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CA 2636829 C 2011/09/13

(11)(21) 2 636 829

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2006/10/20
(87) Date publication PCT/PCT Publication Date: 2007/08/09
(45) Date de délivrance/Issue Date: 2011/09/13
(85) Entrée phase nationale/National Entry: 2008/07/11
(86) N° demande PCT/PCT Application No.: EP 2006/067610
(87) N° publication PCT/PCT Publication No.: 2007/087904
(30) Priorité/Priority: 2006/01/12 (DE20 2006 000 479.3)

(51) Cl.Int./Int.Cl. *F16B 25/00* (2006.01),
F16B 35/04 (2006.01)

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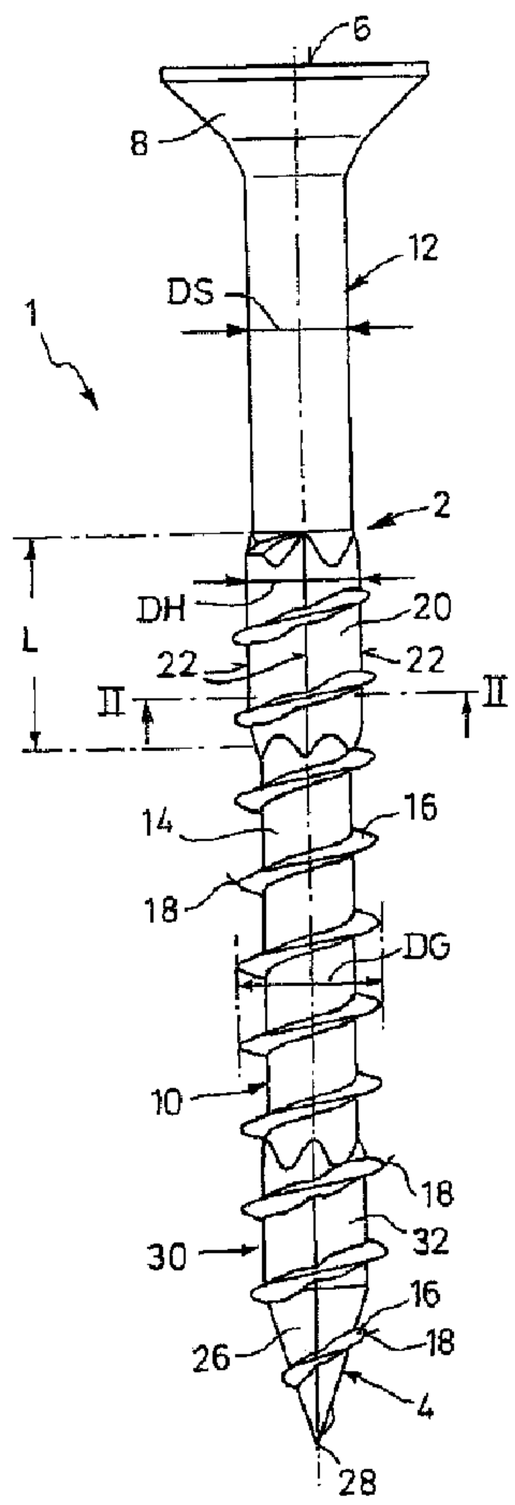
(54) Titre : VIS AUTOPERFORANTE ET TARAUDEUSE
(54) Title: SELF-TAPPING AND THREAD-FORMING SCREW



(57) Abrégé/Abstract:
The invention relates to a self-tapping and thread-forming screw (1), having a screw shank (2) with a screw tip (4) at one end and a force application point (6) at the other end for the transmission of torque. The screw shank (2) is composed of a thread section

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(57) Abrégé(suite)/Abstract(continued):
(10), which has the screw tip (4), and an adjoining thread-free shank section (12) which has the force application point (6). The thread section (10) is composed of a shank core (14) and a thread-forming thread (16). The thread section (10) has, in a region remote from the screw tip (4), a core section (20) with a polygonal core cross section which, with its corners (22), defines a circular envelope (24) with a circular envelope diameter (DH) which is greater than the shank diameter (DS) of the thread-free shank section (12).

