

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P41403760PCT	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE2015/050985	International filing date (<i>day/month/year</i>) 22-09-2015	Priority Date (<i>day/month/year</i>) 25-09-2014
International Patent Classification (IPC) or national classification and IPC See Supplemental Box		
Applicant NORTHERN MINING PRODUCTS AB		

1.	This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2.	This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.
3.	This report is also accompanied by ANNEXES, comprising: a. ☒ (<i>sent to the applicant and to the International Bureau</i>) a total of <u>5</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____ containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).
4.	This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 27-06-2016	Date of completion of this report 25-01-2017
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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: **cover sheet**

International Patent Classification (IPC)

E21D 21/00 (2006.01)

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b)).
- ☐ publication of the international application (Rule 12.4(a)).
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).
2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
- ☐ the international application as originally filed/furnished, or
- ☒ the description: pages 1-6 as originally filed/furnished.
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims: Nos. _____ as originally filed/furnished.
- Nos.* _____ as amended (together with any statement) under Article 19
- Nos.* 1-16 received by this Authority on 21-10-2016
- ☒ the drawings: pages 1-5 as originally filed/furnished.
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing – see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 66.1(d-bis) and 70.2(e)).
- ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 66.4bis and 70.2(e)).
6. With regard to top-up searches (Rules 66.1ter and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 2016-01-24
- ☐ Additional relevant documents have been discovered during the top-up search.
- ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) _____
- has/have been received and taken into account in establishing this opinion (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	1-16	YES
	Claims		NO
Inventive step (IS)	Claims	1-16	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-16	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Document D1, which is considered to represent the most relevant state of the art, discloses a rock bolt to be embedded in a bore hole.

Document D2 describes a rock bolt, and the rock bolt can be assigned a certain degree of pre-stress using a screw joint.

The subject matter of claim 1 differs in that a first end section of a tubular part is connected with an energy absorbing part in association with the anchor and a second end section is arranged to make contact with a washer that is a component of a screw joint and to make contact with the washer when the rock bolt is pre-stressed.

The subject matter of claim 1 is therefore novel (Article 33(2) PCT).

The problem to be solved by the present invention is therefore regarded as being to improve the energy-absorbing ability of the bolt. The solution to this problem proposed in claim 1 of the present application is not considered to be obvious to a person skilled in the art for the following reasons:

There is no indication in D1 or D2 for the skilled person to connect the respective tubular end parts to the respective anchor and the washer to enclose the energy-absorbing part so that the energy-absorbing part is not subject to corrosion or other influences and is given maximum extent over which the bolt can be bent, since the energy-absorbing part does not come into contact with the embedding material.

The subject matter of claim 1 is therefore considered to involve an inventive step (Article 33(3) PCT).

Claims 2-14 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step (Article 33 PCT).

With the same reasoning as for claim 1, independent claims 15-16 are considered to involve novelty an inventive step (Article 33(3) PCT).

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Date: 23 March 2016
Our ref: P41403760PCT00 MIK/MIK
Wipo ref:

Patent: Rock bolt
Appl./Reg.No.: PCT/SE2015/050985
Applicant: Northern Mining Products AB

Dear Sir/Madam,

Reference is made to the search report and written opinion from the International searching authority dated January 25, 2016 received by the Applicant in the present application. In accordance with Art. 19 PCT, the Applicant hereby file a new set of claims 1-16 to replace the claims previously on file.

In the new claims:

Independent claim 1 amended, claim 2 – 3 unchanged, claim 4 amended and claims 16 – 17 amended.

(i) Basis for the amendment: claim 1, In the preamble the word "embedded" has been clarified by adding the words "in grout". Basis for this amendment can be found in the original description on page 5 row 1 – 4.

In the characterizing part, claim 5 previous on file, has been added to claim 1 to achieve a new and patentable claim 1.

(II) Basis for the amendment: claim 4, the word "attached" has been changed to "united", to confirm with the wording of claim 3.

(III) Basis for the amendment: claim 15 and 16, in step 2 the word "arranged" has been amended to "is chosen to correspond to the length of the hole in step 1", In step 3 the word "arranged" is changed to "is chosen to correspond to the length of the hole in step 1 or the diameter of the energy absorbing part in step 1". The indicating of the terms can be found in the description on page 4 row 17 – 22.

Applicant look forward to receiving the official documents indicating that these amended claims 1-17 have been received and accepted by WIPO.

zacco

Yours faithfully
Zacco Sweden AB

A handwritten signature in black ink, appearing to read 'Mikael Åström', with a stylized flourish at the end.

