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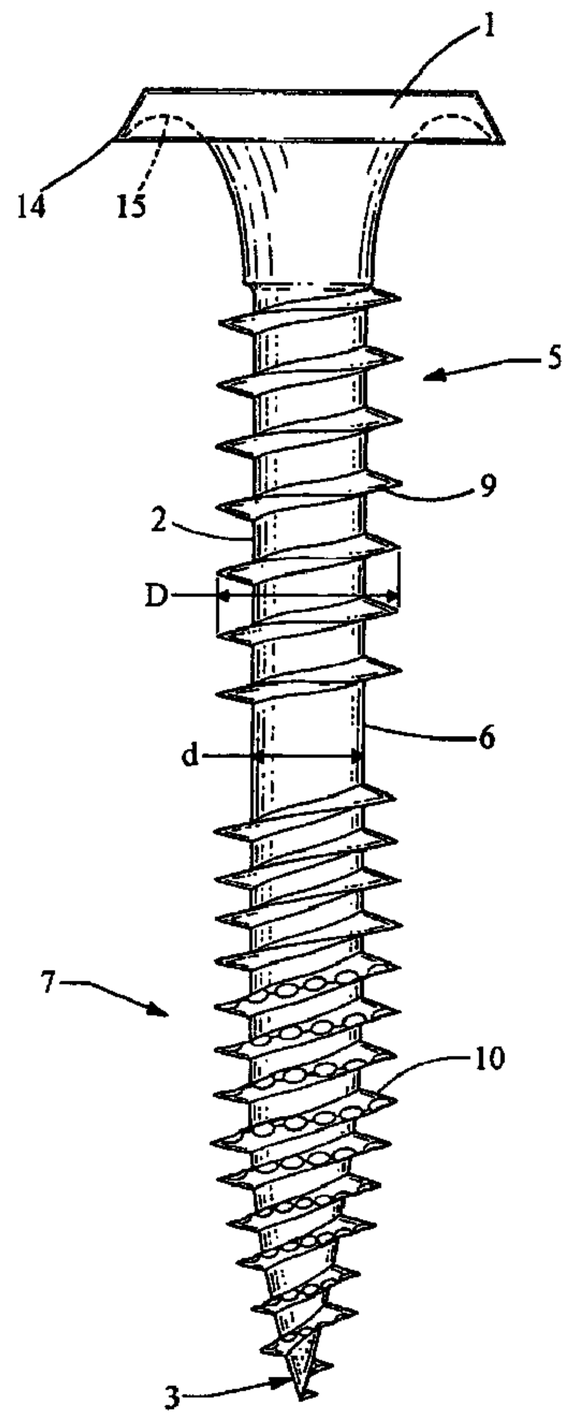
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(54) Titre : VIS AUTOTARAUDEUSE POUR MATERIAUX COMPOSITES
(54) Title: SELF-TAPPING SCREW FOR COMPOSITE MATERIALS



(57) Abrégé/Abstract:
A self tapping screw has a screw shaft with two thread sections separated by a thread free section. The threads of the two thread sections are of different opposite pitches.

ABSTRACT OF THE DISCLOSURE

A self tapping screw has a screw shaft with two thread sections separated by a thread free section. The threads of the two thread sections are of different opposite pitches.

SELF-TAPPING SCREW FOR COMPOSITE MATERIALS

The present invention concerns a self-tapping screw, especially for wood-plastic composite materials or the like, consisting of a screw head and a screw shaft adjacent to it and a screw tip, where two threaded sections have been formed on the screw shaft, which are separated by a thread-free section, and where each of the threads of the two threaded sections has a different pitch.

From the German Gebrauchsmuster 200 07 321.4 a screw of the kind described above is known. This design of a screw leads to the result, that when two adjacent fasteners are to be joined by means of screws, they can be screwed together without pre-drilling in such a manner that the absence of a gap between the two fasteners can be ensured and an initial tensioning force can be generated. For this purpose, the two threaded sections contain threads with different pitches, where the threaded section closest to the screw tip has a greater pitch than the other threaded section.

Such a screw is also known from GB-PS 2 169 051. The WO 99/15796 and the EP 0 460 264 A1 also show similar screws.

