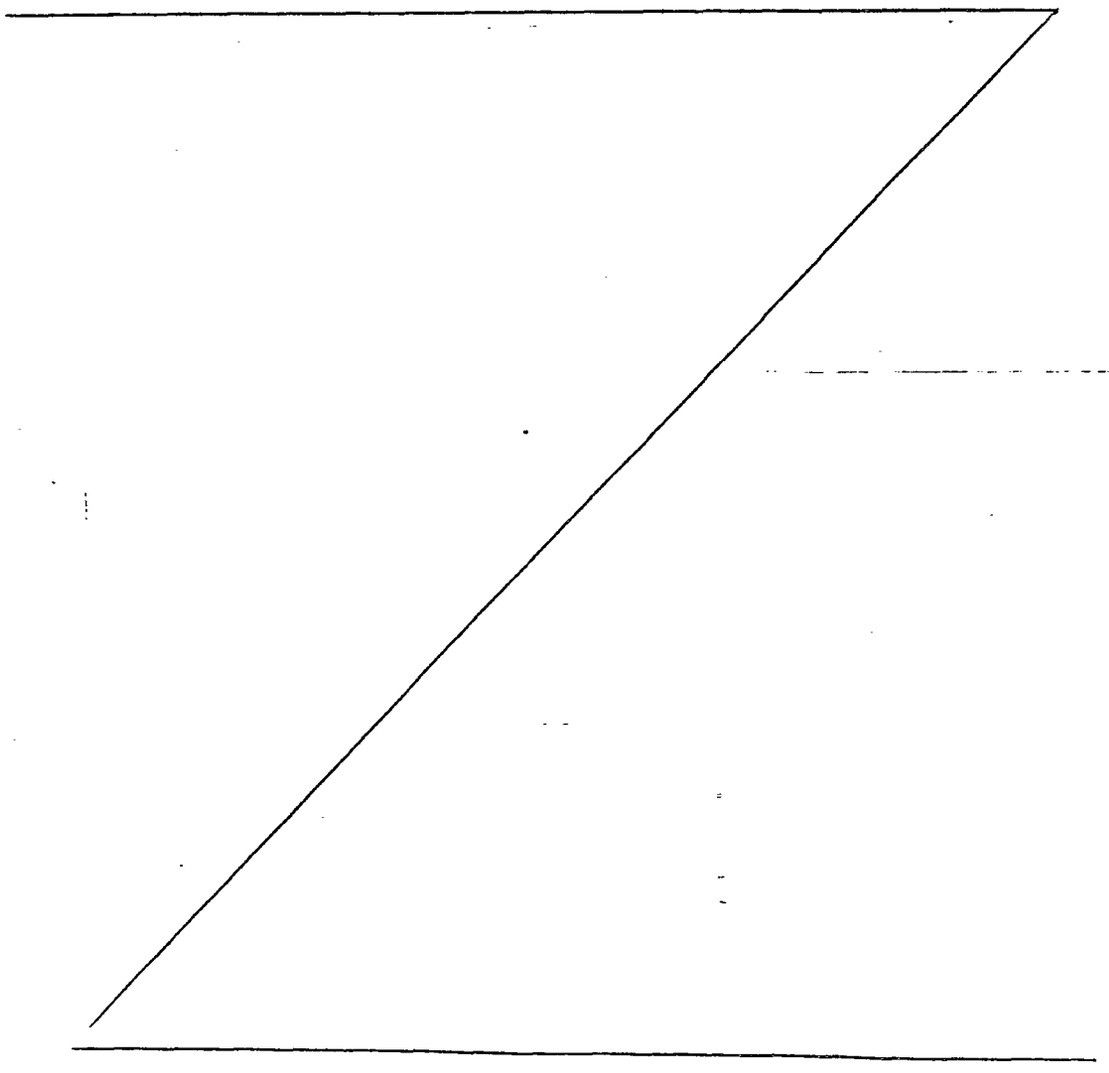
In operation strip is severly bent round round the small diameter breaker rolls 5 and 6 and at the same time the strip is tensioned and made to stretch and this has the effect of loosening the scale, and flattening the strip, in the same way that the conventional stretch leveller achieves the object of flattening the strip. It is to be noted that the small diameter breaker rolls 5 and 6 are held in place by the strip and large diameter rolls only and no backing rolls are used. The thrust bearings supporting the breaker rolls may be well protected against the ingress of scale by being closed in suitable housings.