11573/VII/bj

Abstract

The invention relates to a self-tapping and thread-forming screw (1) having at one end a screw shaft (2) with a screw tip (4) and at the other end a point of application of a force (6) for the transmission of a turning moment. The screw shaft (2) consists of a threaded section (10) exhibiting the screw tip (4) and an adjacent thread-free section of the shaft (12) exhibiting the point of application of a force (6). The threaded section (10) consists of a shaft core (14) and a thread-forming thread (16). The threaded section (10), in an area situated remotely from the screw tip (4), exhibits a core section (20) having a polygonal core cross section, which with its corners (22) defines an enveloping circle (24) with an enveloping circle diameter (DH), which is larger than the shaft diameter (DS) of the thread-free section of the shaft (12).

Fig. 1

11573/VII/bj

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Self-tapping and thread-forming screw

The present invention relates to a self-tapping and thread-forming screw having at one end a screw shaft with a screw tip and at the other end a point of application of a force for the transmission of a turning moment, the screw shaft consisting of a threaded section exhibiting the screw tip and an adjacent thread-free section of the shaft exhibiting the point of application of a force, the threaded section consisting of a shaft core and a thread-forming, single or multiple thread.

Screws of this kind, which, because of their thread-free section of the shaft, are also designated as part-threaded screws, can also be screwed directly without pre-drilling into relatively soft materials, such as wood and the like. It has been established in practice in conjunction with this that the thread-free section of the shaft generates high friction on entering the threaded hole formed by the threaded section, which leads to a disadvantageously high driving moment.

Previously disclosed in relation to a part-threaded screw of this kind is the provision of the thread-free section of the shaft in its area adjacent to the threaded section with a so-called shaft cutter, which consists of radially projecting cutting ribs that are intended to enlarge the threaded hole during driving to such an extent that the section of the shaft is able to penetrate with reduced friction and consequently with a reduced driving moment. Manufacture by a rolling process is problematical, however, in the case of such screws. Deformation of the screw by bending can occur in the area of the shaft cutter during rolling. This means that an exactly straight screw cannot be

produced, or can only be produced with an additional cost.

The object of the present invention is to make available a screw of the aforementioned kind, which, on the one hand, is capable of being driven with a low driving moment and, on the other hand, can be produced in a simple and economical manner with high accuracy (in particular, with exact straightness).

According to the invention, this is achieved in that the threaded section, in an area situated remotely from the screw tip, exhibits a core section having a polygonal core cross section, which with its corners defines an enveloping circle with an enveloping circle diameter which is larger than the shaft diameter of the thread-free section of the shaft. The outcome of this is that the polygonal core section with its corners causes the threaded hole to expand during driving, with the subsequent result that the friction and the driving moment are reduced as the thread-free section of the shaft penetrates. The arrangement of the polygonal core section in accordance with the invention in the area of the threaded section (and not approximately in the area of the thread-free section of the shaft) produces the advantageous outcome in the production of the screw by a rolling process that the screw is guided exactly ("clamped") between the roller jaws over the thread, including directly in the area of the polygonal section of the core, so that bending phenomena are excluded from the axis of the screw. The invention thus permits simple and rapid manufacture with high precision in the rolling process.

Additional advantageous characteristics of the invention are contained in the dependent claims and in the following description.

The invention will now be described in more detail with

reference to two preferred illustrative embodiments depicted in the drawing, in which:

Fig. 1 depicts a side view of a screw according to the invention in a first, preferred embodiment;

Fig. 2 depicts an enlarged cross section in the plane II-II according to Fig. 1;

Fig. 3 depicts a side view of a second embodiment of the screw according to the invention; and

Fig. 4 depicts an enlarged cross section in the plane IV-IV according to Fig. 3.

A screw 1 according to the invention consists in both embodiments of a long and narrow screw shaft 2 having at one end a screw tip 4 and at the other end a point of application of a force 6 for the transmission of a turning moment. In the depicted embodiments, the point of application of a force 6 is embodied as an internal point of application of a force and as such is not actually distinguishable in the side views. In addition, the point of application of a force 6 is formed on or in a screw head 8, which is preferably executed as a countersunk head. The point of application of a force 6 can be formed as a cross-head, an internal hexagonal socket head, a hexalobular internal driving button head (TORX) or the like. It can also be an external point of application of a force, for example an external hexagonal socket head.