When the known screws are used for threading them into so-called wood-plastic-composite materials, it has been found that an increased production of chips occurs, while the chips are transported away from the upper threaded portion, and that the chips are thrown up below the screw head.

The present invention is based on the objective of improving the screw mentioned above in such a manner that the chips are largely prevented from exiting in the region of the upper thread section.

In accordance with the invention this is achieved in that the threads of the two thread sections have an opposite pitch.

Accordingly, the present invention provides a self-tapping screw comprising: a screw head; a screw shaft adjacent to the screw head; a screw tip; and wherein a first and second thread sections have been formed on the screw shaft and are separated by a thread-free section, and the threads of the first and second thread sections having an opposite pitch, and wherein an outer thread diameter of the first thread section near the screw head is smaller than an outer thread diameter of the second thread section near the screw tip and where the first and second thread sections have the same root diameter.

By means of the formation of counter-rotational thread sections chips are not transported away from the upper thread region, which excludes the possibility of generating chips below the screw head.

The tip of the screw near the thread section may be configured as a multiple screw-thread, in particular a double screw-thread, where the pitch of the threads of the multiple screw-thread is greater than the pitch of the single screw-thread of the thread section near the head of the screw.

The formation of a relatively large pitch for the threads of the multiple, in particular the double screw-thread, makes it possible that the pitch of the single screw-thread can be enlarged as well. Here, a pitch ratio of 2:1 is especially advantageous. In this manner, the overall resistance to starting the threaded engagement is reduced as compared to known screws without a reduction of the achievable holding forces, because a reduction of the holding forces resulting from the greater pitch of the thread is essentially compensated for as a result of the multiple thread of the threaded section which is adjacent the tip of the screw.

Furthermore, the use of the single screw-thread with the reduced pitch as compared to the multiple screw-thread results in the advantage that the chips being generated are retained or pushed back into the screw hole.

By virtue of the overall increase of the pitch in both threaded sections achieved in accordance with the invention as compared to known screws, the production of chips as such

is also reduced.

Furthermore, because of the design in accordance with the invention, when the screw threads are first engaged, a different advance occurs as a result of the different pitch of the two threaded sections, as soon as both thread sections are engaged, so that the upper, i.e. in the direction of thread insertion the front fastener part, is pulled against the lower, i.e. the following part when viewed in the direction of thread insertion. In this manner the generation of a gap between the two fastener parts is prevented and at the same time an initial tension force is generated. At the same time, it is contemplated that the threaded section and the thread-free sections are dimensioned in such a way, that when the thread is fully engaged, the section, which is free of threads, bridges the transition region between the two fastener parts.

Advantageous embodiments of the invention are contained in the subordinate claims. The invention will be explained in more detail on the basis of the examples of the embodiments shown in the enclosed drawings.

The following is shown:

Fig. 1 is a view of a self-tapping screw in accordance with the invention,

Fig. 2 is a section through a connection of two fasteners by means of a screw in accordance with the invention according to Fig. 1,

Fig. 3 is a view of a second embodiment of a self-tapping screw in accordance with the invention; and

Fig. 4 is a plan view of a screw head of the screw in accordance with the invention according to Fig. 3.

A screw in accordance with the invention, which is designed as a self-tapping screw or a self-drilling screw, consists of a screw head 1 and an adjacent screw shaft 2 with a screw tip 3. The screw head 1 is shown in the example of the embodiment as a flat head. The screw shaft 2 has a constant root diameter d, which becomes continuously smaller in the region of the screw tip 3, and which runs out at the end of the screw tip 3. On the screw shaft 2 there is a first threaded section 5 which is close to the screw head, and which in turn is followed by

