



Oifig
Na
bPaitinní

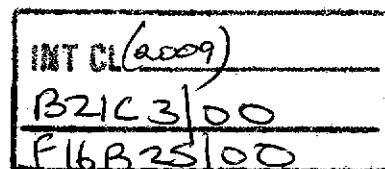
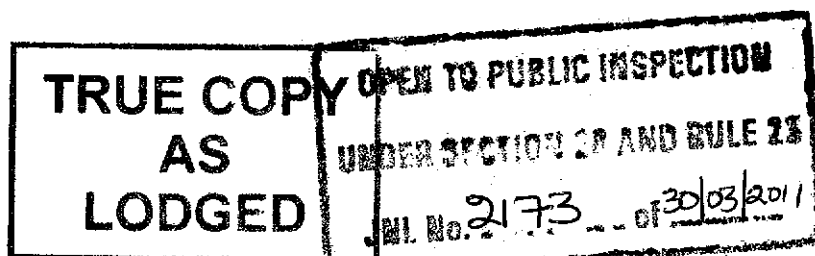
The
Patents
Office

IE 2010/0532

ABSTRACT

A method of forming a hole in a hollow tubular body for receiving a threaded fastener therein, the method comprising advancing a tool in contact with the outer surface of the tubular body to pierce the tube and subsequently extrude or draw the material of the tube inwardly to define a hole of a desired diameter without removing metal from the tubular body; and an apparatus for carrying out the method.

E 100532



1

Method and Apparatus for Forming Holes in a Hollow Tubular Body

This invention relates to method and apparatus for forming one or more holes in a hollow tubular body for receiving threaded fasteners. In particular, the present invention relates to a
5 method and apparatus for forming one or more holes in a hollow fence post or rail for receiving threaded fasteners to secure further components thereto.

Conventional fencing systems and barriers are used in a wide range of applications and exhibit a range of construction techniques and fastening mechanisms. Such systems
10 typically comprise a plurality of spaced apart hollow tubular metal posts to which are attached welded mesh panels formed from steel wire. The mesh panels are typically secured to the posts by clips which are fastened to the posts using threaded fasteners passing through holes formed in the post (typically by drilling) to be secured by threaded bolts on an
opposite side of the post. Further horizontal members may be secured to the posts to extend
15 therebetween to provide further support for the panels and/or to support vertical members or pales. Such bolts are prone to vandalism or unauthorised removal and reduce the security of the fencing.

A more secure form of fastening may be provided by inserting threaded inserts into holes in
20 the posts into which threaded fasteners can be inserted. However, such threaded inserts are costly and are time consuming to insert into the posts during the manufacturing process.

According to a first aspect of the present invention there is provided a method of forming a hole in a hollow tubular body for receiving a threaded fastener therein, the method
25 comprising advancing a tool in contact with the outer surface of the tubular body to pierce the tube and subsequently extrude or draw the material of the tube inwardly to define a hole of a desired diameter without removing metal from the tubular body.

The extruded sides of the hole provide sufficient depth to support a threaded fastener therein
30 without requiring the use of inserts or additional fastening means.

Preferably the method further comprises inserting a mandrel into the tubular body prior to advancing said tool whereby the mandrel supports the wall of the tubular body adjacent said hole during the formation of said hole.

Preferably the method comprises providing an axially extending slot in the mandrel positioned to be aligned with the position of the hole formed in the tubular body when the mandrel is inserted into the tubular body to provide clearance to allow the mandrel to be
5 removed from the tubular body once said hole has been formed.

The method may comprise indexing said tool and mandrel axially with respect to the tubular and repeating said hole forming operation to form a series of axially spaced holes along at least a portion of the length of the tubular body.

10

The method may comprise the step of tapping or otherwise forming a thread in said hole following said extrusion or drawing process,. In an alternative embodiment, a thread may be formed during said extrusion or drawing process, for example by providing thread forming formations on the outer surface of the tool and rotating said tool as it is advanced into the
15 tubular body. Alternatively the hole may be formed to hole receive a suitable self tapping fastener.

According to a further aspect of the present invention there is provided an apparatus for forming a hole in a hollow body for receiving a threaded fastener, said apparatus comprising
20 a tool mounted to be advanced radially against an outer surface of the tubular body to pierce the tube and subsequently extrude the material of the tube inwardly to define a hole of a desired diameter without removing metal from the tubular body.

Preferably the apparatus further comprises a mandrel arranged to be inserted into the tubular
25 body from an open end thereof to support supports the wall of the tubular body adjacent said hole during the formation of said hole. The mandrel may be dimensioned to engage the inner walls of the tubular body to resist deformation of the tubular body during formation of said hole in the tubular body by said tool.

