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Method of overlocking at least one strand in an anchoring block and system for overlocking at least one strand in an anchoring block
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ABSTRACT

Method of overlocking at least one strand (2) in an anchoring block (3) by means of a frustoconical jaw (4) which surrounds the strand (2) and which is housed in a frustoconical recess (5) made in the block (3), the process comprising the following steps: an explosive cartridge device (6) comprising an inertia block (8) intended to be propelled by the explosion of the cartridge is used, a force transmission device (7) is arranged between the inertia block of the explosive cartridge device (6) and the frustoconical jaw (4), and the explosive cartridge is activated to propel the inertia block (8) against the force transmission device (7).

Figure 1

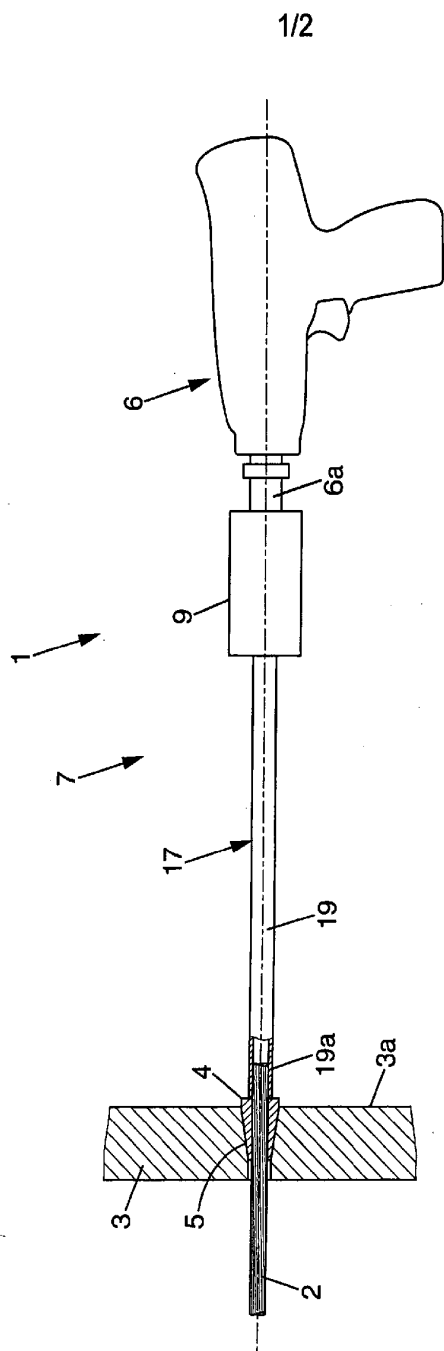


FIG. 1

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COMPLETE SPECIFICATION
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Applicant(s):

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Invention Title:

METHOD OF OVERLOCKING AT LEAST ONE STRAND IN AN
ANCHORING BLOCK AND SYSTEM FOR OVERLOCKING AT LEAST
ONE STRAND IN AN ANCHORING BLOCK

The following statement is a full description of this
invention, including the best method of performing it known to
me/us:

Method of overlocking at least one strand in an
anchoring block and system for overlocking at least one
strand in an anchoring block

5 The present invention relates to a method of
overlocking at least one strand in an anchoring block
and to a system for overlocking at least one strand in
an anchoring block.

10 More particularly, the subject of the invention is a
method of overlocking at least one strand in an
anchoring block by radially clamping the strand by a
frustoconical jaw which surrounds the strand and which
is housed in a frustoconical recess of complementary
15 shape made in the anchoring block.

In a manner known per se, a strand consists of a wire
or of a plurality of twisted wires intended to be
tensioned for the purpose, in particular, of
20 prestressing a body made of concrete or suspending a
civil engineering structure such as a bridge (stay
strand).

The prior locking or clamping of the strand before its
25 overlocking in the anchoring block is provided by the
traction of the strand itself and at least partly by
application of an axial thrust to a large base of the
said jaw. This axial thrust allows cone-on-cone
clamping of the said jaw with the anchoring block, thus
30 causing radial clamping of the strand. In order to
guarantee that the strand does not slip in relation to
the jaw surrounding it, a securing operation, called
overlocking, guarantees that the jaw will be held
around the strand during the lifetime of the civil
35 engineering structure on which the said strand is
tensioned.