Mikael Åström

21-10-2016

The Swedish Patent Office
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Claims

1. A rock bolt (1) to be embedded in grout in a borehole (2), comprising an extended energy-absorbing part (4), the first end (11) of the energy-absorbing part (4) comprising an anchor (12) and the second end (15) of the energy-absorbing part (4) comprising a screw joint (16) for prestressing of the rock bolt (1), characterised in that the rock bolt (1) comprises an extended tubular part (3) with a jacket (7) and a first (5) and a second (6) end section, and an internal dimension of the tubular part (3) that is larger than the external dimension of the energy-absorbing part (4) and arranged in such a manner that it surrounds the energy-absorbing part (4) and that the first end section (5) of the tubular part (3) is connected with the energy-absorbing part (4) in association with the anchor (12) and the second end section (6) is arranged to make contact with a washer (19) that is a component of the screw joint (16) and to make contact with the washer (19) when the rock bolt is prestressed.
2. The rock bolt according to claim 1, whereby the tubular part (3) extends between the anchor (12) and the screw joint (16) and in this way prevents the energy-absorbing part (4) coming into contact with the grout.
3. The rock bolt according to any one of the preceding claims, whereby the end sections (5, 6) of the tubular part (3) are united with the energy-absorbing part (4) in association with the anchor (12) and the screw joint (16).
4. The rock bolt according to claim 3, whereby the tubular part (3) is united by means of welding.
5. The rock bolt according to any one of claims 1-5, whereby the jacket (7) of the tubular part (3) is provided with a structure (8) to increase friction.
6. The rock bolt according to any one of claims 1-5, whereby the jacket (7) of the tubular part (3) is perforated.
7. The rock bolt according to any one of claims 1-5, whereby the jacket (7) of the tubular part (3) is provided with lugs (9).

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8. The rock bolt according to claims 1-8, whereby the energy-absorbing part (4) comprises a reinforcement member (4a).
9. The rock bolt according to claims 1-8, whereby the energy-absorbing part (4) comprises a wire (4b).
10. The rock bolt according to claims 1-8, whereby the energy-absorbing part (4) comprises a steel rod (4c).
11. The rock bolt according to claim 1, whereby the energy-absorbing part (4) comprises an extended body of a composite material (44).
12. The rock bolt according to claims 3 and 12, whereby the tubular part (3) is attached by means of welding.
13. The rock bolt according to claim 1, whereby the anchor (12) comprises a wedge (14) introduced into a slot (13) in the end (11) of the energy-absorbing part (4).
14. The rock bolt according to claim 1, whereby the anchor (12) comprises a stirring arrangement (18) arranged at the end (11) of the energy-absorbing part (4).
15. A method for the manufacture of a rock bolt (1), characterised in that it comprises the following operational steps:
 - that a length and a diameter of the hole (2) in the rock are determined,
 - that an extended energy-absorbing part (4) is chosen to correspond to the length of the hole (2) in step 1,
 - that an extended tubular part (3) is chosen to correspond to the length of the hole (2) in step 1 or the diameter of the energy-absorbing part (4) in step 1,
 - that the energy-absorbing part (4) is adapted inside of the tubular part (3),
 - that one end (5) of the tubular part (3) is permanently attached in association with a first end section (11) of the energy-absorbing part (4),
 - that the second end (6) of the tubular part (3) is permanently attached in association with a second end section (15) of the energy-absorbing part (4), and

- that the first end (11) and the second end (15) of the energy-absorbing part (4) are arranged with a screw joint (16) and an anchor (12), respectively.

16. A method for the manufacture of a rock bolt, characterised in that it comprises the following operational steps:

- that a length and a diameter of the hole (2) in the rock are determined,
 - that an extended energy-absorbing part (4) is chosen to correspond to the length of the hole (2) in step 1,
 - that an extended tubular part (3) is chosen to correspond to the length of the hole (2) in step 1 or the diameter of the energy-absorbing part (4) in step 1,
 - that the energy-absorbing part (4) is adapted inside of the tubular part (3),
 - that one end (5) of the tubular part (3) is permanently attached in association with a first end section (11) of the energy-absorbing part (4),
 - that the first end (11) and the second end (15) of the energy-absorbing part (4) are arranged with a screw joint (16) and an anchor (12), respectively, and
 - that a washer (19) that is a component of the screw joint (16) is arranged in such a manner that it makes contact with the second end (6) of the tubular part (3).
-