30 Preferably the mandrel is provided with an axially extending slot positioned to be aligned with the position of the hole formed in the tubular body by said tool when the mandrel is inserted into the tubular body to provide clearance to allow the mandrel to be removed from the tubular body once said hole has been formed.

The mandrel may be mounted at the end of a rod to allow the mandrel to be inserted into and advanced along the interior of the tubular body. Preferably the mandrel and tool are linked such that the tool remains aligned with a corresponding aperture formed in the mandrel for receiving the tool once it has been pierced through the tubular body. Said aperture may be
5 provided in a hardened insert located on the mandrel. The mandrel and tool and/or the tubular body may be mounted in the apparatus to be indexed axially along the length of the tubular body to allow a series of holes to be formed sequentially along the length of the tubular body. A plurality of piercing tools may be provided axially spaced apart to simultaneously form a plurality of holes in the tubular body.

10

The tool may comprise an elongate member mounted to be reciprocated in a direction substantially transverse to the longitudinal axis of the tubular body. A tap may be provided for tapping a thread in said hole subsequent to formation of the hole by said tool. Alternatively, the tip and/or sides of the tools may be provided with thread forming
15 formations and the tool may be adapted to be rotated as it is advanced into the side of the tube to simultaneously form a thread in the hole as the hole is formed. Alternatively the tool may be dimensioned to enable the hole receive a suitable self tapping fastener.

An embodiment of the present invention will now be described, by way of example only,
20 with reference to the accompanying drawing, comprising a perspective view of a hole forming apparatus according to an embodiment of the present invention.

As shown in the drawing, an apparatus for forming one or more holes 4 in a square section hollow steel fence post 2 for receiving a threaded fastener comprises a piercing tool 10
25 adapted to be driven against a side face of the post 2 in a direction transverse to the longitudinal axis of the post 2 to pierce the post 2 and subsequently extrude or draw the material of the post inwardly to form a hole 4 therein of a predetermined diameter without removing material from the post.

30 The tool 10 forms a hole having sidewalls of an increased depth compared to the thickness of the material of the post 2, enabling the hole 4 to support a threaded fastener without requiring an additional threaded insert.

The apparatus further comprises a mandrel 20 insertable into an open end of the post 2 to engage and support the side walls of the post 2 during formation of a hole 4 therein by the piercing tool 10 such that walls of the post 2 are not crushed or excessively deformed by the action of the piercing tool 10. The mandrel 20 has an insert 22 provided in side wall thereof,
 5 the insert having an aperture formed therein to receive the end of the piercing tool 10 when it is pushed through the side of the post 2.

The piercing tool 10 comprising an elongate member having a pointed end 12 and a cylindrical body 14 having a diameter corresponding to the diameter of the hole 4 to be
 10 formed.

As shown in the drawing, an elongate slot 24 is provided in the mandrel extending from the insert 22 to a distal end of the mandrel 20 to provide clearance for the hole once formed such that the mandrel 20 can be removing from the post once one or more holes have been
 15 formed therein. Without the slot 24, the extruded sides of the hole 4 would prevent removal of the mandrel 20 from the post 2. Further slots 26,28,30 are provided in the remaining faces of the mandrel 20 to allow the post 2 to be rotated once one or more holes 4 have been formed in a first side and the mandrel 20 to be reinserted to form one or more holes 4 in a further wall of the post 2, the further slots 26,28,30 providing clearance for the holes already
 20 formed in the post.

The mandrel 20 is mounted on the end of an elongate pole 32 to allow the mandrel 20 to be inserted into the post 2 to the depth required for the formation of a hole 4 therein at the desired position.

25

The piercing tool 10 and mandrel 20 may be mounted in a machine whereby the piercing tool 10 may be mounted in a press to be driven into the post 2 to form holes 4 therein, the mandrel being mounted to be inserted into the post 2 to a depth such that the insert 22 in the mandrel 20 is aligned with the piercing tool 10 and subsequently withdrawn from the post
 30 following formation of a hole 4 therein. The machine may support the post 2 in a position with respect to the piercing tool 10 and mandrel 20 to form a hole at a predetermined location and may be adapted to axially move the post 2 with respect to the piercing tool 10 and mandrel 20 such that a series of holes can be consecutively formed along the length of

the post 2 at predetermined spacing. The machine may be further adapted to rotate the post 2 such that a row of holes 4 can be sequentially formed in each side of the post 2.