This overlocking operation is currently carried out by
means of hammer blows applied directly to the large

base of the said jaw in order to displace it by a few millimeters within its housing so as to guarantee radial prestressing on the strand. Nevertheless, this overlocking operation carried out by an operator using a hammer to strike blows on the jaw does not guarantee with, certainty that the displacement of the anchoring jaw within its housing has been sufficient for the jaw to find a so-called final position, that is to say a position that the jaw is intended to find during the maximum loading tolerated by the strand.

Moreover, this securing operation by means of hammer blows is not generally suitable when the anchoring jaw is difficult to access, in particular in cramped civil engineering structures.

It would be advantageous if embodiments of the invention provided an improved overlocking method, in particular so that the operator can be sure that the anchoring jaw has reached its overlocking position.

A first aspect of the invention provides a method of overlocking at least one strand in an anchoring block by radially clamping the strand by a frustoconical jaw which surrounds the said strand and which is housed in a frustoconical recess of complementary shape made in the block, characterized in that it comprises the following steps:

- an explosive cartridge device comprising an inertia block intended to be propelled by the explosion of the cartridge is used,

- a force transmission device is arranged between the inertia block of the explosive cartridge device and the frustoconical jaw, and

- the explosive cartridge is activated to propel the inertia block against the force transmission device, which in turn pushes against the frustoconical jaw to drive it into the frustoconical recess in the anchoring block, thereby causing the strand to be overlocked by radial clamping of the frustoconical jaw.

10

In embodiments of this method, it is possible where appropriate, additionally to have recourse to one or other or both of the following steps:

- a high-pressure gas cartridge device is used;
15 - use is made of a force transmission device

which comprises:

• a body defining an inner chamber which extends between a first orifice connected to an end-piece of the explosive cartridge device, from which the inertia block
20 is propelled, and a second orifice, and

• a percussion member which comprises, on the one hand, a first portion which is housed in the inner chamber of the body and which has a larger diameter than the second orifice, the said first portion being intended to
25 be struck by the inertia block, and, on the other hand, a second portion integral with the first portion and mounted such that it can slide in the second orifice, the said second portion having a free end intended to interact with the frustoconical jaw.

30

Embodiments of the invention with the percussion member may further comprise a compression spring interposed

between the first portion of the percussion member and the inner chamber of the body.

A second aspect of the invention is a system for
5 overlocking at least one strand in an anchoring block by radially clamping the strand by a frustoconical jaw which surrounds the strand and which is housed in a frustoconical recess of complementary shape made in the block, characterized in that it comprises:
10 - an explosive cartridge device comprising an inertia block intended to be propelled by the explosion of the cartridge, and

- a force transmission device intended to
interact with the inertia block of the explosive cartridge
15 device to allow, upon the explosion of the explosive cartridge, the inertia block to be propelled against the said force transmission device, which in turn pushes against the frustoconical jaw to drive it into the frustoconical recess in the anchoring block, thereby
20 causing the strand to be overlocked by radial clamping of the frustoconical jaw.

In some embodiments of the overlocking system, it is possible where appropriate, additionally to have recourse
25 to the following arrangement where the force transmission device comprises:

- a body defining an inner chamber which extends between a first orifice connected to an end-piece of the explosive cartridge device, from which the inertia block
30 is propelled, and a second orifice, and

- a percussion member which comprises, on the one hand, a first portion which is housed in the inner chamber of the body and which has a larger diameter than the

second orifice, the said first portion being intended to be struck by the inertia block, and, on the other hand, a second portion integral with the first portion and mounted such that it can slide in the second orifice, the said
5 second portion having a free end intended to interact with the frustoconical jaw.

Embodiments of the second aspect may further comprise a compression spring interposed between the first portion of
10 the percussion member and the inner chamber of the body.

In some embodiments of the second aspect having the body and the percussion member, the body of the force transmission device is formed by a first casing which
15 comprises the first orifice and by a second casing which is integral with the said first casing and comprises the second orifice.

Other features and advantages of embodiments of the
20 invention will emerge in the course of the description below of one of its embodiments, which is given by way of non-limiting example, with reference to the appended drawings.

25 In the drawings:

- Figure 1 is a view in partial section of the overlocking system according to an embodiment of the invention when it is used for overlocking a jaw which
30 surrounds a strand in an anchoring block; and

- Figure 2 is an enlarged view in section of the force transmission device of the overlocking system of Figure 1.

- 5 In the various figures, the same references denote like or similar elements.