Rolls 1, 2, 3 and 4 may be driven in such a manner thatroll 2 runs faster than roll 1 and roll 3 runs faster than roll 2 etc., in order to stretch the strip. Alternatively, these rolls could be undriven and bridle rolls of conventional design could be used at entry or exit to the scale breaker for controlling elongation and tension of the strip. It may be necessary to use the water jets as shown to ensure that all scale produced is flushed away from the machine.

Alternatively it may be possible simply to use an air suction system to remove the dust. A combination of both systems could also be used.

Since the scale breaker will remove most of the scale from the strip the amount of acid pickling required prior to cold rolling will be very much reduced and this will reduce the cost of the whole process.

By using several scale breaker rolls as in Fig. 3, the amount of flexing and the total amount of stretching of the strip is very much increased. This will obviously loosen much more of the scale. By using the wire brushes or abrasive rolls or abrasive belts shown in Fig. 3, the remainder of the scale can be substantially removed.



Claims:-

1. A scale breaker for loosening and/or removing scale from metal strip of predetermined width, comprising a pair of backing rolls and a scale breaking roll characterised by this, that the backing rolls (1,2) are solely supported at their outer ends, outboard of said predetermined strip width, in bearings (7,8) protected against scale, and a scale breaking roll (5) of smaller diameter than the support rolls (1,2) and free to move radially of the support rolls but contained by the strip (11) which is being descaled.

2. A scale breaker according to claim 1 and characterised by this, that the scale breaking roll (5) is supported at its ends in thrust bearings (9,10) to hold the roll (5) laterally in position, the thrust bearings being outboard of the strip (11) and being protected against the ingress of scale.

3. A scale breaker according to claim 2 and characterised by this, that the backing rolls (1,2) are driven and so arranged that the second roll (2) of a pair of support rolls (1,2) runs faster than the first (1) roll in order to stretch the strip (11).

4. A scale breaker according to claim 2 and characterised by this, that the backing rolls (1,2) are undriven, and bridle rolls are used at entry and/or exit to the scale breaker for controlling the elongation and tension of the strip.

5. A scale breaker according to any one of claims 1 to 4 characterised by this, that water jets are used to ensure that all scale is flushed away from the scale breaker.

6. A scale breaker according to any of claims 1 to 5 and characterised by this, that an air suction system is used to remove dust and scale.

7. A scale breaker according to any of claims 1 to 4 and characterised by this, that water jets are used where the breaker roll is located above the support rolls and

air extraction is used where the breaker roll is located below the support rolls, to remove scale and dust.

8. A scale breaker according to any preceding claims and characterised by this, that rotating wire brushes, abrasive rolls or abrasive belts are used to brush away the loosened scale.

9. A scale breaker according to any preceding claim characterised by being followed by an acid pickling apparatus combined with or followed by a cold rolling mill so that the operations of descaling and cold rolling may be carried out on a continuous basis.

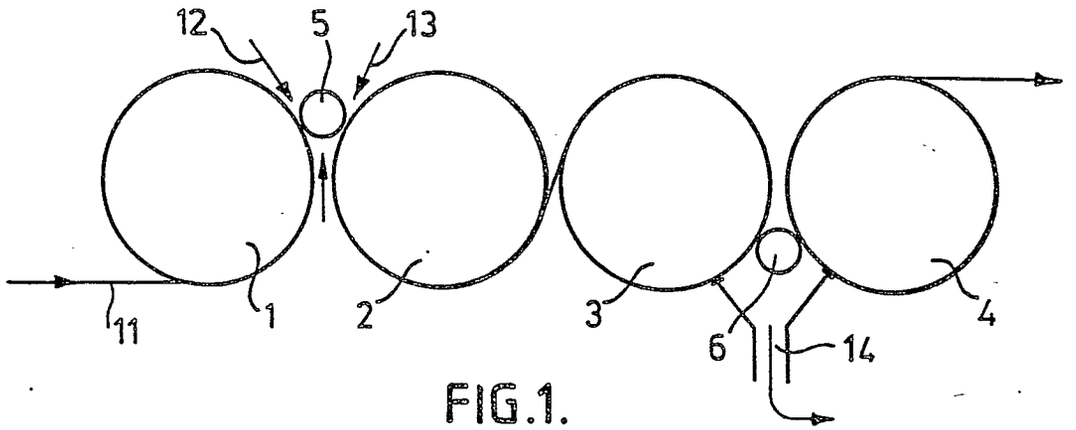


FIG.1.

