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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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(54) Title: METAL FRAME MEMBERS FOR USE IN BUILDING CONSTRUCTION

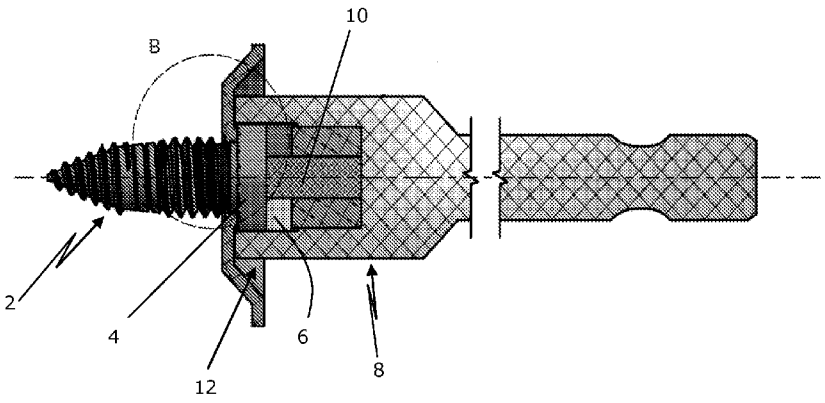


FIGURE 1

(57) Abstract: A metal frame member for use in building construction includes a recess (12) with a hole formed in the recess for receiving a screw (2) for connecting the frame member to a like frame member. The recess includes a boss (16) formed around the periphery of the hole and against which the underside of the head (4) of the screw sits when driven by an external driver tool (8) having a socket (6) within which the head fits. The presence of the boss and the sizing of the driver tool ensures that an outer end of the driver tool is maintained in spaced relationship from the base of the recess externally of the boss. Accordingly possible damage during driving to protective coating on the frame member is avoided.

METAL FRAME MEMBERS FOR USE IN BUILDING CONSTRUCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a frame member of steel or other metal for use in building construction and more particularly to the profiling of a dimple or recess pressed into the frame member to receive a screw for fastening together to such frame members.

2. Description of the Prior Art

In building construction involving the use of steel frames, particularly the construction of domestic housing (but not restricted to that), steel frame members are typically fastened together using self-tapping screws driven into holes pre-formed in the frame members. Usually, the hole is formed within a dimple or recess pressed into the frame member so that the head of the screw sits within the recess. Although the head sits within the recess, desirably the head itself is of relatively low profile or depth so that it does not project beyond the surface of the frame member. The reason for this is to enable drywall cladding, plasterboard for example, to be fixed directly to the surface of the frame without the heads of the fasteners forming unsightly bulgers and bumps in the cladding. Similar considerations apply to the fixing of other components in the structure such as window and door lintels and bracing straps. Existing screw fasteners for this purpose usually have a head formed with an internal drive recess to receive a power driven driver tool. There are a number of commonly available internal drive systems such as Phillips, Torx and internal hex and which system is selected is essentially is a matter of design choice. With a low profile head specifically designed for the purpose discussed above, the depth of the internal drive recess is inherently restricted due to the reduced depth of the head. This has a weakening effect on the driver tool as the load bearing surfaces are reduced and this, in turn, increases the load per unit area resulting in an increase in driver wear and an increased tendency for driver breakage. It can also increase the tendency of the driver tool to "cam out" of the drive recess under the effect of driving torque when the torque inserts a greater force tending to dislodge the tool from the recess than that being applied to retain the tool in the recess.

In order to mitigate that problem we have proposed in our co-pending Australian Patent Application 2012216330 a screw with a drive configuration which provides more reliable engagement between the driver tool and screw head even when the screw head is of low profile form. More particularly the aforesaid application provides a screw fastener having a peripheral surface of hexagonal or other configuration for cooperation with an external driver tool, the head including an axially-directed hole for receiving an axially-directed pin of the driver tool whereby engagement of the pin within the hole acts to maintain the driver tool in engagement with the screw head during driving of the screw.

Although the screw configuration just described provides a more reliable engagement between the driver tool and screw head irrespective of whether or not the screw head is of low profile, the use of an external driver tool, i.e. one which engages the shaped peripheral surface of the head, in the fastening situation as described earlier can result in the outer axial end face of the driver tool coming into contact with the surface of the pressed recess in the frame member during driving of the screw. This may result in damage to, or removal of, protective coating on the steel section in the part of the pressed recess externally of the screw head leading to the possibility of corrosion in that part.