Figure 1 depicts an overlocking system 1 designed to overlock at least one strand 2 in an anchoring block 3 by
10 radially clamping the strand by an anchoring jaw 4 which surrounds the strand 2 and which is housed in a frustoconical recess 5 made in the anchoring block 3. The strand 2 may be composed of a single wire or of a plurality of twisted wires.

- 15 As can be seen in more detail in Figure 2, the anchoring jaw 4 may be formed by a split anchoring jaw or by a plurality of wedges 4a, 4b, for example two, having a substantially semi-cylindrical and frustoconical shape.
20 The narrowest portion of the frustoconical jaw 4, formed by the wedges 4a, 4b, is housed in the narrow end 5a of the frustoconical recess 5 made in the anchoring block 3 which the strand 2 passes right through. The larger end of the anchoring jaw 4 projects axially on the face 3a of the
25 anchoring block 3. The free end of the strand 2 likewise extends beyond the widest portion of the anchoring jaw 4.

- The radial clamping of the strand 2 by the anchoring jaw 4 is provided by a wedging action by causing this anchoring
30 jaw 4, and therefore the wedges 4a, 4b, to be driven axially into the frustoconical recess 5. During the installation of the anchoring jaw 4 in the frustoconical recess 5 of the anchoring block 3, the axial stress may be

generated by the actual tension of the strand 2 on account of the friction which exists between this strand and the internal face of the anchoring jaw 4, or else by axially driving this anchoring jaw 4 into the recess 5 while the
5 tension of the strand 2 is zero.

In order to ensure that the strand 2 will not slip across the anchoring block 3, a securing operation, referred to as an overlocking operation, ensures that the anchoring
10 jaw 4, and therefore the wedges 4a, 4b, will hold over the lifetime of the civil engineering structure. This overlocking ensures radial prestress on the strand 2 by driving in the anchoring jaw 4, this prestress on the strand 2 substantially corresponding to the final position
15 of the wedges 4a, 4b, that is the position that they would assume during the maximum loading to be tolerated by the strand 2.

To this end, an embodiment of the overlocking system
20 according to the invention comprises, as can be seen in Figure 1, an explosive cartridge device 6 and also a force transmission device 7 directly arranged between the explosive cartridge device 6 and the anchoring jaw 4 previously driven into the frustoconical recess 5 in the
25 anchoring block 3.

The explosive cartridge device 6 may, for example, be formed by an automatic gun with an automatically or manually replaceable explosive cartridge, and which
30 comprises (Figure 2) an inertia block 8 intended to be propelled upon the explosion of the explosive cartridge. By way of example, this explosive cartridge device 6 may

- 6b -

be formed by an automatic cartridge gun marketed by the company HILTI, in particular under the reference DXA 40.

For its part, the force transmission device 7 is
5 intended to interact with the inertia block 8 of the explosive cartridge device 6 to allow, upon explosion

of this explosive cartridge, the inertia block to be propelled against the force transmission device, which in turn pushes against the frustoconical jaw 4 in order to drive it into an overlocking position in the frustoconical recess 5 in the anchoring block 3.

To this end, this force transmission device 7 comprises a body 9 formed by a first casing 10 and a second casing 11 which define between them an inner chamber 12. This inner chamber 12 of the body 9 extends between a first orifice 13 made directly in the first casing 10 and a second orifice 14 made directly in the second casing 11. The first orifice 13 is directly connected to an end-piece 6a in which the inertia block 8 of the explosive cartridge device 6 is housed in a sliding manner. This end-piece 6a may form a constituent element of the explosive cartridge device 6 or else form a constituent element of the force transmission device 7. This end-piece 6a is directly mounted in a fixed manner in the orifice 13 in the first casing 10, for example by means of a pin 15 which passes right through the casing 10 to interact with the end-piece 6a so as to secure them to one another.

As can be seen in Figure 2, the second casing 11 has an end wall 11a in which the orifice 14 is made, and from which extends an annular wall 11b intended to interact with an annular wall 10a of the first casing 10 to form the inner chamber 12. The first casing 10 and the second casing 11 are fixed relative to one another by all suitable means and in particular, for example, by screwing and/or by means of a pin 16.