The screw shaft 2 consists of a threaded section 10 exhibiting the screw tip 4 and an adjacent, thread-free section of the shaft 12 exhibiting the point of application of a force 6 and the screw head 8. The thread-free section of the shaft 12 exhibits a cylindrical peripheral surface with a shaft diameter DS. The threaded section 10 consists of a shaft core 14

and a thread-forming tapping thread 16, being a single thread in the case depicted here, in the form of a radial elevation running in the form of a helical line. With its external thread edge 18 formed between two flanks, the thread 16 defines an external thread diameter DG.

According to the invention, the threaded section 10 exhibits a core section 20 with a polygonal core cross section in an area remote from the screw tip 4. As can be appreciated in particular from the cross sections depicted in Figs 2 and 4, the polygonal core section 20 with its corners 22 defines an enveloping circle 24 with an enveloping circle diameter DH, which is larger than the shaft diameter DS of the thread-free shaft section 12, although it is preferably smaller than the thread diameter DG. The enveloping circle diameter DH should preferably be up to 1.4 times, and in particular between 1.1 and 1.2 times the diameter of the shaft DS. In an 8 mm screw, for example, the thread diameter DG is 8 mm, and the shaft diameter DS is about 5.6 mm. According to the invention, the enveloping circle diameter DH in this case lies in the range from about 6.2 mm to 6.4 mm.

In the first embodiment illustrated in Figs 1 and 2, the thread 16 runs along the entire core 14 of the shaft including the polygonal core section 20. In this way, the polygonal core section 20 can preferably be arranged in the end area of the threaded section 10 on the shaft side (at the thread run-out) in direct proximity to the thread-free section 12 of the shaft. Exact straightness is nevertheless achieved in the manufacture of the screw 1 by the rolling process, in that the area of the polygonal core section 20 is guided precisely, practically clamped, over the continuous thread 16 between two roller jaws. The thread 16 also passes with its outer thread edge 18 over the area of the polygonal core section 20 - viewed

in an axial projection - with a constant radius in the form of a circle (see Fig. 2). Unlike the embodiment depicted in Fig. 1, the polygonal core section 20 provided with a thread 16 can also be arranged in the threaded section 10 at a greater distance from the thread-free section 12 of the shaft, in which case a part of the "normal" thread with a cylindrical shaft core 14 is provided between the sections 20 and 12.

In the alternative embodiment according to Figs 3 and 4, the polygonal core section 20 - interrupting the thread 16 - is of thread-free execution. An end area of the threaded section 10, preferably with at least one complete turn of the thread, is provided for this purpose between the polygonal core section 20 and the thread-free section 12 of the shaft. According to Fig. 3, this may also involve at least four complete turns of the thread. A part of the threaded section 10 is thus situated axially to either side of the polygonal core section 20, so that exact guiding to prevent distortion/bending is also achieved in this embodiment in conjunction with rolling the thread.

In both embodiments, the polygonal core section 20 exhibits an axial length L, which corresponds more or less to the length of a part of the threaded section 10 having between one and six turns of the thread.

As can be appreciated in addition from Figs 2 and 4, the polygonal core cross section of the core section 20 is preferably embodied as a four-sided figure (square or quadrilateral). It is fundamentally possible, however, to choose a preferably equilateral, three-sided to six-sided figure for this. The lateral surfaces in this case, unlike in the depictions, can be curved in a weakly concave or convex manner. The corners 22 should be as square-edged as possible, although they can also be slightly rounded.

In a preferred embodiment of the invention, the screw tip 4 also exhibits a core 26 with a polygonal core cross section. The thread 16 in this case passes with its outer thread edge 18 - viewed in an axial projection - over the area of the tapering screw tip 4 and as far as a pointed end 28 with a continuously reducing radius in the form of a spiral over the core 26. Provided in addition, preferably in conjunction with the tip 4 of the screw, is a transitional section 30, which exhibits a core 32 with a constant, similarly polygonal core cross section over its axial length. This core cross section corresponds in particular to the core cross section that is present in the directly adjacent area of the core 26 of the tip 4 of the screw. The thread 16 passes over the area of the core 32 of the transitional section 30 with its outer thread edge 18 - in this case, too, viewed in an axial projection - in a similar manner to the rest of the threaded section 10 with a constant radius in the form of a circle.