thread-free section 6, which is again followed by a second screw tip near the threaded section 7, the thread of which runs out at the screw tip 3. The threaded section 5 has a thread 9, which is designed as a single thread. A thread 10 on the threaded section 7 is designed as a multiple thread, especially as a double thread, with two parallel threads. The pitch of the threads of the double thread is greater than the pitch of the thread of the single-thread of the threaded section 5. The pitch ratio is preferably 2:1. Thus, the advance in the threaded section 7 with its greater pitch is greater than the advance in the threaded section 5 with its smaller pitch. In the example of the embodiment shown the threads 9, 10 of the two threaded sections 5, 7 have the same outer thread diameter D. However, it would also be within the scope of the invention, if these two threaded sections would have a different outer thread diameter, while it would be advantageous, in such a case, if the outer thread diameter of the thread 9 would be greater than the outer thread diameter of the thread 10. In this case, the root diameter d of the two threaded sections 5, 7 is, therefore, also dimensioned in the appropriate different magnitudes. In the example of an embodiment shown, the thread 10 continues on the tip of the screw up to its end point. But it is also within the scope of the invention, if the screw point 3, for example, is designed as a drill tip or a friction tip. By means of having a thread on the threaded section 5, which has a smaller pitch, it is further achieved that the chips, which are being generated, are held back or pushed back into the drilled hole. By virtue of the fact that the thread of the threaded section 5 has a relatively large pitch, an overall reduced resistance to an initial thread engagement is achieved, while the configuration as a multiple thread or a double thread still ensures, as before, a strong holding force. The screw head 1 has on its underside a circumferential edge 14, which protrudes with respect to its lower head surface 15. By means of this edge 14, any protruding material chips are cut through while the screw is screwed in. By virtue of fact that the lower head surface 15 is curved slightly toward the inside, an additional space for receiving the chips is generated.

As can be seen from Fig. 2, where a connection in accordance with the invention by means of a screw in accordance with the invention, as described above, is shown, the thread-free section 6 bridges the contact area of the two fasteners, which are joined by means of the two fasteners 12 and 13 in accordance with the invention. It may advantageous if these two fasteners 12, 13 are composite parts made of a wood-plastic mixture. As can be gathered from

Fig. 2, it is thus ensured that the screw in accordance with the invention, when it is screwed in, has individual screw sections which proceed in such a manner that the thread section 5 runs preferably exclusively in the front fastener 12, when viewed in the direction in which it is screwed in, and that the thread section 7 runs preferably exclusively in the fastener 13, which is located behind it when viewed in the direction in which it is screwed in. By virtue of this design, it is then ensured that, when the screw according to the invention is screwed in, the two fasteners 12, 13 are in contact with each other free of gaps and under an initial tension force. The magnitude of the initial tension force is determined by the pitch difference and the advance difference associated with it, when the screw in accordance with the invention is screwed into the two fasteners 12, 13. For the screw in accordance with the invention a pre-drilling of the fasteners is not required.

A further embodiment of the screw according to the invention, see fig. 3, which has been designated as a self-tapping or self-drilling screw, consists of a screw head 101 and screw shaft 102 adjacent to it with a screw tip 103. The screw head 101 in the embodiment shown according to Fig. 3 is fashioned as a flat-head. The screw shaft 102 has a constant root diameter d, which is progressively reduced in the region of the screw tip 103 and runs out at the end of the screw tip 103. On the screw shaft 102 a first thread section 105 is formed near the screw head, which is followed by a thread-free section 106, which in turn is followed by a second thread section 107 near the screw tip, the thread of which thread section 107 runs out at the screw tip 103. The thread section 105 has a thread 109, which is formed as a single-thread screw. A thread 110 on the thread section 107 has a pitch opposite to that of thread 109. The thread 110 is, in its preferred embodiment, fashioned as a single thread, but it can also be designed as a multiple thread, especially a double thread. The pitch angles of the two threads 109, 110 are of equal magnitude, but they can also be of different sizes.

By means of the embodiment of the invention with the two oppositely threaded thread sections 105, 107 it is avoided that the tips are transported away from the upper thread region when the screw is threaded into parts to be joined. Rather, the chips remain in the region of the thread section 105 near the screw head and are transported advantageously in the direction of the thread section 107 near the screw tips. By this means an accumulation of chips below the

screw head is excluded.

In the example of the embodiment of the invention according to Fig. 3, the threads 109, 110 of the two thread sections 105, 107 have different outer thread diameters D2, D3. The outer thread diameter D2 of the thread section 105 near the screw head is smaller than the outer thread diameter D3 of the thread section 107 near the screw tip. Preferably the outer thread diameter D2 is 5.3 mm, while the outer thread diameter D3 preferably amounts to 5.5 mm.

The thread-free section 106 has, in the examples of embodiments described, a diameter D4, which is larger than the root diameter d of the respective thread sections 105, 107.