SUMMARY OF THE INVENTION

In accordance with the present invention, the effect discussed in the preceding paragraph is mitigated by forming in the base of the pressed recess a projecting boss surrounding the screw-receiving hole whereby the screw driven into the hole engages the boss at the underside of its head. As a consequence, in its fully fastened position the underside of the screw head firmly seated against the boss actually sits proud of the remainder of the base of the recess externally of the boss to ensure that during driving of the screw the axial end face of the driver tool will also sit proud of and thereby not engage and damage corrosion protection present on the section.

According to the present invention there is provided a metal frame member for use in building construction, the frame member including a recess with a hole formed in the recess for receiving a screw for connecting the frame member to a like frame member with the head of the screw being within the recess, wherein the recess includes a boss formed

around the periphery of the hole and against which the underside of the head of the screw sits when driven by an external driver tool having a socket within which the head fits whereby the presence of the boss ensures that an outer end of the driver tool is maintained in spaced relationship from the base of the recess externally of the boss.

Further according to the present invention, there is provided a system comprising a metal frame member defined above, a screw for connecting the frame member to a like frame member by application through aligned holes in aligned recesses of the two frame members, and a driver tool for driving the screw, wherein the screw head has an outer diameter greater than the outer diameter of the boss and less than the diameter of the base of the recess, the screw having an outer periphery configured for driving engagement with the driver tool when seated within a socket of the driver tool, and the axial projection of the boss in relation to the configuration of the driver tool is such that during driving of the screw no part of the driver tool is in engagement with the surface of the recess.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in further detail by way of example only with reference to the accompanying drawings in which:

Figure 1 shows schematically a screw and associated driver tool according to our co-pending application 2012216330 used in conjunction with a shaped recess of a metal frame member in accordance with the preferred embodiment of the present invention;

Figure 2 shows an enlarged detail B of Figure 1;

Figure 3 shows an enlarged detailed C of Figure 2; and

Figure 4 shows a part of the frame member including the shaped recess.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a screw 2 substantially as described in our co-pending application 2012216330 with a head 4 having an outer periphery preferably of hexagonal form. The

head is shown sitting within a correspondingly shaped drive socket 6 of driver tool 8, the socket having an axially-directed pin 10 which engages within the head 6, all as described in our earlier application as aforesaid. Figure 1 also shows the recess 12 pressed into the frame member and in which the head 4 of the screw sits. Although not shown in Figure 1, in practice two such frame members are connected by assembling the two frame members so that the recess of the forward frame member sits within that of the rear frame member and then driving the screw, which is a self-tapping screw, through the aligned holes of the two members.

It will be seen from the views of Figures 2 to 4 that the recess 12 in the zone of the hole is shaped to provide at the inside face of the recess a projecting lip or boss 16 against which the underside of the screw head is driven in its fastened state. Radially outwardly of the boss 16, the recess 12 has a flat base 20 and an inclined peripheral wall 22. It will be seen from Figure 3 that the outer diameter of the boss 16 is less than the outer diameter of the screw head and as a consequence the boss will not be contacted by any part of the driver tool during driving of the screw. It should also be noted that the outer diameter of the driver tool 8 is less than the outer diameter of the base 20 of the recess (see Fig. 2) to ensure that the axial end face of the driver tool remains clear of the peripheral wall of the recess during driving. Due to the presence of the boss 16 the axial end face of the driver is also maintained clear of the base 20 of the recess externally of the boss during driving as can be seen from Figures 2 and 3; Figure 3 shows the clearance D between the axial end face of the driver tool and the base 20 of the recess. With this configuration the driver tool is kept out of contact with any part of the recess during driving. It will be appreciated that the effect just described does require the socket 6 of the driver tool to be configured in relation to the depth of the screw head 4 to ensure that when the head is seated within the socket, the cooperation between the socket and the head does not permit the driver tool to be pushed axially relative to the head beyond the engagement position shown in Figures 1 to 3.

The boss 16 can readily be formed by pressing as part of the actions involved in pressing the recess in the frame member and punching the associated hole

In practice, the projection P of the boss 16 (see Figure 3) beyond the base 20 of the recess does not need to be particularly large and for a typical screw as may be used in coupling together frame members used in metal frame construction of domestic buildings (10g to ½" and M4.8 to M10) the projection P can be as little as 0.5mm. Particularly advantageously the design of the screw head is matched to the design of the recess (or vice versa) to ensure that when the screw is fully driven and the underside of the screw head is seated against the boss the screw head does not project outwardly beyond the outer surface S (see Figure 4) of the frame member. Moreover, the sizing of the driver tool and of its socket needs to fulfil the criteria discussed earlier to ensure that no part of the driver tool can contact the surface of the recess during driving of the screw. From what has just been said, it will be appreciated that the frame member, screw, and driver tool each form related components of an overall system for connecting metal frame members for use in building construction.

