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(54) **METHOD FOR THE MANUFACTURE OF EXTENDED STEEL PRODUCTS.**

VERFAHREN ZUR HERSTELLUNG VON LANGGESTRECKTEN STAHLPRODUKTEN

PROCEDE DE FABRICATION DE PRODUITS EN ACIER ETENDUS

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- **BECKER W W: "Flame cleaning iron and steel" MATERIALS PROTECTION, NACE. HOUSTON, US, vol. 6, no. 7, 1 July 1967 (1967-07-01), pages 36-37, XP002248242**
- **PATENT ABSTRACTS OF JAPAN vol. 016, no. 043 04 February 1992 & JP 03 249 135 A (NISSHIN STEEL CO LTD) 07 November 1991**
- **PATENT ABSTRACTS OF JAPAN vol. 013, no. 546 06 December 1989 & JP 01 222 043 A (NISSHIN STEEL CO LTD) 05 September 1989**

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Description

[0001] The present method relates to a method for the manufacture of extended steel products.

[0002] When manufacturing tape, wire and sheet products from steel, these are manufactured as extended products. The surfaces of the products are contaminated during the manufacture by oils and by organic and/or inorganic particles that are dissolved or suspended in the oils.

[0003] The oils may be emulsions, roller oils, polymers, lubricants, etc. The organic particles may be carbon or carbon compounds. Inorganic particles may be particles of steel, oxides, etc.

[0004] Such an oil film causes quality problems in later process steps if it is not removed. For this reason, such oil residues are currently removed with the aid of solvents in washing stages, before the product is transferred to a subsequent treatment, such as, a heating furnace or a heat-treatment furnace.

[0005] This means that the process line becomes longer and more expensive than would be the case if it was not necessary to wash away the oil film. Furthermore, the washing stage results in the manufacturer receiving a residual product, which may be classified as harmful to the environment, from the wash.

[0006] The present invention solves this problem.

[0007] In FR 2 846 341 a method is described where a material is heated in a furnace having a temperature exceeding 500° C and where burners are fed with an oxidant containing more than 21 vol% of oxygen. FR 2 846 341 does not describe that the combustion gases of the burners interact with the surface of the material that is to be heated.

[0008] A paper, BECKER W W: "Flame cleaning iron and steel" Materials Protection, NACE, HOUSTON US, vol 6 No. 7, 1 July 1967, pp 36-37, relates to a flame cleaning process where a mixture of oxygen and acetylene is combusted.

[0009] JP 07 243070 relates to a method where oil is burnt away with an air/fuel burner.

[0010] The present invention thus relates to a method for the manufacture of extended steel products, following the shaping of the steel product by working, but before the subsequent treatment of the steel product, whereby the steel product is contaminated by oils and by at least one of organic and inorganic particles that are suspended or dissolved in the oils, and it is characterised in that burners are caused to emit exhaust gases that are caused to interact directly with the surface of the steel product, in that the burners are caused to be driven by an oxidant that contains at least 80% oxygen by weight percentage, whereby oils that are present on the said products are vaporised and combusted, and in that the exhaust gases are caused to interact with the surface of the steel product with a speed that is sufficiently high to blow away organic and/or inorganic particles from the surface of the steel product and in that the exhaust gases

leave the burners with a speed that is at least 25 metres/sec.

[0011] The invention is described in more detail below, partially in association with embodiments of the invention shown in the attached drawing, where

- Figure 1 shows a burner and a steel product
- Figure 2 shows a part of the processing line with burners
- Figure 3 shows a part of an other processing line with burners.

[0012] The invention is described below in association with processing lines, but the invention is in no way limited to any particular processing line or any particular steel products. It can be applied in any form of processing lines and for any type of extended steel products. Due to the equipment required to carry out the present method still being relatively compact, it can be introduced into an existing processing line, preferably one in which the steel product is to be heated for a subsequent treatment.

[0013] The present method concerns the manufacture of extended steel products 1, following shaping of the steel product through working, but before further treatment of the steel product. The product is often at this time contaminated by oils and by inorganic particles dissolved in these oils. This is illustrated by the film 2 in Figure 1.

[0014] According to the invention, the burner 3 emits exhaust gases 4 that are caused to interact directly with the surface of the steel product 1. The term "exhaust gases" is here used to denote combustion products and gas components that have not yet been combusted that leave the burners. The burners are caused to be driven by an oxidant that contains at least 80% oxygen gas by weight percentage, whereby oils 2 that are present on the said products are vaporised and combusted. Furthermore, the exhaust gas 4 is caused to interact with the surface of the steel product 1 with a speed that is sufficiently high to blow away inorganic particles from the surface of the steel product.

