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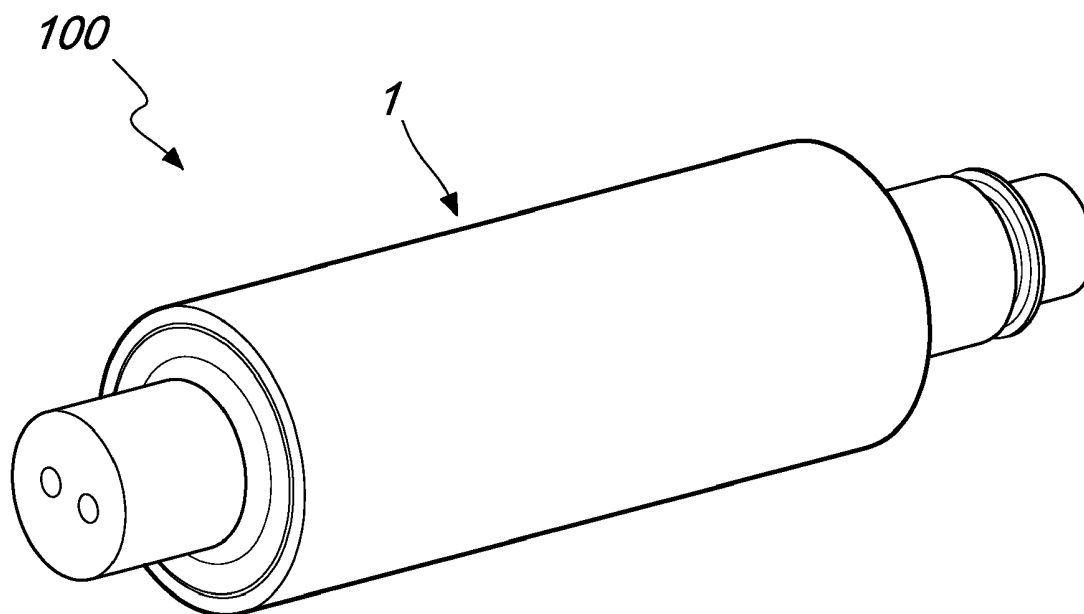
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(54) **JACKET FOR A ROLLER USED IN CONTINUOUS CASTING, PARTICULARLY FOR THE PRODUCTION OF ALUMINUM OR ALUMINUM ALLOY STRIPS AND OF ZINC-BASED ALLOY STRIPS**

(57) A jacket for a roller used in continuous casting, characterized in that it includes a hardened and quenched steel base surrounded by a cladding which

ensures a high mechanical strength and protects the jacket from the chemical aggression of the liquid metal.



*Fig. 1*

## Description

**[0001]** The present invention relates to a jacket for a roller used in continuous casting, particularly for the production of aluminum or aluminum alloy strips and of zinc-based alloy strips.

**[0002]** As is known, steel rollers, in normal roles, in normal use on continuous casting lines, must be replaced approximately every production month after producing approximately 1000 tons of aluminum or zinc alloy in the form of strips.

**[0003]** Replacement entails the extraction of the roller pack with the replacement of a roller pack regenerated by turning and grinding.

**[0004]** These operations entail an economic loss due to the interruption of production and due to maintenance costs.

**[0005]** Once the old roller pack has been extracted, the rollers themselves are entrusted to the mechanical maintenance department, which performs the following operations:

disassembling the fittings (estimated time, one work-day);

turning the casting rollers (estimated time, three workdays);

grinding the casting rollers (estimated time, two workdays);

reassembling the fittings (estimated time, one work-day).

**[0006]** The need to replace the roller pack every month, or when 1000 tons of cast material are reached, arises from the objective fact that the jackets have cracks that are believed to be caused by thermomechanical stress.

**[0007]** The cracks that have formed on the jacket are repeated and imprinted onto the manufactured strip.

**[0008]** The quality of the casting strip is related to the surface of the jackets; the surface of the jacket degenerates as the tons manufactured increase, according to the following table:

| Production week               | Product quality   |
|-------------------------------|-------------------|
| First week (0 to 300 tons)    | Excellent         |
| Second week (300 to 600 tons) | Mediocre          |
| Third week (600 to 900 tons)  | Barely acceptable |

**[0009]** Replacement of the roller pack every month with a regenerated roller pack is an operation that is performed by all manufacturers that use a casting machine, known as caster.

**[0010]** During the turning step, the removal of material from the surface of the jacket is approximately 3 mm on the diameter; this measurement ensures the complete removal of the cracks formed previously during casting.

**[0011]** The turning and grinding operations can be performed a limited number of times; on average, it is possible to perform approximately 10-12 turning cycles, after which it is necessary to replace the jacket with a new one.