CLAIMS

1. A metal frame member for use in building construction, the frame member including a recess with a hole formed in the recess for receiving a screw for connecting the frame member to a like frame member with the head of the screw being within the recess, wherein the recess includes a boss formed around the periphery of the hole and against which the underside of the head of the screw sits when driven by an external driver tool having a socket within which the head fits whereby the presence of the boss ensures that an outer end of the driver tool is maintained in spaced relationship from the base of the recess externally of the boss.

2. A frame member according to claim 1 wherein the recess and the boss around the hole are formed by a pressing action.

3. A system comprising a metal frame member according to claim 1 or claim 2, a screw for connecting the frame member to a like frame member by application through aligned holes in aligned recesses of the two frame members, and a driver tool for driving the screw, wherein the screw head has an outer diameter greater than the outer diameter of the boss and less than the diameter of the base of the recess, the screw having an outer periphery configured for driving engagement with the driver tool when seated within a socket of the driver tool, and the axial projection of the boss in relation to the configuration of the driver tool is such that during driving of the screw no part of the driver tool is in engagement with the surface of the recess.

4. A system according to claim 3 wherein the configuration of the recess including the projecting boss is such that when the screw is in its fully driven position the head of the screw does not project beyond the surface of the metal frame member.

5. A system according to claim 3 or claim 4 wherein the socket includes an axially projecting pin for engagement within an axial recess in the head of the screw.