The force transmission device 7 also comprises a percussion member 17 which is substantially in the form of an elongate shaft which comprises, on the one hand, a first portion 18 which is housed in the inner chamber 12 of the body 9 and which has a greater diameter than the second orifice 14 of the casing 11, and, on the

other hand, a hollow second cylindrical portion 19 which is integral with the first portion 18 and which is mounted such that it can slide in the second orifice 14 in the casing 11. This second cylindrical portion 19
5 has a free end 19a intended to bear against the widest part of the wedges 4a, 4b forming the anchoring jaw 4 while surrounding the end of the strand 2 which projects beyond the said wedges 4a, 4b. The first
10 portion 18 of the percussion member 17 also comprises a cylindrical annular wall 18a which extends in the direction of the casing 10 and which surrounds a compression spring 20 directly interposed between the casing 10 and the first portion 18 of the percussion
15 member 17. The first portion 18 of the percussion member 17 also comprises a centring piece 21 for the spring 20 which is arranged facing the inertia block 8. Moreover, shock-absorbing elements 22, 23 are arranged on either side of the inner chamber 12 of the body 9 so as to absorb the displacement of the first portion 18
20 of the percussion member 17 inside the body 9.

When an operator wishes to overlock the anchoring jaw 4 in the frustoconical recess 5 in the anchoring block 3 after having previously placed and driven the said
25 anchoring jaw 4 into the frustoconical recess 5, the operator first of all positions the overlocking system such that the free end 19a of the percussion member 17 comes into contact with the wedges 4a, 4b while surrounding the strand 2. This placing of the
30 overlocking system 1 on the anchoring jaw 4 has the effect of bringing the annular wall 18a of the first portion 18 of the percussion member 17 into abutment with the shock-absorbing element 23, doing so against the loading exerted by the compression spring 20.

35 All the operator then has to do is activate the explosive cartridge device 6 by triggering the explosion of the said cartridge, which may be an explosive cartridge releasing a high-pressure gas after

the explosion has been triggered, in order to propel the inertia block 8 against the centering piece 21 of the first portion 18 of the percussion member 17. This percussion member 17 then automatically transmits the
5 impact produced by the inertia block 8 to the wedges 4a, 4b of the anchoring jaw 4 so as to bring it into an overlocking position which corresponds to a position that the anchoring jaw would have adopted during the maximum loading tolerated by the strand 2, thereby ensuring that
10 the strand 2 is radially prestressed.

This overlocking operation therefore, makes it possible to dissociate the holding of the strand in the anchoring and the tension of the strand, which may prove to be
15 advantageous in the event of the tension of the strand 2 becoming greatly diminished or even cancelled during the actual service of the strand, such a situation possibly arising, for example, when an impact is received by a suspension bridge strand, where the impact may, for
20 example, be caused by an earth tremor, by a tornado or by a heavy goods vehicle losing control.

Moreover, the choice of explosive cartridge and percussion member 17 makes it possible to adapt and choose the
25 calibrated force transmitted to the anchoring jaw in order to fix it in its so-called overlocking position. Moreover, it goes without saying that the dimensions of the inertia block and of the percussion member 17 may be chosen so as to prevent them from buckling or deforming.

30 In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary

implication, the word "comprise" or variations such as
"comprises" or "comprising" is used in an inclusive sense,
i.e. to specify the presence of the stated features but
not to preclude the presence or addition of further
5 features in various embodiments of the invention.

While the invention has been described with reference to a
number of preferred embodiments it should be appreciated
that the invention can be embodied in many other forms.

10

It is to be understood that, if any prior art information
is referred to herein, such reference does not constitute
an admission that the information forms a part of the
common general knowledge in the art, in Australia or any

15 other country.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Method of overlocking at least one strand in an
5 anchoring block by radially clamping the strand by a
frustoconical jaw which surrounds the said strand and
which is housed in a frustoconical recess of complementary
shape made in the block, characterized in that it
comprises the following steps:
 - 10 - an explosive cartridge device comprising an
inertia block intended to be propelled by the explosion of
the cartridge is used,
- a force transmission device is arranged between
the inertia block of the explosive cartridge device and
15 the frustoconical jaw, and
- the explosive cartridge is activated to propel
the inertia block against the force transmission device
which in turn pushes against the frustoconical jaw to
drive it into the frustoconical recess in the anchoring
20 block thereby causing the strand to be overlocked by
radial clamping of the frustoconical jaw.
2. Method according to Claim 1, in which an explosive
cartridge device releasing a high-pressure gas is used.
25
3. Method according to either one of Claims 1 and 2, in
which use is made of a force transmission device which
comprises:
 - a body defining an inner chamber which extends
30 between a first orifice connected to an end-piece of the
explosive cartridge device, from which the inertia block
is propelled, and a second orifice, and

- a percussion member which comprises, on the one hand, a first portion which is housed in the inner chamber of the body and which has a larger diameter than the second orifice, the said first portion being intended to be struck by the inertia block, and, on the other hand, a second portion integral with the first portion and mounted in a sliding manner in the second orifice, the said second portion having a free end intended to interact with the frustoconical jaw.