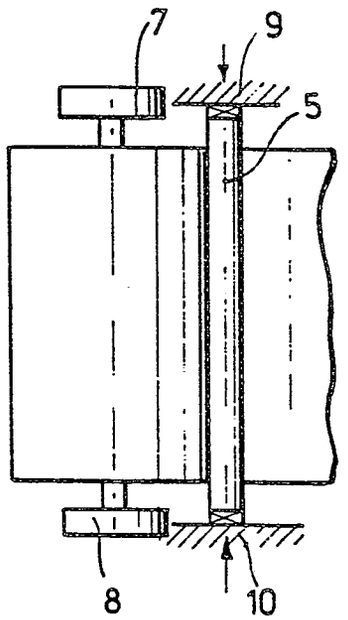


FIG.2.

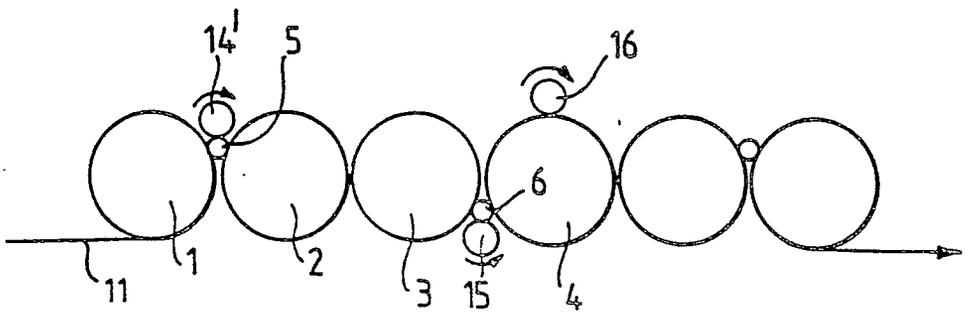


FIG.3.

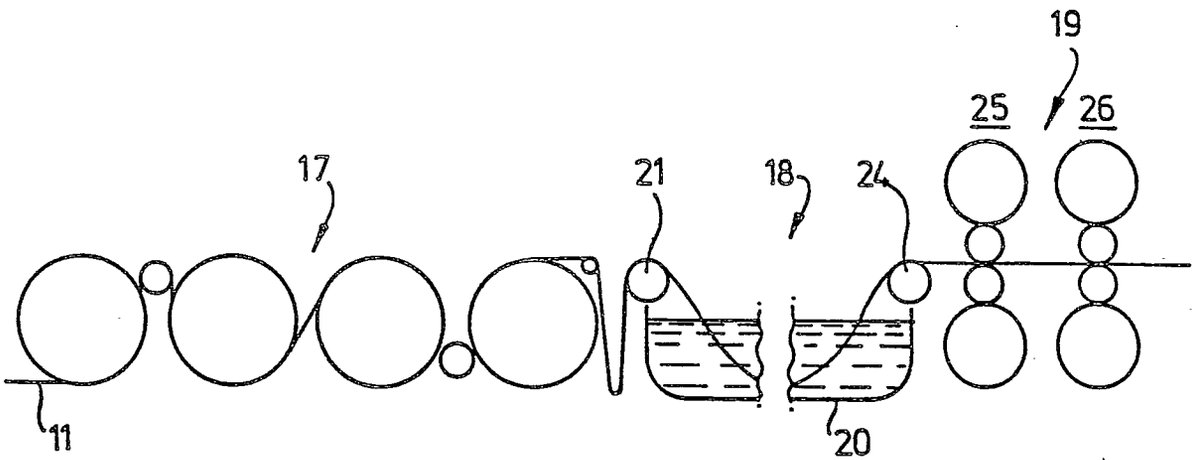


FIG.4.

European Patent Office

EUROPEAN SEARCH REPORT

0067911

Application number

EP 81 30 2769

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	FR - A - 1 137 742 (UNITED) * The whole document *	1-3
A	DE - B - 1 011 839 (THOMAS)	1
A	CH - A - 348 670 (THOMAS)	4
A	CH - A - 351 568 (FICHTER)	5
A	US - A - 2 907 151 (PETERSON)	6
A	GB - A - 755 444 (WUPPERMANN)	9
D	GB - A - 1 545 114 (LAWSON)	1

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

B 21 B 45/06

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

B 21 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15-02-1982	SEMBRITZKI

EPO Form 1503.1 06.78