The height of the thread between two threads – i.e. the pitch – of the thread section 105 near the screw head is smaller than the pitch of the thread section 107 near the screw tips. The pitch of the thread near the screw head is preferably 2.5 mm, while the pitch of the thread section 107 near the screw tip is preferably 2.8 mm.

In the example of the preferred embodiment according to Fig. 3, the screw head 101 has on its underside a circumferential edge 114, which protrudes with respect to the surface 115 beneath its head. By means of this edge 114, any protruding material chips are severed while the screw is screwed in. By virtue of the fact that the surface 115 underneath the head is curved slightly toward the inside, an additional space for receiving the chips is generated.

In the example of the preferred embodiment shown in Fig. 3, the length of the thread section 107 near the screw tips is about 2 to 3 times greater than that of the thread section 105 near the screw head. The length of the thread section 107 near the screw tips is preferably 2.6 to 2.7 times greater than that of the thread section 105 near the screw head.

The screw head 101 is up to 2 to 3 mm high. It is, in particular, 2.6 mm high. The screw head diameter at the end near the threaded shaft is larger than the diameter at the opposite end, while the screw head diameter at the end near the threaded shaft is, in particular, 8.1 mm,

and the diameter at the opposite end has a size of about 7.7 mm.

The screw head 101 includes a recess 116 (Fig. 4) for a turning tool for turning the screw into the parts to be joined. The recess 116 is preferably formed as an interior square. But it is also within the scope of the invention that the screw head be equipped with a recess, which can serve for accepting a common turning tool, where the turning tool may be fashioned as a screw driver for slotted-head screws or even as a hex-head screw driver. The screw head in accordance with Fig. 1 can, of course, have this configuration.

When the screw is screwed in, the configuration of the individual threaded sections is such that the thread section 105 is located preferably exclusively in the forward part to be joined as viewed in the direction in which it is screwed in, and the screw section 107 is located preferably exclusively in the rearward part to be joined when viewed in the direction in which it is screwed in. Pre-drilling of the parts to be joined is not required in the case of the screw according to the invention.

WHAT IS CLAIMED IS:

1. A self-tapping screw comprising:

a screw head;

a screw shaft adjacent to the screw head;

a screw tip; and

wherein a first and second thread sections have been formed on the screw shaft and are separated by a thread-free section, and the threads of the first and second thread sections having an opposite pitch, and wherein an outer thread diameter of the first thread section near the screw head is smaller than an outer thread diameter of the second thread section near the screw tip and where the first and second thread sections have the same root diameter.

2. Self-tapping screw according to claim 1, characterized in that a pitch angle of the first and second thread sections is of equal size.

3. Self-tapping screw according to claim 1, characterized in that a pitch angle of the first and second thread sections is of a different size.

4. Self-tapping screw according to claim 3, characterized in that the pitch of the first thread section near the screw head is smaller than the pitch of the second thread section near the screw tip.

5. Self-tapping screw according to any one of claim 1 to claim 4, characterized in that the length of the first thread section close to the screw tip is about 2.0 to 3.0 times larger than the second thread section near the screw head.

6. Self-tapping screw according to any one of claim 1 to claim 5, characterized in that the screw head is 2 to 3 mm high.

7. Self-tapping screw according to any one of claim 1 to claim 6, characterized in that the thread-free section has a larger diameter than a root diameter of the first and second thread

sections.

8. Self-tapping screw according to any one of claim 1 to claim 7, characterized in that the threads of the second thread section on the screw tip continue to its end.

9. Self-tapping screw according to any one of claim 1 to claim 8, characterized in that the screw head has a circumferential edge on a underside of the screw head, which edge protrudes relative to a surface on the underside of the head.

10. Self-tapping screw according to any one of claim 1 to claim 9, characterized in that the screw head diameter is greater at an end near the thread shaft than a diameter at an opposite end.

11. Self-tapping screw according to any one of claim 1 to claim 10, characterized in that the screw head contains a recess for a turning tool.