In the case of the core cross sections of the core 26 of the screw tip 4 and the core 32 of the transitional section 30, it is preferably also a matter of a quadrilateral or a square, or any in particular equilateral, three-sided to six-sided figure. The polygonal core 32 of the transitional section 30 with its corners defines an enveloping circle, the diameter of which, on the one hand, is larger than the diameter of the core 14 of the shaft, but, on the other hand, is smaller than the enveloping circle diameter DH of the core section 20 according to the invention.

By means of the preferred embodiment described here in the area of the tip 4 of the screw, this acts as a boring tip, which permits centered and easy driving.

The invention is not restricted to the illustrative embodiments depicted and described here, but also includes all embodiments of identical effect within the

scope of the invention. Moreover, the invention is also as yet not restricted to the combination of characteristic features of a self-boring and self-tapping screw comprising a screw shaft with a screw tip at a first end extending axially to a force application member for the transmission of a turning torque ata second end, the screw shaft including a threaded section disposed between the screw tip and a thread-free section of the shaft, the thread-free section including the force application member, the threaded section including a shaft core and a thread, the threaded section further including a core section axially displaced from the screw-tip, the core section having a polygonal core cross section with corners defining an enveloping circle having an enveloping circle diameter larger than a shaft diameter of the thread-free section of the shaft; wherein the thread runs along the entire core, including the polygonal core section, and the polygonal core section is provided within the threaded section adjacent the thread-free section of the shaft. Rather, the invention can also be defined by any other desired combination or particular characteristic features of all previously disclosed individual characteristic features. This means, fundamentally, that practically every individual characteristic feature listed above can be omitted, and can be replaced by at least one individual characteristic feature disclosed elsewhere in the application.

WHAT IS CLAIMED IS:

1. A self-boring and self-tapping screw comprising a screw shaft with a screw tip at a first end extending axially to a force application member for the transmission of a turning torque at a second end, the screw shaft including a threaded section disposed between the screw tip and a thread-free section of the shaft, the thread-free section including the force application member, the threaded section including a shaft core and a thread, the threaded section further including a core section axially displaced from the screw-tip, the core section having a polygonal core cross section with corners defining an enveloping circle having an enveloping circle diameter larger than a shaft diameter of the thread-free section of the shaft;

wherein the thread runs along the entire core, including the polygonal core section, and the polygonal core section is provided within the threaded section adjacent the thread-free section of the shaft.

2. The screw according to claim 1, wherein the enveloping circle diameter of the polygonal core section is equal to or less than 1.4 times the shaft diameter of the thread-free section of the shaft.

3. The screw according to claim 1, wherein the enveloping circle diameter of the polygonal core section is between 1.1 and 1.2 times the shaft diameter of the thread-free section of the shaft.

4. The screw according to claim 1, wherein an outer thread edge defines a constant radius circle.

5. The screw according to claim 1, wherein the thread runs over the screw tip and an outer thread edge defines a continuously reducing radius spiral over a tip core.

6. The screw according to claim 5, further including a transitional section adjacent the tip, the transitional section having a transitional core with a constant polygonal core cross section corresponding to the cross section of the tip core directly adjacent the transitional section of the screw, the thread passes over an area of the transitional core of the transitional section with its outer thread edge forming a constant radius circle.

7. The screw according to claim 1, wherein the polygonal core section includes an axial length corresponding approximately to a length of the threaded section having between one and six turns of the thread.

8. The screw according to claim 1, wherein the polygonal core cross section comprises an equilateral polygon having three to six sides.

9. The screw according to claim 1, wherein the thread-free section of the shaft transitions into a countersunk screw head.

