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54 **WEAR RESISTANT DOCTOR BLADE.**

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EP 0 262 137 B1

Description

Technical Field

The invention relates to cold rolled, heat-treated and hardened steel strip articles. More precisely the invention aims to improve the wear resistance and friction properties of such cold rolled steel strip articles which are exposed to abrasion. In the first place the invention concerns coated scraper or doctor blades, for example for smoothing out a coating material on a continuous paper web or the scraping clean of rollers for crêping, removal or scraping clean of surplus paint on rotogravure rollers, anilox rollers and similar machine parts.

Background of the Invention

The wearing out time for cold rolled steel strip coating scrapers is normally about 4 hours if the scraper is not coated with some wear or friction reducing coating. When the scraper is worn, the coating becomes faulty, and therefore the paper line must be stopped for replacement. For self-evident reasons it is desirable to increase the life of the scrapers, not in the first place in order to reduce the cost of the scrapers but in order to reduce the down times of the paper machine.

With printing press doctor blades too similar problems appear. When the doctor blade is worn, unevennesses build up at the edge, which can leave traces on the print roller with which the doctor blade is engaged. It is sufficient for these traces to have a depth of about 1 μm for coloured edges and other defects to arise on the web that is being printed by means of the roller.

It is well known that these problems can be reduced by coating the active parts of the blade, i.e. the parts that are in contact with the paper web or printing press roller along with the most closely adjacent parts of the blade with a coat of a material which has higher wear resistance than the cold rolled steel strip. For example in this connection reference can be made to GB-A-978 988 and GB-A-1 289 609, which describe how printing press doctor blades can be made more wear resistant through coating with ceramic coatings.

Disclosure of the Invention

The object of the invention is to offer an improved solution to the above problems. One aim is thus to improve the wear resistance and friction properties of a scraper or doctor blade in the shape of a chamfered, coated steel strip for smoothing out a coating material on a continuous paper web or for scraping rollers clean, i.e. a product which in its employment is exposed to wear which can put at risk the function of the product and/or reduce its active life. It is also an aim to reduce the energy requirement with the use of the product.

It is also an aim to offer a coating which can preferably be applied directly to the steel strip, i.e. without an intermediate coating such as is required in for example the application of ceramic coatings to steel strip.

These and other aims can be achieved through the fact that the coating consists of molybdenum or a molybdenum alloy consisting mainly of molybdenum and covering at least a part of the scraper or doctor blade's surface.

The layer thickness of the coating can vary but generally amounts to between 0.02 and 0.5 mm, which can correspond to between 10 and 100% of the thickness of the steel strip. In a normal case the coating is limited essentially only to that part of the blade or corresponding element which is exposed to wear during work, preferably the face area or face areas and/or the area up to the leading edge of the face area or face areas, in a way which in itself is conventional.

Further characteristics and aspects of the invention become clear from the patent claims below and from the following description of a preferred embodiment and from wear tests carried out.

Brief Description of the Drawings

In the following description reference will be made to the enclosed drawings, of which

Fig. 1 shows a cross section of a printing press doctor blade which has been coated with a wearing layer, and

Fig. 2 shows in diagrammatic form the wear as a function of the time for different coatings.

Description of preferred embodiment and tests carried out

With reference first to Fig. 1 a doctor blade in general is marked with the numeral 7. The blade's dimensions are considerably increased in the drawing. It consists of a thin cold rolled strip 8 with a face area 9. The face area 9 is coated with a wearing layer 10. The wearing layer also covers with a part 11 the area up to the leading edge 12 of the face area 9.

In the tests carried out the material in the doctor blades 8 consisted of a carbon steel (quality UHB[®] 20C) with hardness about 530 HV. The scraper blades had the following dimensions: thickness 0.38 mm, width 45 mm, length 225 mm. The scraper blades 8 were clad with the wearing layers 10 and 11 of varying composition. After coating, the coating surfaces were ground to the thicknesses which can be seen in Table 1. The table also contains information about the composition of the coating layer and the wearing down expressed as weight loss after 30 min.

In the test the doctor blades were worn down against a rotating steel cylinder which had hardness 33 HRC for a total of 30 min. The weight loss of the blades was determined every fifth minute. The applied

EP 0 262 137 B1

pressure against the cylinder was 1-8 bar. The cylinder speed went up to 1400 rpm.

The result can be seen from the two last columns in Table 1 and from the diagrams in Figure 2. For the best result was obtained with the molybdenum coated doctor blade according to the invention. Expressed in relative wear resistance this was nearly 10 times better than the next best.

