(11) Application No. AU 2006202997 B2

(19) AUSTRALIAN PATENT OFFICE

(54) Title

Fastening element for hard constructional elements

(51)[6] International Patent Classification(s)

F16B 13/13 (2006.01) 20060101AFI2006071

F16B 13/13 9BHAU

(21) Application No: 2006202997 (22) Application Date: 2006.07.14

(30) Priority Data

(31) Number	(32) Date	(33) Country
102005000110.6	2005.09.02	DE

(43) Publication Date : 2007.03.22

(43) Publication Journal Date : 2007.03.22

(71) Applicant(s)

Hilti Aktiengesellschaft

(72) Inventor(s)

Wieser, Jurgen; Allaart, Jan; Huber, Franz-Xaver; Glogger, Josef

(74) Agent/Attorney

Shelston IP, 60 Margaret Street, Sydney, NSW, 2000

(56) Related Art

US 5183357

US 6250866

ABSTRACT OF THE DISCLOSURE

A fastening element for hard constructional components such as concrete, masonry, and the like, includes a cylindrical base body (22; 42; 62) having an inwardly located engagement element (28; 48; 68) for the setting bit and formed as a through-opening (31; 51; 71) in the bottom section (23; 43; 63) which is provided at the first end of the base body, a receptacle (29) opening toward the second end (25), remote from the first end and adjoining the engagement element (28; 48; 68) in a direction toward the second end (25), and provided with load application means (30; 50); and a self-tapping thread (27) provided, at least regionwise, on an outer surface (26) of the base body (22, 42; 62).

Figure 1 to accompany abstract

2006202997 14 Jul 2006

Fig. 1

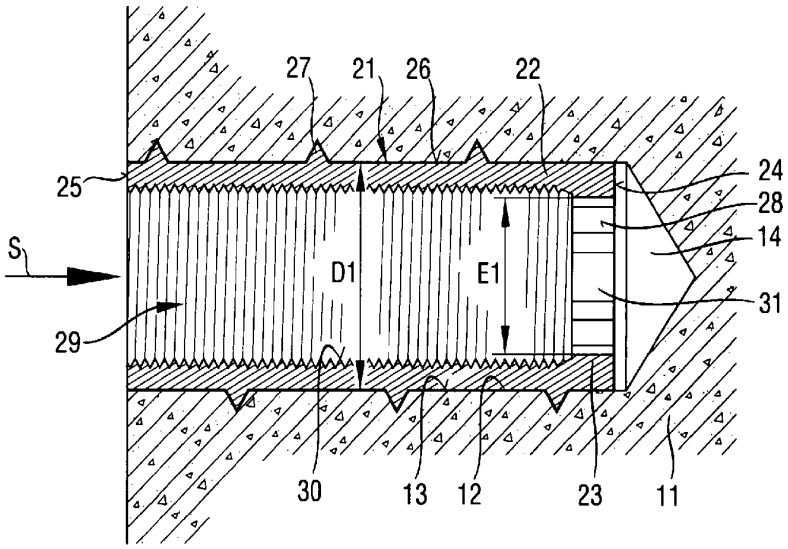
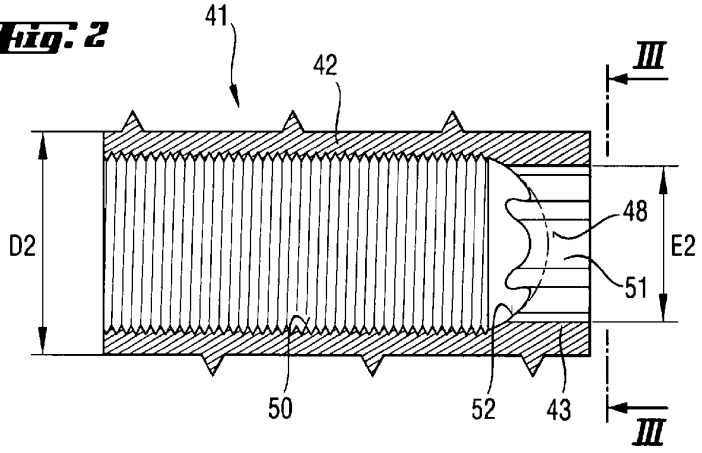