Reivindicaciones

1. Un perno de anclaje (1) que será empotrado en lechada en una perforación (2), que comprende una parte extendida que absorbe energía (4), donde el primer extremo (11) de la parte que absorbe energía (4) comprende un anclaje (12) y el segundo extremo (15) de la parte que absorbe energía (4) comprende una unión roscada (16) para pretensar el perno de anclaje (1), CARACTERIZADO porque el perno de anclaje (1) comprende una parte tubular externa (3) con una envoltura (7) y una primera (5) y una segunda (6) sección de extremo, y una dimensión interna de la parte tubular (3) que es más grande que la dimensión externa de la parte que absorbe energía (4) y dispuesta de tal forma que rodea la parte que absorbe energía (4) y porque la primera sección de extremo (5) de la parte tubular (3) está conectada con la parte que absorbe energía (4) en asociación con el anclaje (12) y la segunda sección de extremo (6) está dispuesta de forma de hacer contacto con una golilla (19) que es un componente de la unión roscada (16) y hacer contacto con la golilla (19) cuando el perno de anclaje es pretensado.
2. El perno de anclaje de acuerdo a la reivindicación 1, CARACTERIZADO porque la parte tubular (3) se extiende entre el anclaje (12) y la unión roscada (16) y de esta forma impide que la parte que absorbe energía (4) entre en contacto con la lechada.
3. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones precedentes, por lo que las secciones de extremo (5, 6) de la parte tubular (3) están unidas con la parte que absorbe energía (4) en asociación con el anclaje (12) y la unión roscada (16).
4. El perno de anclaje de acuerdo a la reivindicación 3, por lo que la parte tubular (3) está unida a través de soldadura.
5. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones 1-5, por lo que la envoltura (7) de la parte tubular (3) está provista de una estructura (8) para aumentar la fricción.
6. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones 1-5, por lo que la envoltura (7) de la parte tubular (3) está perforada.
7. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones 1-5, por lo que la envoltura (7) de la parte tubular (3) está provista de hendiduras (9).

8. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones 1-8, por lo que la parte que absorbe energía (4) comprende un elemento de reforzamiento (4a).
9. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones 1-8, por lo que la parte que absorbe energía (4) comprende un alambre (4b).
10. El perno de anclaje de acuerdo a cualquiera de las reivindicaciones 1-8, por lo que la parte que absorbe energía (4) comprende una varilla de acero (4c).
11. El perno de anclaje de acuerdo a la reivindicación 1, por lo que la parte que absorbe energía (4) comprende un cuerpo extendido de un material compuesto (44).
12. El perno de anclaje de acuerdo a las reivindicaciones 3 y 12, por lo que la parte tubular (3) está acoplada mediante soldadura.
13. El perno de anclaje de acuerdo a la reivindicación 1, por lo que el anclaje (12) comprende una cuña (14) introducida en una ranura (13) en el extremo (11) de la parte que absorbe energía (4).
14. El perno de anclaje de acuerdo a la reivindicación 1, por lo que el anclaje (12) comprende un mecanismo de agitación (18) dispuesto en el extremo (11) de la parte que absorbe energía (4).
15. Un método para fabricar un perno de anclaje (1), CARACTERIZADO porque comprende las siguientes etapas de operación:
 - Se determinan la longitud y diámetro del orificio (2) en la roca,
 - Se escoge una parte que absorbe energía (4) extendida que corresponda a la longitud del orificio (2) en la etapa 1,
 - Se escoge una parte tubular extendida (3) que corresponda a la longitud del orificio (2) en la etapa 1 o el diámetro de la parte que absorbe energía (4) en la etapa 1,
 - Se adapta la parte que absorbe energía (4) dentro de la parte tubular (3),
 - Un extremo (5) de la parte tubular (3) queda permanentemente acoplado en asociación con una primera sección de extremo (11) de la parte que absorbe energía (4),
 - El segundo extremo (6) de la parte tubular (3) es acoplado de manera permanente en asociación con una segunda sección de extremo (15) de la parte que absorbe energía (4), y

- El primer extremo (11) y el segundo extremo (15) de la parte que absorbe energía (4) están provistos de una unión roscada (16) y un anclaje (12) respectivamente.

16. Un método para fabricar un perno de anclaje, CARACTERIZADO porque comprende las siguientes etapas de operación:

- Se determinan la longitud y diámetro del orificio (2) en la roca,
- Se escoge una parte que absorbe energía (4) extendida que corresponda a la longitud del orificio (2) en la etapa 1,
- Se escoge una parte tubular extendida (3) que corresponda a la longitud del orificio (2) en la etapa 1 o el diámetro de la parte que absorbe energía (4) en la etapa 1,
- Se adapta la parte que absorbe energía (4) dentro de la parte tubular (3),
- Un extremo (5) de la parte tubular (3) queda permanentemente acoplado en asociación con una primera sección de extremo (11) de la parte que absorbe energía (4),
- El primer extremo (11) y el segundo extremo (15) de la parte que absorbe energía (4) están provistos de una unión roscada (16) y un anclaje (12) respectivamente,
- Una golilla (19) que es un componente de la unión roscada (16) está dispuesta de forma tal que hace contacto con el segundo extremo (6) de la parte tubular (3).