10

4. Method according to Claim 3, in which a compression spring is interposed between the first portion of the percussion member and the inner chamber of the body.

15

5. System for overlocking at least one strand in an anchoring block by radially clamping the strand by a frustoconical jaw which surrounds the said strand and which is housed in a frustoconical recess of complementary shape made in the block, characterized in that it

20 comprises:

- an explosive cartridge device comprising an inertia block intended to be propelled by the explosion of the cartridge, and

- a force transmission device intended to interact with the inertia block of the explosive cartridge device to allow, upon the explosion of the explosive cartridge, the inertia block to be propelled against the said force transmission device, which in turn pushes against the frustoconical jaw to drive it into the frustoconical recess in the anchoring block, thereby causing the strand to be overlocked by radial clamping of the frustoconical jaw.

30

6. Overlocking system according to Claim 5, in which the force transmission device comprises:

- a body defining an inner chamber which extends between a first orifice connected to an end-piece of the explosive cartridge device, from which the inertia block is propelled, and a second orifice, and
- a percussion member which comprises, on the one hand, a first portion which is housed in the inner chamber of the body and which has a larger diameter than the second orifice, the said first portion being intended to be struck by the inertia block, and, on the other hand, a second portion integral with the first portion and mounted in a sliding manner in the second orifice, the said second portion having a free end intended to interact with the frustoconical jaw.

7. Overlocking system according to Claim 6, in which a compression spring is interposed between the first portion of the percussion member and the inner chamber of the body.

8. System according to either one of Claims 6 and 7, in which the body of the force transmission device is formed by a first casing which comprises the first orifice and by a second casing which is integral with the said first casing and comprises the second orifice.

9. A method of overlocking substantially as herein described with reference to the accompanying drawings.

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10. A system for overlocking substantially as herein
described with reference to the accompanying drawings.

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Dated this 25th day of May 2004

FREYSSINET INTERNATIONAL (STUP)

By its Patent Attorneys

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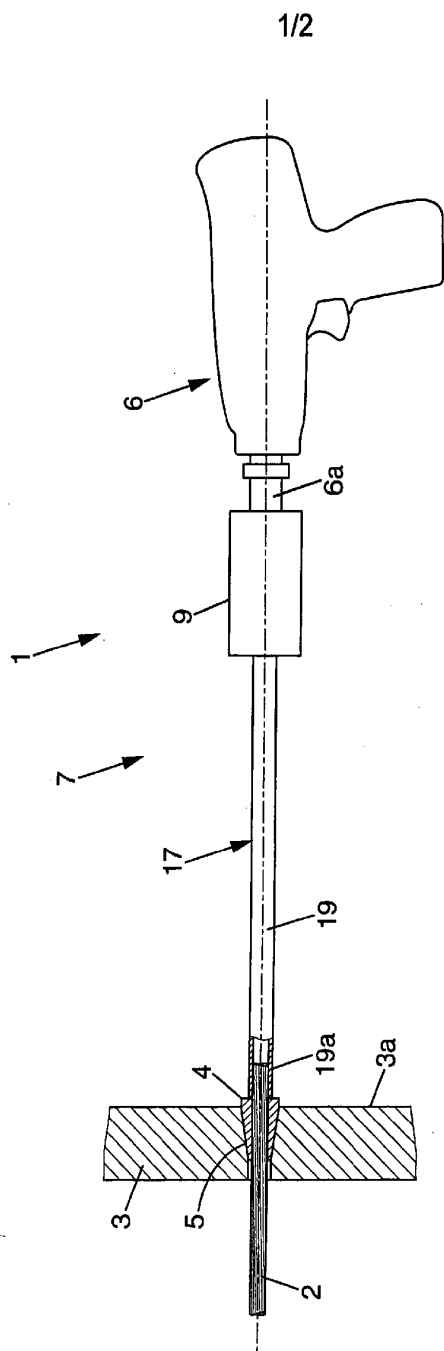


FIG. 1