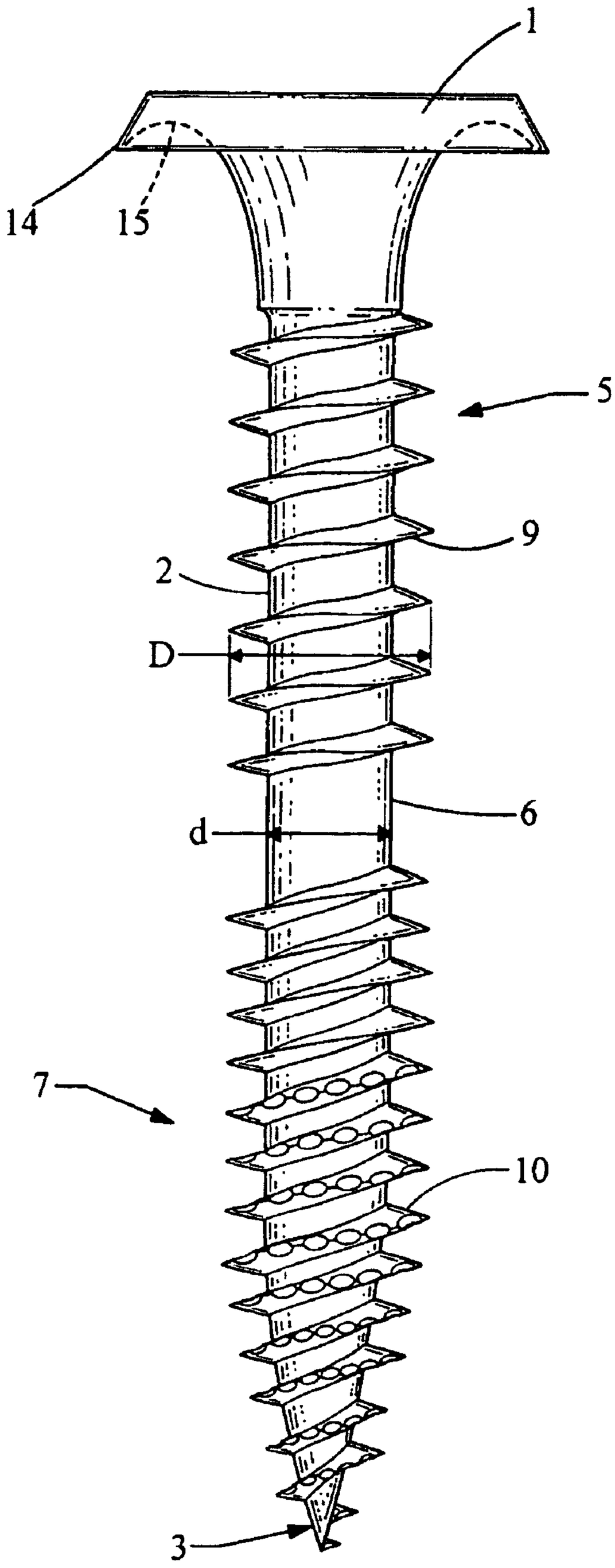


Fig. 1