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TABLE 1

Sample No. graph	Coating	Method	Thickness(mm)		Wear(mg) after 30 min	Relative wear resistance
			Side	Face area		
1.	NiAl+ZrO ₂ /MgO	Flame spraying of powder	0.080	0.068	0.090	0.07
2.	NiAl+Cr ₂ O ₃	Flame spraying of rod	0.068	0.045	0.093	0.07
3.	NiAl+Al ₂ O ₃ /TiO ₂	Flame spraying of powder	0.113	0.045	0.056	0.11
4.	NiAl+Cr ₂ O ₃	Plasma spraying	0.090	0.045	0.046	0.13
5.	Mo	Flame spraying of wire	0.068	0.068	0.006	1.0
6.	None	—	—	—	0.090	0.07

EP 0 262 137 B1

It can be seen that the improved wear resistance can be utilised to prolong the effective life of paper machine scrapers, so that the interval between scraper replacements can be very considerably extended. In addition the lower friction results in a reduced output requirement significantly so as to decrease the investment and operating costs.

Claims

1. Scraper or doctor blade (7) in the shape of a chamfered, coated steel strip (8) for smoothing out a coating material on a continuous paper web or for scraping rollers clean, characterised by the fact that at least a part (9) of its surface has a covering coating (10, 11) of molybdenum or a molybdenum alloy consisting mainly of molybdenum.

2. Article as per claim 1, characterised by the fact that the coating has a thickness of 0.02-0.5 mm.

3. Article as per claim 2, characterised by the fact that the coating has a thickness of between 10 and 100% of the thickness of the scraper or doctor blade.

4. Article as per any of the claims 1-3, characterised by the fact that the said coating of molybdenum or molybdenum alloy is applied directly to the steel without a binding layer.

5. Article as per any of the claims 1-4, characterised by the fact that the coating essentially is limited to that part (9) of the blade (8) which is exposed in work to wear, preferably the face area or face areas and/or the area up to the leading edge of the face area or face areas (12).

6. Article as per any of the claims 1-5, characterised by the fact that its thickness is 0.05-3.5 mm.

Patentansprüche

1. Schaberklinge oder Rakel in Form eines abgefasten, beschichteten Stahlbandes (8) zum Abziehen von Beschichtungsmaterial auf einer endlosen Papierbahn oder um Walzen sauber zu schaben, dadurch gekennzeichnet, daß mindestens ein Teil (9) seiner Oberfläche eine Abdeckbeschichtung (10, 11) aus Molybdän oder einer Molybdänlegierung, hauptsächlich Molybdän enthaltend, aufweist.

2. Artikel nach Anspruch 1, dadurch gekennzeichnet, daß die Beschichtung eine Dicke von 0,02 - 0,5 mm aufweist.

3. Artikel nach Anspruch 2, dadurch gekennzeichnet, daß die Beschichtung eine Dicke von 10 bis 100% der Dicke der Schaberklinge oder des Rakels aufweist.

4. Artikel nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die gen. Beschichtung aus Molybdän oder der Molybdänlegierung direkt auf den Stahl aufgebracht ist ohne eine Bindschicht.

5. Artikel nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Beschichtung im wesentlichen begrenzt ist auf den Teil (9) des Blattes (8), welcher bei seinem Einsatz dem Verschleiß ausgesetzt ist, vorzugsweise auf den Stirnflächenbereich oder die Stirnflächenbereiche und/oder den Bereich bis zu der Vorderkante (12) des Stirnflächenbereiches oder der Stirnflächenbereiche.

6. Artikel nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß seine Dicke 0,05 - 3,5 mm beträgt.

Revendications

1. Racleur ou lame de raclage (7) sous la forme d'une bande d'acier revêtue, chanfreinée (8) pour lisser un matériau de revêtement sur une bande de papier continue ou pour nettoyer des rouleaux par raclage, caractérisé par le fait qu'au moins une partie (9) de sa surface possède un revêtement (10, 11) de molybdène ou d'un alliage de molybdène consistant principalement en molybdène.

2. Objet selon la revendication 1, caractérisé par le fait que le revêtement possède une épaisseur de 0,02-0,5 mm.

3. Objet selon la revendication 2, caractérisé par le fait que le revêtement possède une épaisseur comprise entre 10 et 100% de l'épaisseur du racleur ou de la lame de raclage.

4. Objet selon l'une quelconque des revendications 1 à 3, caractérisé par le fait que ledit revêtement de molybdène ou d'alliage de molybdène est appliqué directement à l'acier sans couche de liaison.

5. Objet selon l'une quelconque des revendications 1 à 4, caractérisé par le fait que le revêtement est essentiellement limité à cette partie (9) de la lame (8) qui est exposée durant le travail à une usure, de préférence là où les facettes et/ou la surface jusqu'au bord antérieur de la ou des facettes (12).