Fig. 2



2006202997 14 Jul 2006

AUSTRALIA

PATENTS ACT 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name of Applicant/s: Hilti Aktiengesellschaft

Actual Inventor/s: Jan Allaart and Josef Glogger and Franz-Xaver Huber and Jurgen Wieser

Address for Service is:

SHELSTON IP
60 Margaret Street
SYDNEY NSW 2000
CCN: 3710000352
Attorney Code: SW

Telephone No: (02) 9777 1111
Facsimile No. (02) 9241 4666

Invention Title: FASTENING ELEMENT FOR HARD CONSTRUCTIONAL ELEMENTS

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

File: 50625AUP00

2006202997 31 Jul 2007

FASTENING ELEMENT FOR HARD CONSTRUCTIONAL COMPONENTS

FIELD OF THE INVENTION

The present invention relates to a fastening element for hard constructional components such as concrete, masonry and the like.

BACKGROUND OF THE INVENTION

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

Fastening elements of the type described above are used to attach objects to hard constructional components such as concrete, masonry, and the like. A fastening element is typically screwed into a pre-formed borehole using a suitable setting bit. The self-tapping thread forms a complementary thread in the constructional component or in the borehole wall. The fastening element is anchored in the constructional component by the undercut formed by the complementary thread. A load application means is provided in the receptacle and is formed, for example, as an inner thread into which an attachment element, such as a threaded rod or a screw, is screwed to form an attachment. Instead of the inner thread, a bayonet joint can be used.

European Publication EP 1 536 149 A2 discloses a fastening element of a type described above. The fastening element has a cylindrical base body having a first end, facing in the setting direction, and a second end remote from the first end. A self-tapping thread is provided on the outer surface of the base body. The base body has inwardly located, engagement means for a setting bit and a receptacle opening to the second end, which adjoins the engagement means in the direction toward the second end. The receptacle is provided with an inner thread that forms a load application means. In the end region of the first end, the engagement means is arranged at the same axial height of the base body as the thread runout of the self-tapping screw.

Fastening elements are typically well suited to mass production, where economical manufacturing is an important competitive advantage. The drawback of this fastening element consists in that formation of the engagement means at the bottom of the receptacle is connected with increased manufacturing costs, as it is cost-intensive. Furthermore, the manufacturing possibilities for such fastening elements are limited. U.S. Patent No. 5,630,688 discloses a self-tapping sleeve which is designed for suspendable plaster ceilings for suspended lighting fixtures. This self-tapping sleeve includes a cylindrical base body having a first end, facing in the setting direction of the sleeve, and a second end remote from the first. Two cutting elements are provided on the outer surface of the base body, at the first end. Upon setting of the sleeve the two cutting elements form an opening for the sleeve in the plaster ceiling. An engagement means for a setting tool is provided between the first and second ends of the base body. The engagement means simultaneously serves as a through-opening. The base body also has a receptacle opening toward the second end and adjoining the engagement means in the setting direction.

The self-tapping sleeve of the above-discussed U.S. patent is unsuitable for use with hard components, such as concrete, masonry and the like, as typically, self-drilling fastening elements cannot be used for such hard components. The above-described sleeve is also unsuitable for use as a fastening element insertable into a pre-formed borehole as the cutting elements would be unnecessary and would not have load application means.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

It is an object of the present invention at least in one preferred form to provide a fastening element for hard constructional components that can be produced relatively simply and economically.