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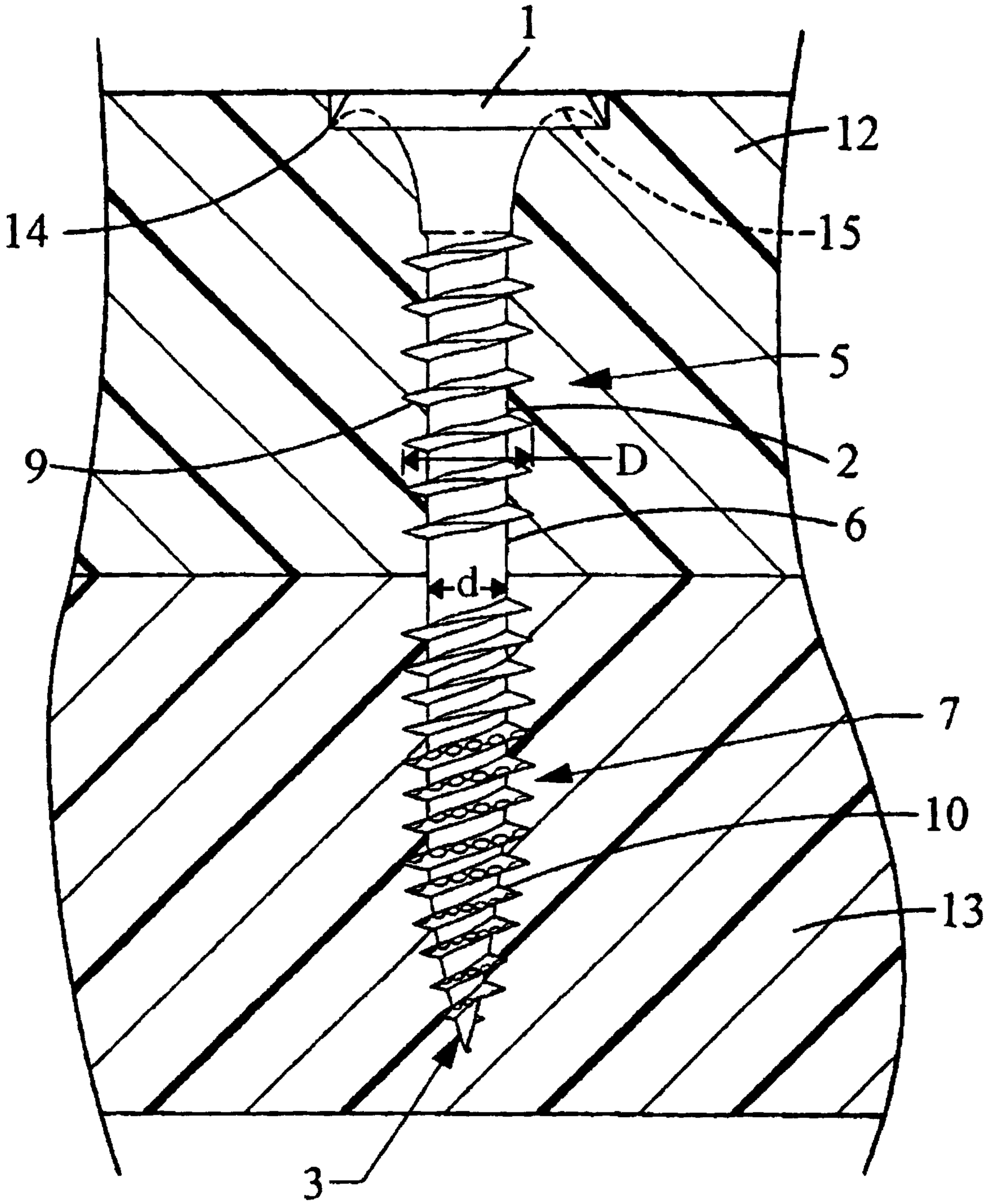