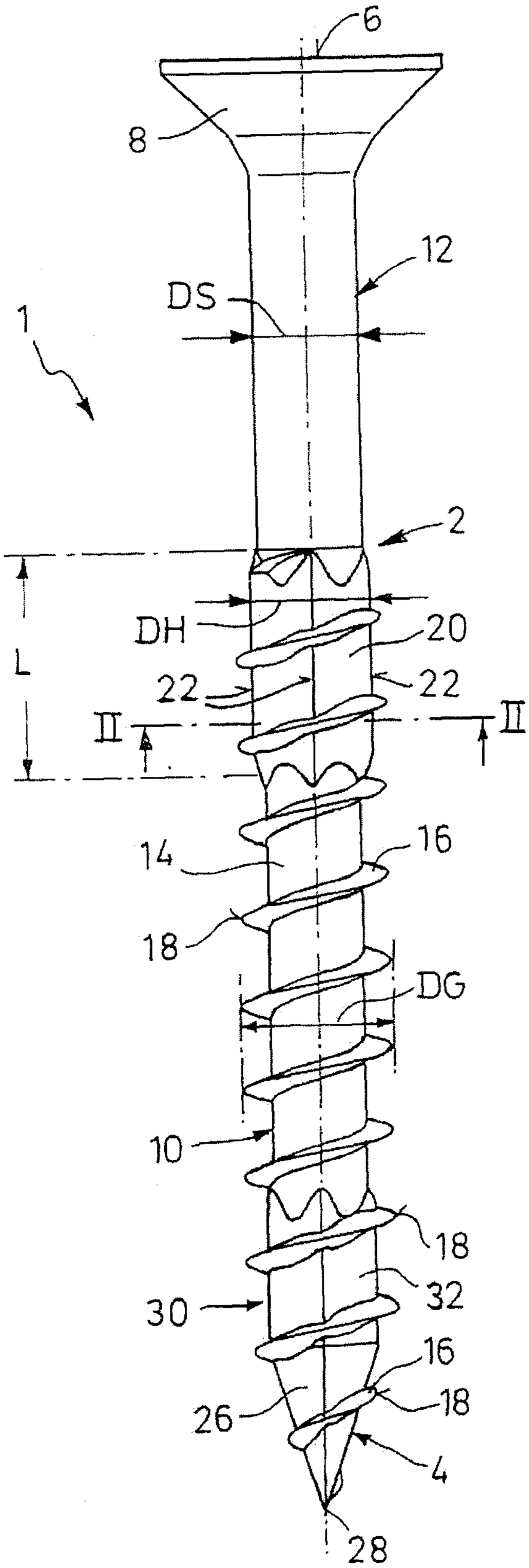
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Fig.1

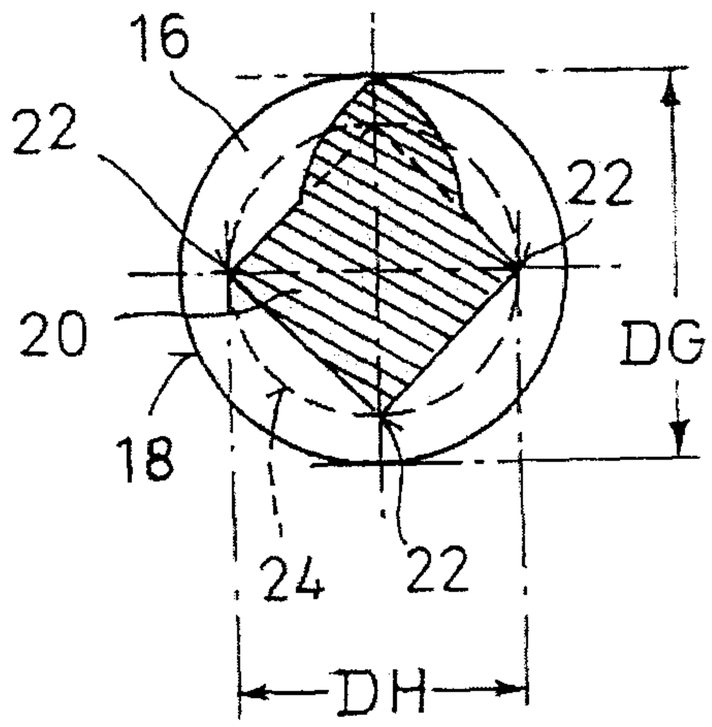
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Fig.2