SUMMARY OF THE INVENTION

According to the invention, there is provided a fastening element for hard constructional components, comprising:

a cylindrical base body having a first end with a bottom section, a second end remote from the first end, inwardly located engagement means for engagement with a

setting bit, the engagement means formed as a through-opening in the bottom section, a receptacle opening towards the second end, adjoining the engagement means in a direction toward the second end, and a load application means; and

a self-tapping thread provided, at least regionwise, on an outer surface of the base body.

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise", "comprising", and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

Advantageously, the engagement means for the setting bit can be formed at any point in time during manufacturing of the fastening element. Advantageously, the engagement means can start either from the first end or from the second end of the base body. Therefore, diverse, simple and economical manufacturing processes can advantageously be used for producing the inventive fastening element. In addition, the space in the borehole in front of the fastening element is advantageously accessible, after the fastening element has been set, through the engagement means, and this space can be filled with, for example, mortar.

The receptacle or the load application means extends, advantageously, from the second end up to the engagement means, so that the entire section is advantageously available for transmitting loads over the fastening element. According to one embodiment, the load application means for the attachment means extends, in the receptacle, at a distance from the engagement means and/or the second end.

Advantageously, the maximal diameter of the through-opening corresponds to from 50% to 80% of the core diameter of the base body, which ensures a stable shape of the engagement means for the setting bit for transmitting high torques for screwing the fastening element into a hard constructional component. The core diameter of the base body is understood to mean the outer diameter of the base body without the self-cutting thread or the diameter of the thread root.

Advantageously, the base body has, between the load application means and the bottom section, a transition region for guiding the setting bit. The transition region is advantageously formed such that upon insertion of the setting bit, the bit is deflected for engagement with the engagement means. In some embodiments the transition region may be formed spherically, while in other embodiments it may be cup-shaped. In still further embodiments, the transition region can have a funnel profile. The transition region advantageously provides a larger engagement surface for the setting bit upon engagement of the setting bit with the engagement means. The transition region enables larger torques to be introduced than those transmitted in the absence of the transition region.

Advantageously, the first end of the base body has a conical profile, which facilitates insertion of the fastening element in an already available borehole and provides for centering of the fastening element in the borehole. In addition, the conical surface advantageously provides a larger engagement surface for the setting bit upon engagement with the engagement means, which advantageously provides for transmission of high torques.

According to a particular advantageous embodiment of the invention, the fastening element has a conical transition region extending between the load application means and the bottom section, and a conical first end.

The invention both as to its construction and its mode of operation, together with additional advantages thereof, will be best understood from the following detailed description of preferred embodiment, when read with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 a longitudinal cross-sectional view of a first embodiment of a fastening element according to the present invention, shown in a set condition;

Fig. 2 a longitudinal cross-sectional view of a second embodiment of a fastening element according to the present invention;

Fig. 3 a view of the fastening element shown in Fig. 2 in direction of arrows III; and

Fig. 4 a longitudinal cross-sectional view of a third embodiment of a fastening element according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A fastening element 21 for hard constructional components 11, a first embodiment of which is shown in Fig. 1, has a cylindrical base body 22 on an outer side 26 of which, a self-tapping thread 27 is provided. The base body 22 has a first end 24, facing in a setting direction S, with a bottom section 23 and a second end 25 remote from the first end 24. The base body 22 further has located inside, engagement means 28 for a setting bit (not shown) and formed as a through-opening 31 in the bottom section 23. The maximal diameter E1 of the through-opening 31 corresponds to about 70% of the core diameter D1 of the base body 22. The base body 22 further has a receptacle 29 that opens to the second end 25. The receptacle 29 is provided with an inner thread that serves as load application means and adjoins the engagement means 28 in a direction toward the second end 25.

For setting the fastening element 21 in the hard constructional component 11, here a concrete component, firstly a borehole 12 is formed and then the fastening element 21 is inserted thereinto. A torque is transmitted to the fastening element 21 via the engagement means 28, using a suitable setting bit (not shown), and the fastening element 21 is screwed in the borehole 12. The self-tapping thread 27 forms a complementary thread in the borehole wall 13 for forming an undercut therein. Through the opening 31, access to the space 14 in front of the fastening element is possible such that it can, for example, be filled with mortar.