Fig. 2

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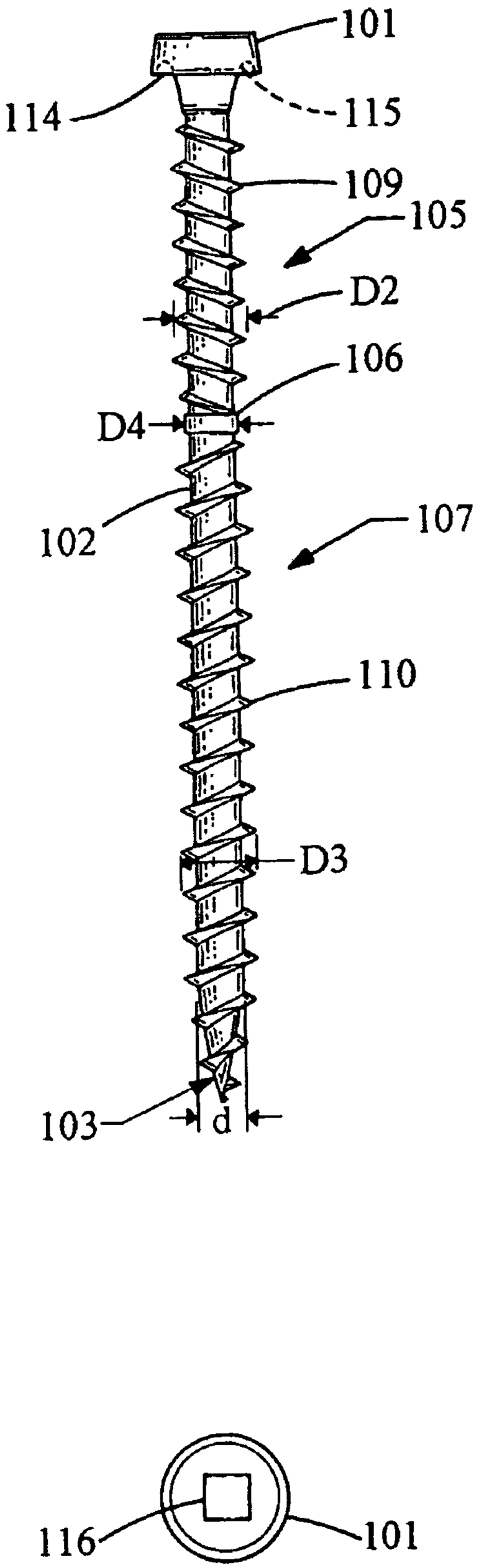
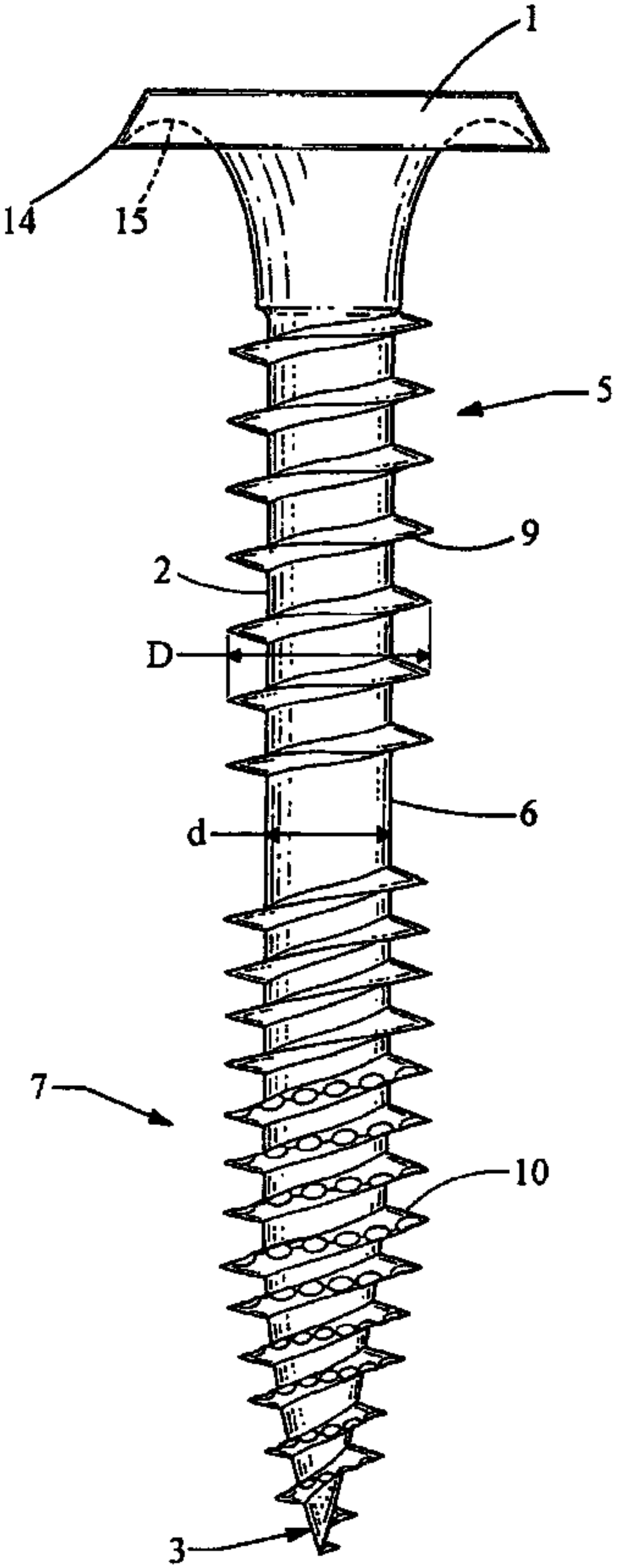


Fig. 3

Fig. 4

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