**[0012]** Jacket machining cannot go beyond a minimum diameter in order to allow to stay within safety.

**[0013]** When the jacket can no longer be regenerated, it must be replaced and the replacement of the jacket generates additional costs for the manufacturer.

**[0014]** The operation for replacement of the depleted jacket is performed by specialized companies; removal and insertion of the new jacket is performed when hot with the use of an adapted oven.

**[0015]** WO2009/130079 discloses a roll for supporting and conveying hot material, comprising a roll element that has a roll jacket made of a basic material and a wearing coat which is applied to the basic material by means of a surface welding process using a welding additive and which surrounds the surface of the roll jacket. The basic material of the roll jacket is steel and contains up to 0.45 percent of C, the welded-on surface is designed as a single-layer weld, and the wearing coat contains 12.5 to 14.0 percent of Cr in an external zone that surrounds the surface of the roll jacket.

**[0016]** JPH106001(A) discloses a roll, having improved corrosion resistance and wear resistance, produced by using a submerged arc welding method with a band electrode and by executing the build-up welding of a stainless steel having a specific composition with a specific welding input heat.

**[0017]** The aim of the present invention is to provide a new jacket for continuous casting rollers that overcomes the drawbacks of the cited prior art.

**[0018]** Within the scope of this aim, an object of the invention is to provide a jacket that has a longer useful life than jackets of the prior art.

**[0019]** Another object of the invention is to provide a jacket that has a great resistance to wear at high temperature.

**[0020]** A further object of the present invention is to provide a jacket that allows an increase in the productivity of the continuous casting line.

**[0021]** Another object of the invention is to provide a jacket that allows an increase in the quality of the manufactured strip.

**[0022]** This aim, these objects and others which will become better apparent hereinafter are achieved by a jacket for a roller used in continuous casting, characterized in that it comprises a hardened and quenched steel base surrounded by a cladding.

**[0023]** For well over 40 years of history in the field of continuous castings for aluminum (casters), it has always been thought that the cracks generated at the surface of the jackets were caused by the thermomechanical stress generated during testing.

**[0024]** This Applicant has surprisingly found that the cracks instead form due to chemical aggression by the liquid metal.

[0025] The invention consists in creating a jacket provided with a hardened and quenched steel base plus a cladding.

[0026] Further characteristics and advantages will become better apparent from the description of preferred but not exclusive embodiments of the invention, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a roller for continuous casting, provided with the jacket according to the present invention;

Figure 2 is a perspective view, enlarged with respect to the preceding one, which shows a detail of the roller;

Figure 3 is a schematic sectional view of the jacket according to the present invention;

Figure 4 is a view of the jacket mounted with supports in order to be subjected to machining.

[0027] With reference to the cited figures, the jacket according to the invention, designated generally by the reference numeral 1, is adapted to be mounted on a roller 100 which is part of a plurality of rollers of a continuous casting line, not shown in the figures, for the production of aluminum or aluminum alloy strips and of zinc-based alloy strips.

[0028] According to the present invention, the jacket 1 has a hardened and quenched steel base 2 surrounded by a cladding 3.

[0029] The cladding 3 welded over the base 2 allows a drastic reduction in the wear of the jacket.

[0030] For the cladding 3, a material is used which is particularly suitable for applications that require high mechanical strength, hardness, resistance to abrasion together with a sufficient resistance to corrosion.

[0031] The cladding can be provided by means of martensitic stainless steels and applied with various methods, such as EBW (Electron Beam Welding), SAW (Submerged Arc Welding), GMAW (MIG - Metal-arc Inert Gas or MAG - Metal-arc Active Gas welding), SMAW (Shielded Metal Arc Welding), FCAW (Flux-Cored Arc Welding), GTAW (Gas Tungsten Arc Welding - TIG welding).

[0032] The cladding increases the life of the jacket, allowing to replace the roller pack of the casting line not before it has produced approximately 50,000 tons, increasing productivity.

[0033] Another feature of the present invention is that the quality of the product is kept constant throughout the life of the jacket, because of the drastic reduction of the surface defects.

[0034] In Figure 3, which is a sectional view of the jacket 1 according to the invention, the reference numeral 2 designates the part with the base material, while the reference numeral 3 designates the part with the cladding material.

[0035] In Figure 4, the jacket 1 is shown mounted on supports 104 in order to perform its machining.

[0036] In practice it has been found that the invention achieves the intended aim and objects, providing a jacket for continuous casting rollers that allows to achieve several important advantages.

5 [0037] First of all, the present jacket ensures a longer life of the material.

[0038] Also, the jacket according to the present invention ensures resistance to high-temperature wear, a defect caused by oligocyclic fatigue phenomena due to thermal expansions.