[0015] The oxidant normally consists of oxygen gas together with argon and nitrogen gas. The fuel is a gaseous fuel, and it may be propane, butane, hydrogen gas, natural gas, etc.

[0016] The present principle is to achieve a rapid evaporation of the contaminants through a very rapid heating of the steel surface and the contaminant layer, and an immediate combustion of the gases that are thus formed without overheating the material itself. This is achieved by the use of burners designed for the purpose, which burners are driven by an oxidant that contains more than 80% oxygen gas and which deliver through their design heat and an excess of oxygen to a region close to the surface. The products of the said combustion and the said particles that are not combusted will be transported away from the surface.

[0017] The excess of oxygen is to be sufficiently large that combustion of the oil film is to take place. The mag-

nitide of the excess of oxygen needs to be of the order or 10%.

[0018] Thus, the result is a clean steel surface, where the oils have contributed to the heating of the steel product.

[0019] A very significant application of the present invention is during the manufacture of products that are to be galvanised or provided with an organic coating, such as a paint or polymer, in the said subsequent treatment.

[0020] Figure 1 shows a burner 3, the exhaust gases 4 of which interact with the surface of the steel product. The product has an oil layer 2 at the left of the drawing. The oil layer and inorganic contaminants have been removed from the product at the right of the drawing.

[0021] The arrow 13 in Figures 1 - 3 shows the direction of motion of the product.

[0022] Figure 2 shows an example in which the burners 3 have been installed in an existing processing line with guide rollers 6 - 8 and a subsequent treatment unit 9 for the product 1. This illustrates that the burners can be installed at a freely chosen position prior to a treatment unit.

[0023] Figure 3 shows burners 3 located in a unit 10 that is an auxiliary unit on a treatment unit 11.

[0024] In order to ensure that inorganic particles are blown away, the exhaust gases 4 are caused to leave the burners 3 with a speed that is at least 25 metres/sec. The speed is normally of the order of magnitude of 100 metres/sec during operation.

[0025] It will present one skilled in the arts with no difficulty to calculate the number of burners required and the dimensions that are required in order to achieve the interaction of the exhaust gases from the burners with the complete surface of the steel product with the speed specified.

[0026] It is preferred that the burners 3 are caused to heat the steel product 1 to a temperature within the range 100 - 800 °C. It is, however, important not to heat the surface of the steel product to such a high temperature that any solid particles present can reattach to the surface of the steel.

[0027] It is, however, preferred in certain cases that the burners are caused to heat the surface 12 of the steel product to a temperature that lies close to but does not exceed its melting point.

[0028] With the aim of achieving the desired effect of combustion of oils and blowing away of particles, it is preferred that the distance between the outlet opening 5 of the burners 3 and the steel product 1 should be caused to be 50 - 250 millimetres. The outlet opening 5 of the burners thus has a diameter that does not exceed the said distance. A suitable diameter lies within the range approximately 10 - 15 millimetres.

[0029] The burners 3 may be, but do not need to be, located such that the combustion products impact the material at an angle that is not 90° to the surface of the steel product.

[0030] The present invention makes it possible for the

user to avoid operating a separate washing plant, which in turn removes the necessity for handling solvents that harm the environment.

[0031] The present process also makes it possible to avoid the formation of a residual product based on solvents, which in turn must be destroyed in an approved facility.

[0032] Furthermore, the energy content of the contaminant is used directly in the process.

[0033] Furthermore, the exhaust gases that are generated from the combusted oils can be handled in exhaust gas treatment plants that already exist.

[0034] A number of embodiments have been described above. The invention, however, can be varied with respect to the number of burners, and their locations and dimensions, in order to adapt it for the particular products.

[0035] Thus, the present invention is not to be regarded as being limited to the embodiments specified above. It can be varied within the framework specified by the attached claims.

Claims

1. A method for the manufacture of extended steel products, following the shaping of the steel product by working, but before the subsequent treatment of the steel product, whereby the steel product is contaminated by oils and by at least one of organic and inorganic particles that are suspended or dissolved in the oils, **characterised in that** burners (3) are caused to emit exhaust gases (4) that are caused to interact directly with the surface of the steel product (1), **in that** the burners (3) are caused to be driven by an oxidant that contains at least 80% oxygen by weight percentage, whereby oils (2) that are present on the said products (1) are vaporised and combusted, and **in that** the exhaust gases (4) are caused to interact with the surface of the steel product (1) with a speed that is sufficiently high to blow away organic and/or inorganic particles from the surface of the steel product and **in that** the exhaust gases (4) leave the burners (3) with a speed that is at least 25 metres/sec.
2. The method according to claim 1, **characterised in that** the burners (3) are caused to be positioned with an angle between the longitudinal axis of the burner (3) and the surface of the steel product (1) that lies between 45 and 90 degrees.
3. The method according to claim 1 or 2, **characterised in that** the burners (3) are caused to heat the steel product (1) to a temperature that lies in the range 100 - 800 °C.
4. The method according to claim 1, 2 or 3, **character-**

ised in that the burners (3) are caused to heat the surface (12) of the steel product (1) to a temperature that lies close to, but does not exceed, its melting point.