A second embodiment of a fastening element 41 for hard constructional components is shown in Figs. 2-3 and has, in addition to elements of the fastening element 21 shown in Fig. 1, a spherical transition region 52 between the load application means 50

and the bottom section 43 of the base body 42. The spherical transition region 52 serves for guiding a setting bit within the fastening element 41. The contact surface of the engagement means 48, with which the setting bit cooperates, is noticeably increased in comparison with the contact surface of the engagement means 28 of the fastening element 21 shown in Fig. 1. Alternatively, the transition region 52 can be made conical.

As particularly shown in Fig. 3, the through-opening 51, which forms the engagement means 48 in the bottom section 43 for the setting bit, is formed for engagement with a TORX-shaped setting bit. The maximal diameter E2 of the through-opening 51 corresponds to about 80% of the core diameter D2 of the base body 42.

A third embodiment of a fastening element 61 for hard constructional components is shown in Figure 4 and has a base body 62 with a first end 64 having a conical profile. The engagement means 68 is formed as a through-opening 71 in the bottom section 63 of the base body 62. The contact surface of the engagement means 68 for the setting bit has a noticeably bigger surface area, when compared with the contact surface of the engagement means 28 of the fastening element 21 shown in Fig. 1. The conical profile of the first end 64 facilitates insertion of the fastening element 61 into the borehole and provides for its centering when the fastening element 61 is screwed into the borehole. The maximal diameter E3 of the opening 71 corresponds to about 50% of the core diameter D3 of the base body 62.

Though the present invention was shown and described with references to the preferred embodiments, such are merely illustrative of the present invention and are not to be construed as a limitation thereof and various modifications of the present invention will be apparent to those skilled in the art. It is, therefore, not intended that the present invention be limited to the disclosed embodiments or details thereof, and the present invention includes all variations and/or alternative embodiments within the spirit and scope of the present invention as defined by the appended claims.

2006202997 31 Jul 2007

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A fastening element for hard constructional components, comprising:

a cylindrical base body having a first end with a bottom section, a second end remote from the first end, inwardly located engagement means for a setting bit formed as a through-opening in the bottom section, a receptacle opening towards the second end, adjoining the engagement means in a direction toward the second end, and a load application means; and

a self-tapping thread provided, at least regionwise, on an outer surface of the base body.

2. A fastening element according to claim 1, wherein the through-opening has a maximal diameter corresponding to from about 50% to about 80% of a core diameter of the base body.

3. A fastening element according to claim 1 or claim 2, wherein the base body has a transition region between the load application means and the bottom section for guiding the setting bit.

4. A fastening element according to any one of the preceding claims, wherein the first end of the base body has a conical profile.