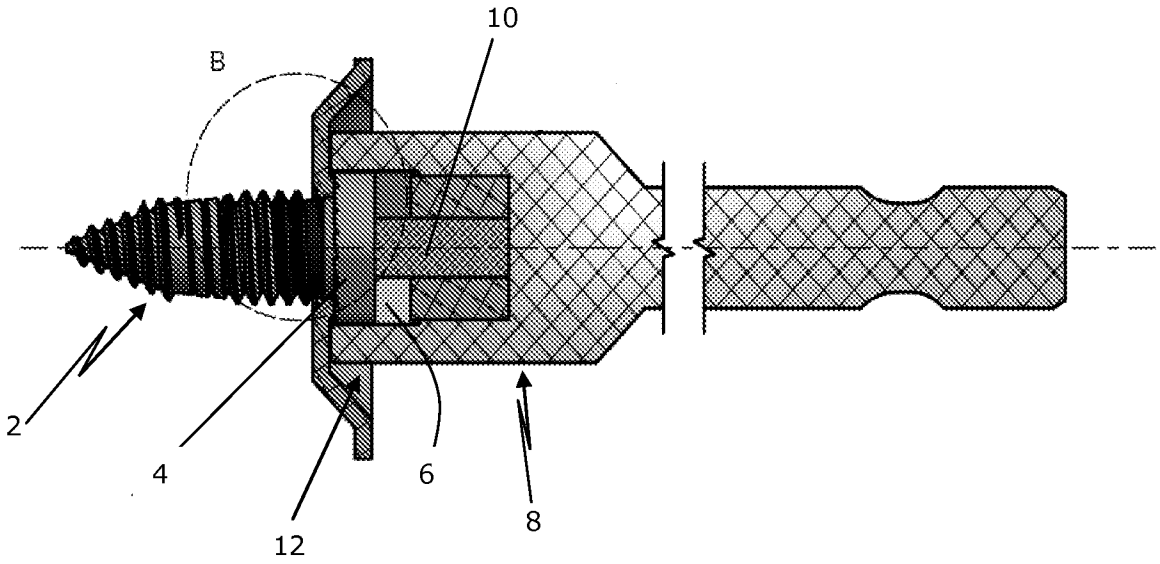


FIGURE 1

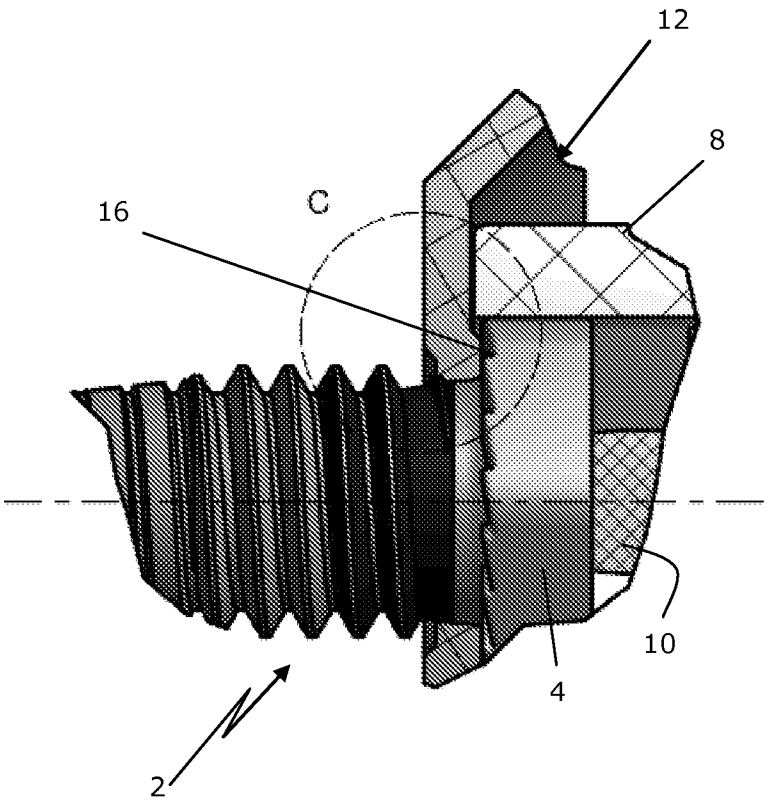


FIGURE 2

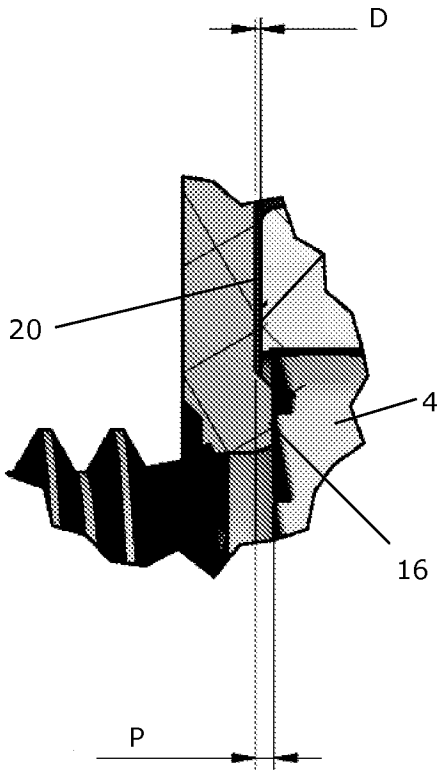


FIGURE 3

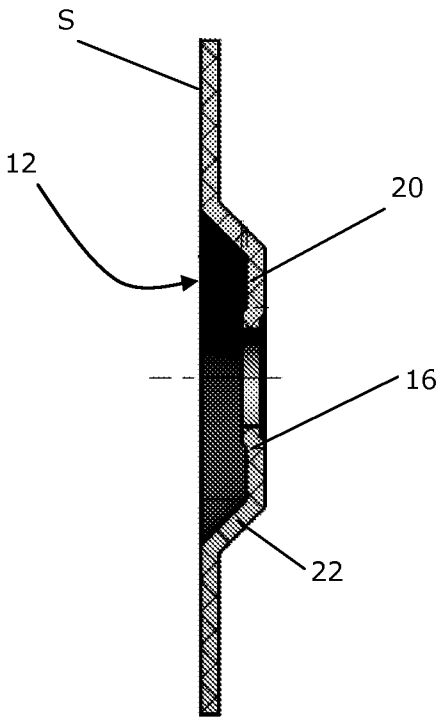


FIGURE 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/031361

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16B5/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 267 760 A1 (SANDEN CORP [JP]) 18 May 1988 (1988-05-18)	1,2
A	column 2, line 9 - line 45; claims 1,4,5; figure 3	3-5

X	DE 10 2009 060127 A1 (PORSCHE AG [DE]) 22 June 2011 (2011-06-22)	1,2
A	paragraphs [0023], [0024]; figures 3,4	3-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 May 2014	11/06/2014

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/031361

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