5. The method according to claim 1, 2, 3 or 4, **characterised in that** the distance between the outlet opening of the burners (3) and the steel product is caused to be 50 - 250 millimetres.

Patentansprüche

1. Verfahren zur Herstellung von langgestreckten Stahlprodukten nach der Formgebung des Stahlprodukts durch Bearbeiten, aber vor der nachfolgenden Behandlung des Stahlproduktes, wobei das Stahlprodukt durch Öle und durch mindestens ein organisches oder anorganisches Teilchen kontaminiert ist, das in den Ölen suspendiert oder aufgelöst ist, **dadurch gekennzeichnet, dass** Brenner (3) dazu veranlasst werden, Abgase (4) auszustoßen, die direkt mit der Oberfläche des Stahlprodukts (1) in Wechselwirkung treten, und dadurch, dass die Brenner (3) veranlasst werden, von einem Oxidationsmittel angetrieben zu werden, das mindestens 80 Gew.-% Sauerstoff enthält, wodurch die Öle (2), die an den Produkten (1) vorhanden sind, verdampft und verbrannt werden, und dadurch, dass die Abgase (4) veranlasst werden, mit der Oberfläche des Stahlprodukts (1) bei einer Geschwindigkeit in Wechselwirkung zu treten, die ausreichend hoch ist, um die organischen und/oder anorganischen Teilchen von der Oberfläche des Stahlprodukts zu blasen, und dadurch, dass die Abgase (4) die Brenner (3) mit einer Geschwindigkeit von mindestens 25 m/Sek verlasen.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die Brenner (3) veranlasst werden, in einem Winkel zwischen der Längsachse des Brenners (3) und der Oberfläche des Stahlprodukts (1) angeordnet zu werden, der zwischen 45 und 90 Grad beträgt.
3. Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Brenner (3) veranlasst werden, das Stahlprodukt (1) auf eine Temperatur zu erwärmen, die zwischen 100 bis 800 °C liegt.
4. Verfahren nach Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** die Brenner (3) veranlasst werden, die Oberfläche (12) des Stahlprodukts (1) auf eine Temperatur zu erwärmen, die nahe des Schmelzpunkts davon liegt, diesen aber nicht überschreitet.
5. Verfahren nach Anspruch 1, 2, 3 oder 4, **dadurch**

gekennzeichnet, dass der Abstand zwischen der Austrittsöffnung der Brenner (3) und dem Stahlprodukt dazu veranlasst wird, 50 bis 250 Millimeter zu betragen.

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Revendications

1. Procédé de fabrication de produits en acier étendus, mis en oeuvre après le formage du produit en acier par travail de l'acier, mais avant le traitement ultérieur du produit en acier, le produit en acier étant souillé par des huiles et par des particules organiques et/ou inorganiques qui sont en suspension ou dissoutes dans les huiles, **caractérisé en ce que** des brûleurs (3) émettent des gaz d'échappement (4) qui interagissent directement avec la surface du produit en acier (1), **en ce que** les brûleurs (3) sont alimentés par un oxydant qui contient au moins 80 % en poids d'oxygène, les huiles (2) qui sont présentes sur lesdits produits (1) étant ainsi vaporisées et brûlées, **en ce que** les gaz d'échappement (4) interagissent avec la surface du produit en acier (1) à une vitesse qui est suffisamment élevée pour emporter les particules organiques et/ou inorganiques de la surface du produit en acier et **en ce que** les gaz d'échappement (4) sortent des brûleurs (3) à une vitesse qui est d'au moins 25 mètres/sec.
2. Procédé selon la revendication 1, caractérisé en que les brûleurs (3) sont positionnés à un angle de 45 à 90 degrés entre l'axe longitudinal du brûleur (3) et la surface du produit en acier (1).
3. Procédé selon la revendication 1 ou 2, caractérisé en que les brûleurs (3) chauffent le produit en acier (1) à une température de 100 à 800 °C.
4. Procédé selon la revendication 1, 2 ou 3, **caractérisé en ce que** les brûleurs (3) chauffent la surface (12) du produit en acier (1) à une température qui est proche de son point de fusion, sans toutefois le dépasser.
5. Procédé selon la revendication 1, 2, 3 ou 4, **caractérisé en ce que** la distance entre l'ouverture de sortie des brûleurs (3) et le produit en acier est de 50 à 250 millimètres.