5. A fastening element for hard constructional components, substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

2006202997 14 Jul 2006

Fig. 1

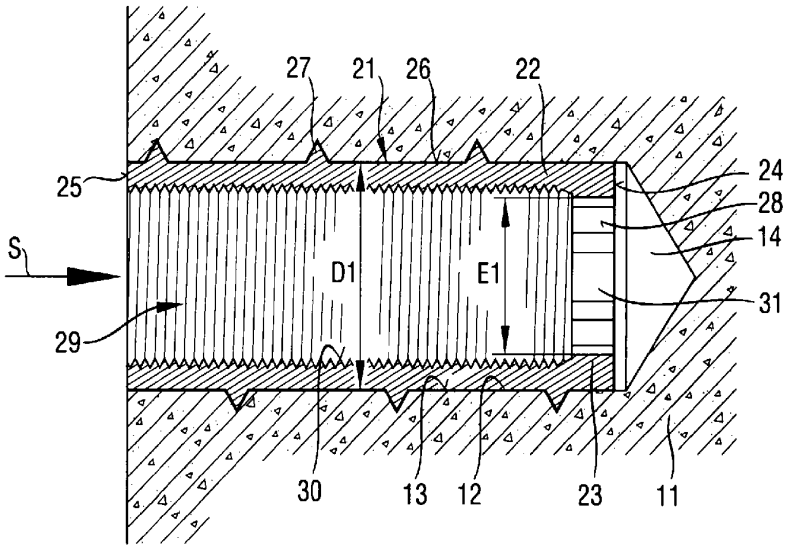
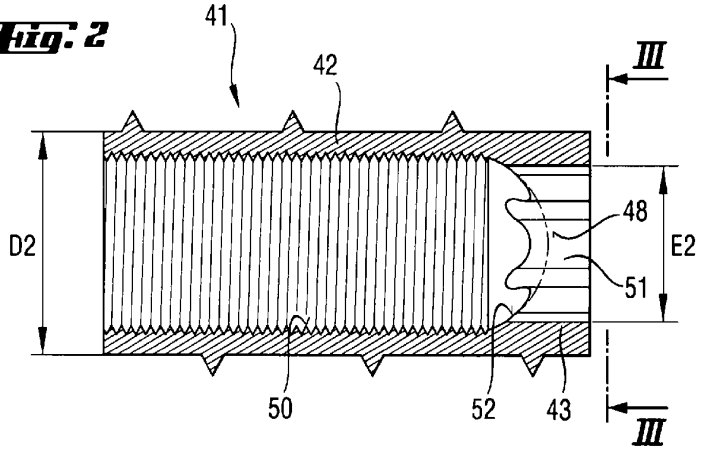


Fig. 2



2006202997 14 Jul 2006

Fig. 3

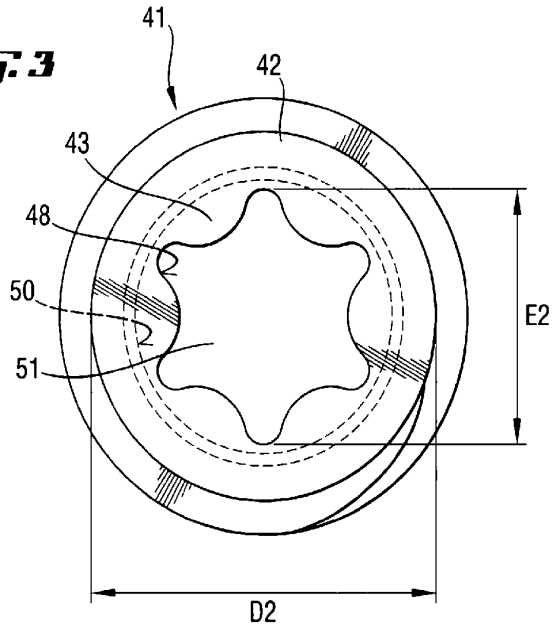
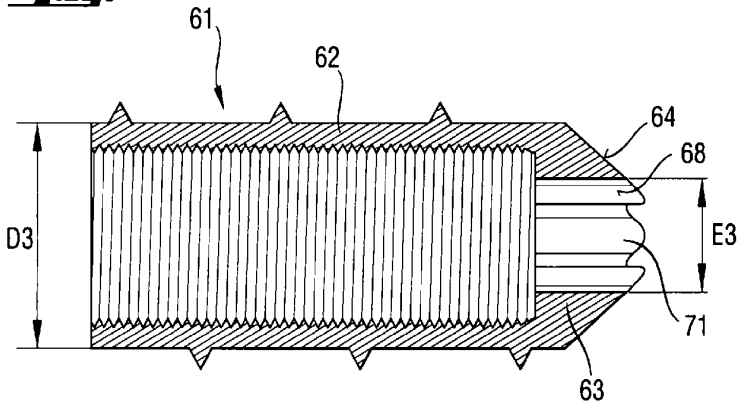


Fig. 4



2006202997 14 Jul 2006

ABSTRACT
ZUSAMMENFASSUNG
ABRÉGÉ