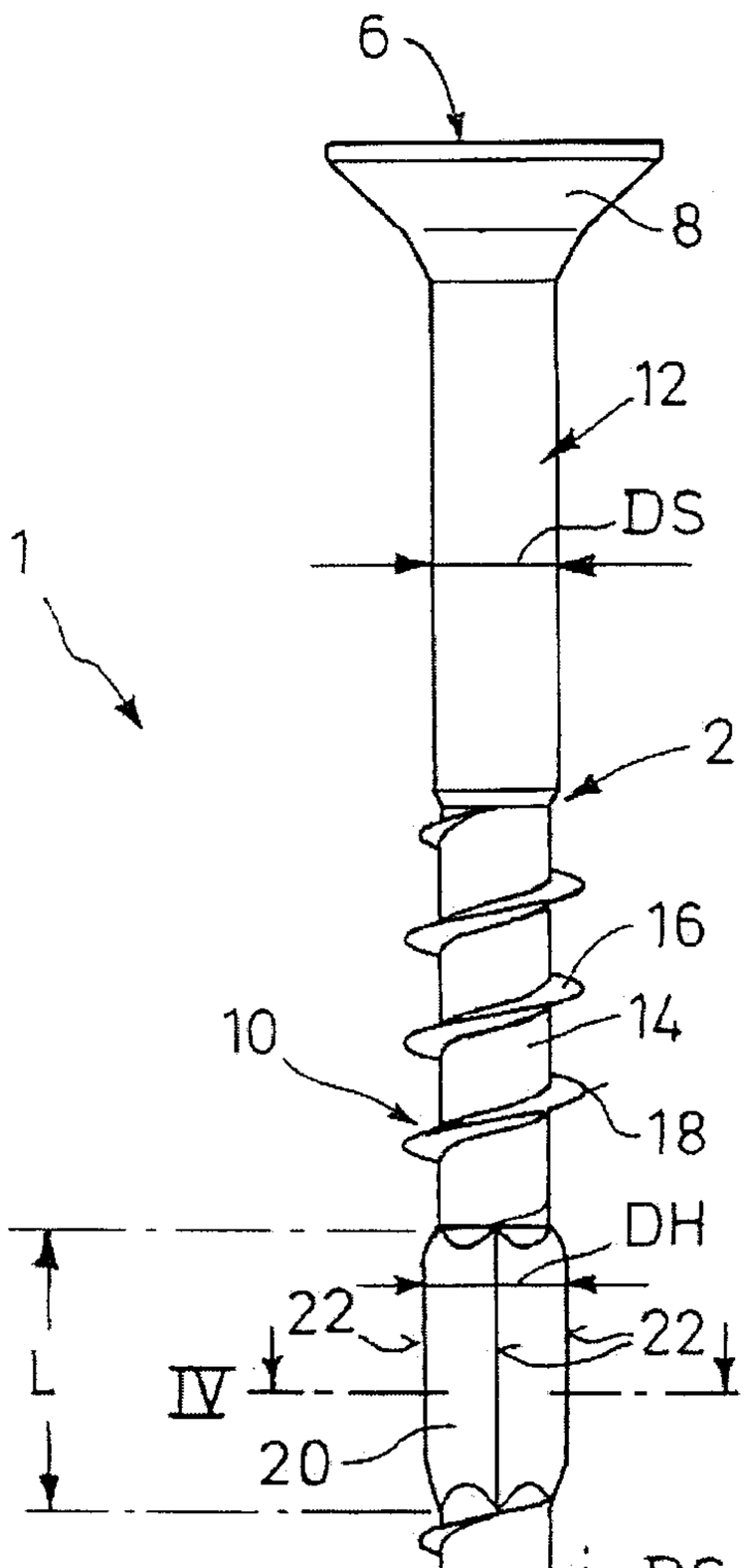
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Fig.3