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Fig. 1

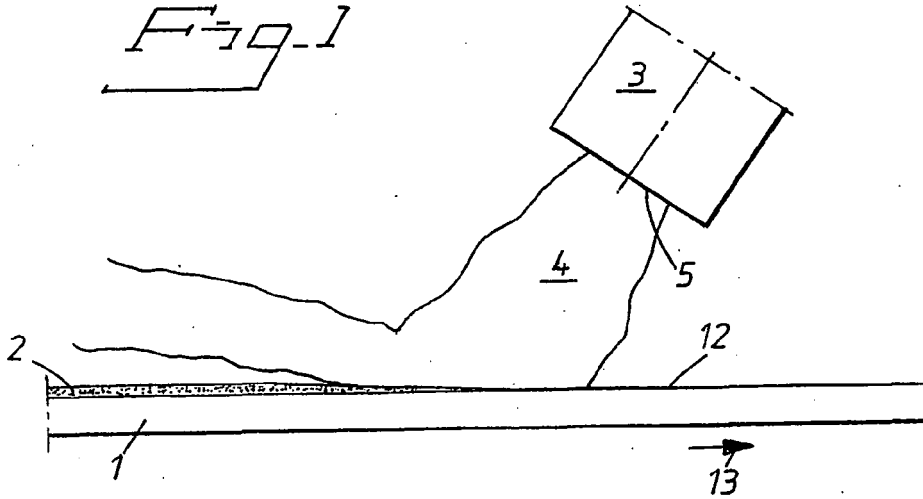


Fig. 2

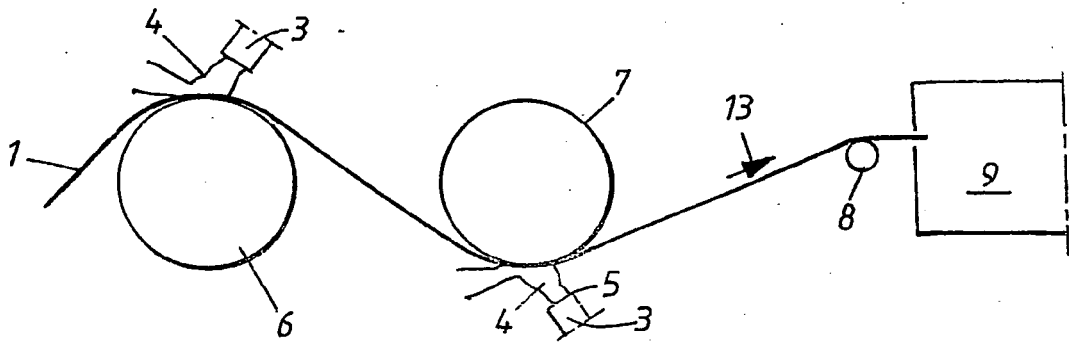
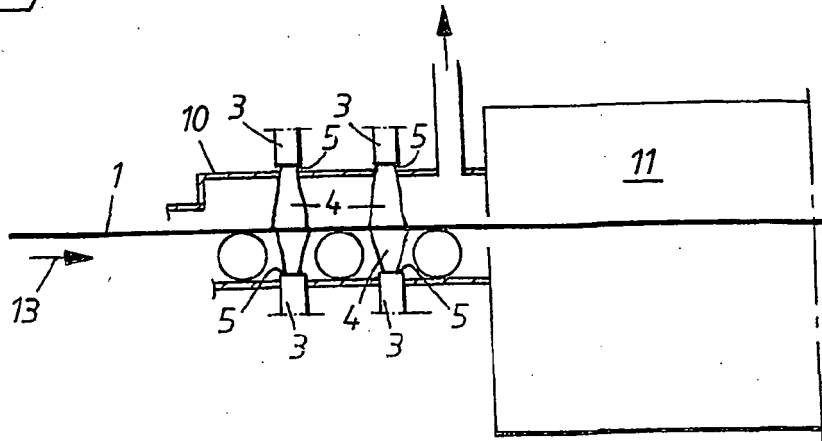


Fig. 3



REFERENCES CITED IN THE DESCRIPTION

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- FR 2846341 A [0007]
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- **BECKER W W.** Flame cleaning iron and steel. *Materials Protection*, 01 July 1967, vol. 6 (7), 36-37 [0008]