6. Objet selon l'une quelconque des revendications 1 à 5, caractérisé par le fait que son épaisseur est de 0,05-3,5 mm.

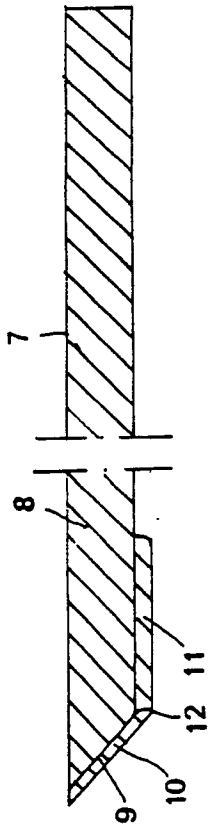


FIG. 1

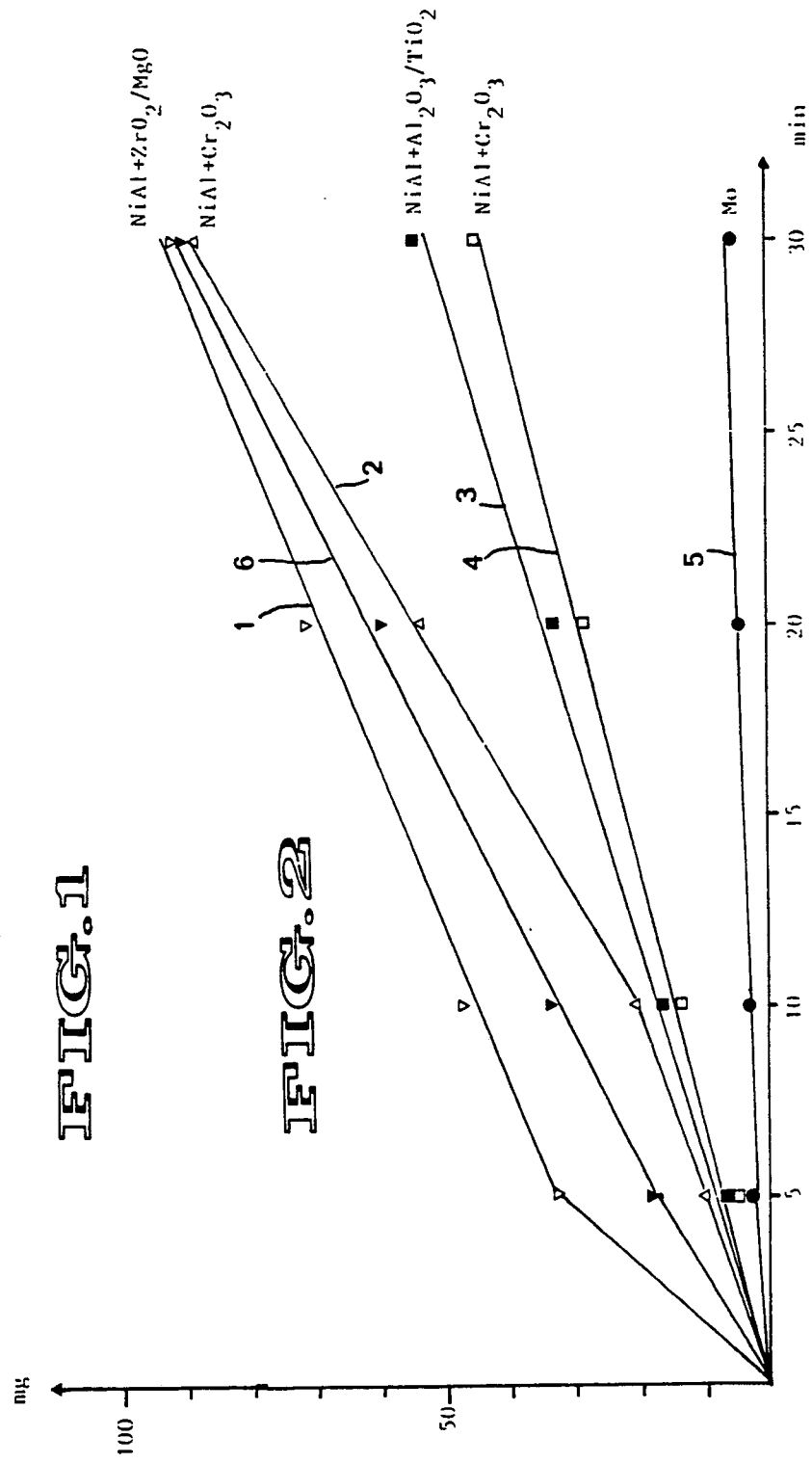


FIG. 2