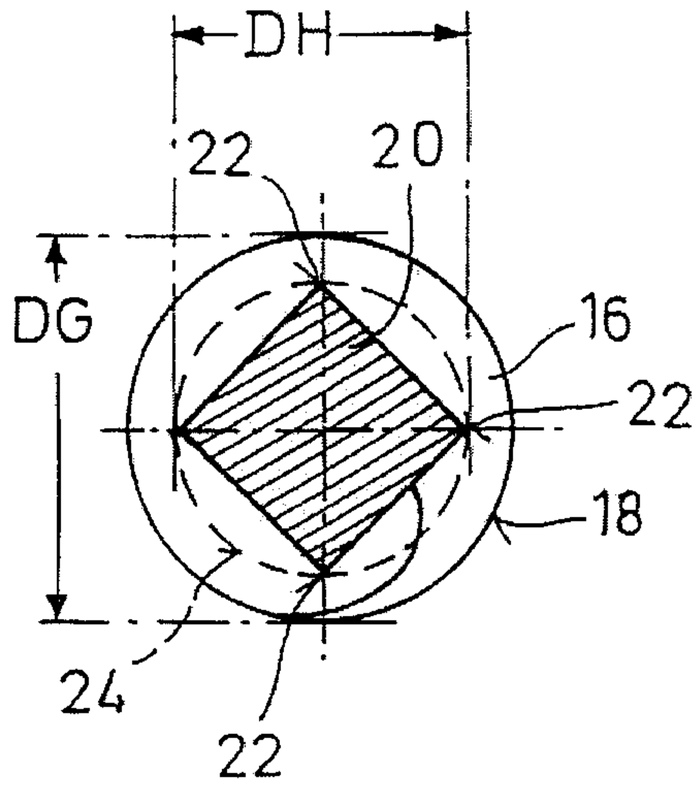
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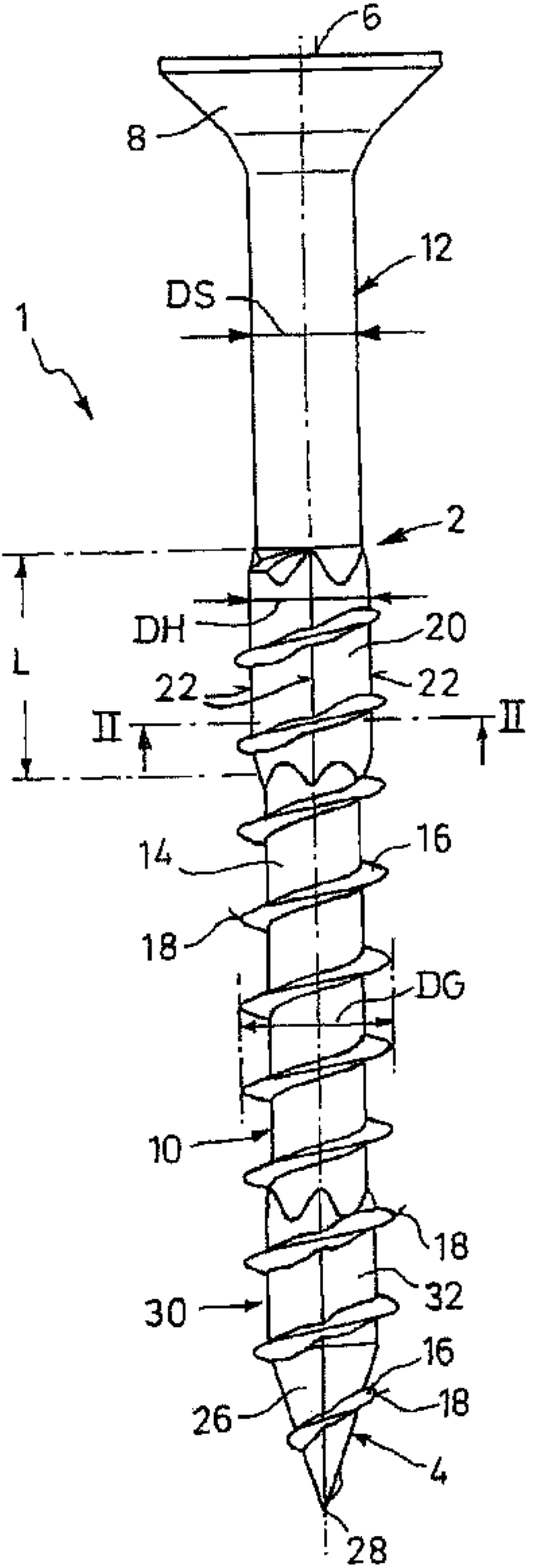
Fig.4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