As shown in the drawing, the holes 4 may be utilised to insert threaded fasteners 8 to secure
5 clips 6 to the post for securing welded mesh fencing panels to the post 2.

Self tapping threaded fasteners may be inserted into the holes. Alternatively the hole may be threaded by a suitably dimensioned tap following formation of the hole. In an alternative embodiment, the piercing tool 10 may be adapted to cut a thread in the hole during
10 formation of the hole. For example, the outer surface of the piercing tool 10 may be adapted to comprise a tap and may be arranged to be rotated as it is forced into the post to cut a thread simultaneously as the hole is formed.

The apparatus may be utilised to form holes one or both of opposing sides of a horizontal
15 bar of a fence, adjacent a vertically extending through aperture extending through upper and lower sides of the bar for receiving a vertical fence railing therethrough whereby the railing may be retained in position within the horizontal bar by means of a fastener extending through said one or both holes to engage or pass through the railing.

20 The invention is not limited to the embodiment(s) described herein but can be amended or modified without departing from the scope of the present invention.

Claims

1. A method of forming a hole in a hollow tubular body for receiving a threaded fastener therein, the method comprising advancing a tool in contact with the outer surface of the tubular body to pierce the tube and subsequently extrude or draw the material of the tube inwardly to define a hole of a desired diameter without removing metal from the tubular body.
2. A method according to claim 1, wherein the extruded sides of the hole provide sufficient depth to support a threaded fastener therein without requiring the use of inserts or additional fastening means.
3. A method according to claim 1, which comprises inserting a mandrel into the tubular body prior to advancing said tool whereby the mandrel supports the wall of the tubular body adjacent said hole during the formation of said hole.
4. A method according to claim 2, which comprises providing an axially extending slot in the mandrel positioned to be aligned with the position of the hole formed in the tubular body when the mandrel is inserted into the tubular body to provide clearance to allow the mandrel to be removed from the tubular body once said hole has been formed.
4. A method according to claim 2, which comprises indexing said tool and mandrel axially with respect to the tubular and repeating said hole forming operation to form a series of axially spaced holes along at least a portion of the length of the tubular body.
5. A method according to claim 1, which comprises the step of tapping or otherwise forming a thread in said hole following said extrusion or drawing process,.
6. A method according to claim 1, which comprises forming a thread by providing thread forming formations on the outer surface of the tool and rotating said tool as it is advanced into the tubular body.

7. An apparatus for forming a hole in a hollow body for receiving a threaded fastener, said apparatus comprising a tool mounted to be advanced radially against an outer surface of the tubular body to pierce the tube and subsequently extrude the material of the tube inwardly to define a hole of a desired diameter without removing metal from the tubular body.
8. An apparatus according to claim 7, which comprises a mandrel arranged to be inserted into the tubular body from an open end thereof to support supports the wall of the tubular body adjacent said hole during the formation of said hole.
9. An apparatus according to claim 8, wherein the mandrel is dimensioned to engage the inner walls of the tubular body to resist deformation of the tubular body during formation of said hole in the tubular body by said tool.
10. An apparatus according to claim 8, wherein the mandrel is provided with an axially extending slot positioned to be aligned with the position of the hole formed in the tubular body by said tool when the mandrel is inserted into the tubular body to provide clearance to allow the mandrel to be removed from the tubular body once said hole has been formed.
11. An apparatus according to claim 8, wherein the mandrel is mounted at the end of a rod to allow the mandrel to be inserted into and advanced along the interior of the tubular body.
12. An apparatus according to claim 8, wherein the mandrel and tool are linked such that the tool remains aligned with a corresponding aperture formed in the mandrel for receiving the tool once it has been pierced through the tubular body.
13. An apparatus according to claim 12, wherein said aperture is provided in a hardened insert located on the mandrel.
14. An apparatus according to claim 8, wherein the mandrel and tool and/or the tubular body are mounted in the apparatus to be indexed axially along the length of the

tubular body to allow a series of holes to be formed sequentially along the length of the tubular body.

15. An apparatus according to claim 7, wherein a plurality of piercing tools is provided axially spaced apart to simultaneously form a plurality of holes in the tubular body.
16. An apparatus according to claim 7, wherein the tool may comprises an elongate member mounted to be reciprocated in a direction substantially transverse to the longitudinal axis of the tubular body.
17. An apparatus according to claim 7, wherein a tap is provided for tapping a thread in said hole subsequent to formation of the hole by said tool.
18. An apparatus according to claim 7, wherein the tip and/or sides of the tool is provided with thread forming formations and the tool is adapted to be rotated as it is advanced into the side of the tube to simultaneously form a thread in the hole as the hole is formed.