10 [0039] Also, the present jacket allows a reduction of surface deterioration caused by liquid metal.

[0040] The present jacket allows an increase in the productivity of the casting line by virtue of the reduced maintenance and the decreased machine downtimes.

15 [0041] The present jacket allows an increase in the quality of the product, i.e., of the strip.

## 20 Claims

1. A jacket for continuous casting rollers, **characterized in that** it comprises a hardened and quenched steel base surrounded by a cladding.

25 2. The jacket according to claim 1, **characterized in that** said cladding is welded onto said base.

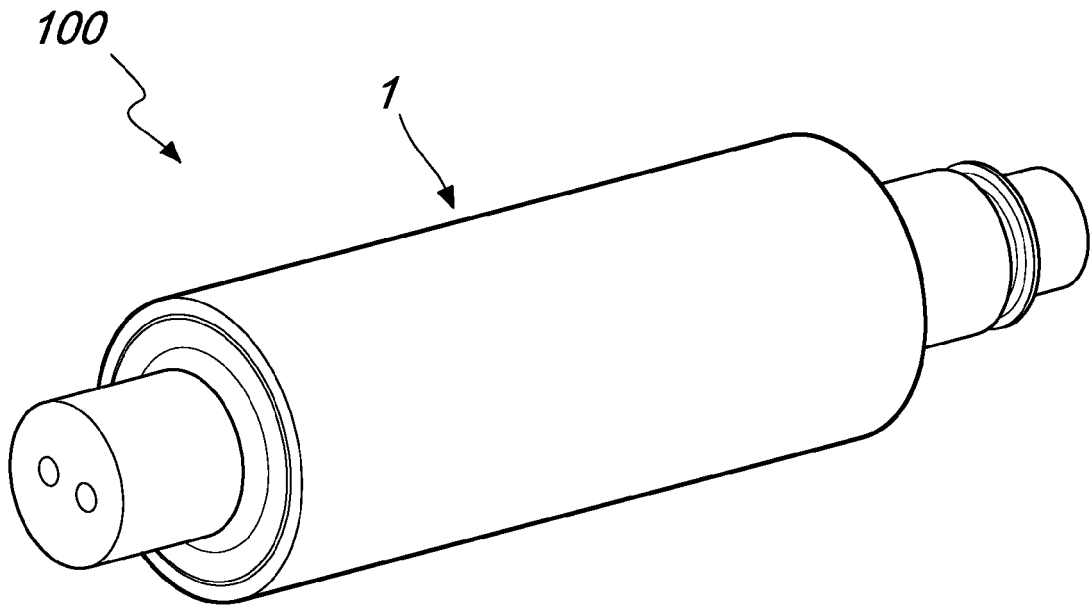
30 3. The jacket according to claim 1, **characterized in that** said cladding is made of a material that has a high mechanical strength, hardness, resistance to abrasion together with sufficient resistance to corrosion.

35 4. The jacket according to claim 1, **characterized in that** said cladding is made of a martensitic stainless steel.

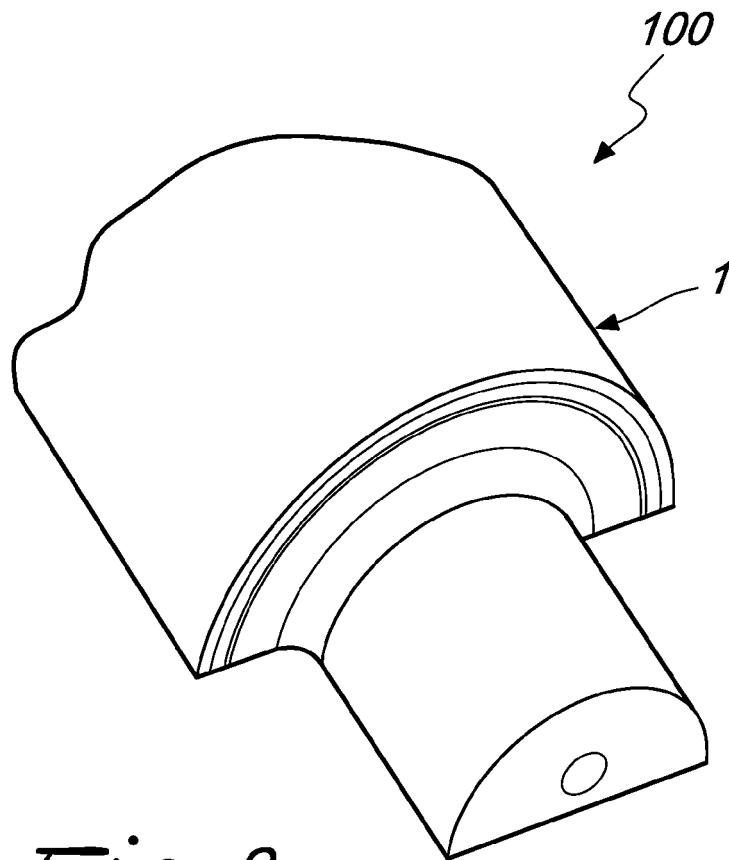
40 5. The jacket according to claim 1, **characterized in that** said cladding is applied with a method chosen among EBW (Electron Beam Welding), SAW (Submerged Arc Welding), GMAW (MIG - Metal-arc Inert Gas or MAG - Metal-arc Active Gas welding), SMAW (Shielded Metal Arc Welding), FCAW (Flux-Cored Arc Welding), GTAW (Gas Tungsten Arc Welding - TIG welding).

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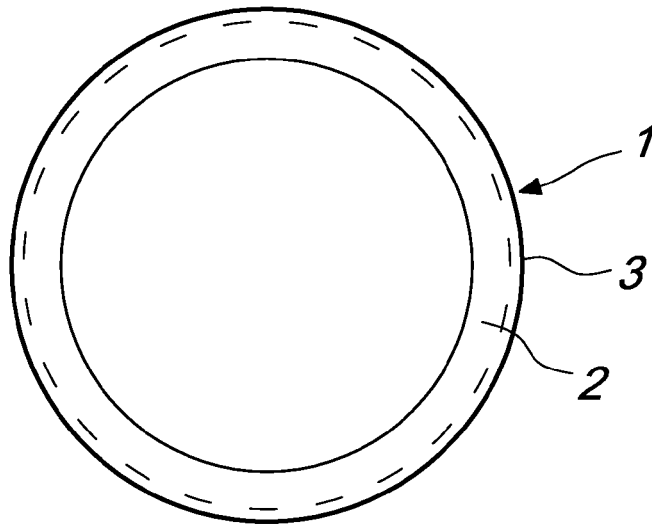
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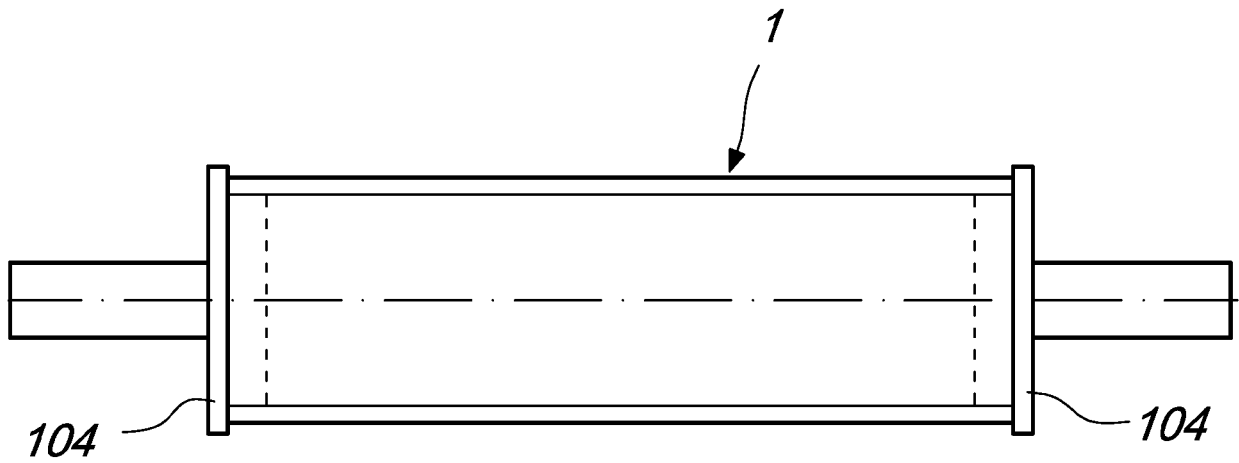
*Fig. 1*



*Fig. 2*



*Fig. 3*



*Fig. 4*



## EUROPEAN SEARCH REPORT

Application Number  
EP 18 16 5451

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EPO FORM 1503 03.82 (P04C01)

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                              |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                                                               | Relevant to claim                                                                                                                                                                                                                                                            | CLASSIFICATION OF THE APPLICATION (IPC) |
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| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                              |                                         |
| Place of search<br><b>The Hague</b>                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                             | Date of completion of the search<br><b>4 July 2018</b>                                                                                                                                                                                                                       | Examiner<br><b>Peis, Stefano</b>        |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                                                                                                                                             | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                         |

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 16 5451

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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