

PATENT SPECIFICATION

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(54) SCREW FIXING /

(71) We, BICC LIMITED, a British Company, of 21 Bloomsbury Street, London WC1B 3QN, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of making a screw fixing of the kind in which a screw (or threaded bolt) screws into a female threaded member (a nut) and attaches brackets or other fittings to channels of the kind (for example that sold by the Applicants through their subsidiary BICC Components Ltd. under the Trade Mark "Leprack" as Leprack channel) having inturned flanges at the free ends of the limbs of the channel, hereinafter called "slotted channels". Fixings commonly require to be made to a slotted channel after the channel has been fixed, base down, to a wall or other structural member. Access to the nut or the bolt head in fixings of this kind prevented by the presence of the channel member. Current standard practice is to pass a spring-backed rectangular nut (usually with two rounded corners) through the open slot between the inturned flanges and then rotate it through 90° to engage behind those flanges, the spring serving to bias the nut into contact with the flanges and so hold it against sliding along the channel until the associated screw is in place, although occasionally the arrangement has been reversed with a specially shaped bolt head in the channel and the nut on the accessible side of the fitting.

Under normal circumstances this system works well, but in adverse conditions, e.g. when the operative is working near the limit of his reach, there may be difficulty in placing the nut in precisely the required position, so that it may take several presentations to get the screw home, and occasionally the nut may be displaced from the channel; nuts may sometimes (especially in cold conditions) also be dropped before reaching their intended positions in the channel.

In accordance with the present invention a method of making a screw fixing comprises presenting to a slotted channel member a fitting having a screw pre-inserted through a clearance hole therein and having a nut threaded on it, either the screw head or the nut constituting an abutment member; passing the abutment member through the slot; rotating the screw or the nut (which ever remains accessible) in the tightening direction, the screw and the nut being engaged by a tubular member which surrounds the screw shank, the tubular member offering resistance to, but not preventing relative rotation so that the screw and the nut rotate together until the abutment member engages the side walls of the slotted channel member to prevent it rotating further; and continuing to rotate the screw or the nut, as the case may be, in the same direction so as to draw the nut towards the screw head until an abutment surface on the abutment member engages inside the flanges defining the slot in the channel member.

The invention also includes a screw fixing made by the method described, and a device for making a screw fixing.

Preferably the abutment member has an approximately rectangular shape with those two opposite corners which move towards a position that previously lay inside the abutment member when the abutment member is rotated with respect to the nut or the screw head, as the case may be, in the direction that draws the nut towards the screw head rounded or otherwise relieved so as to lie wholly within an imaginary cylinder concentric with the screw axis and having a diameter equal to the length of the long side of the rectangle.

The resistance to screwing up that is required will vary with the particular application and especially with the size of the screw, but for most structural applications we prefer that the resistance is great enough to prevent tightening by hand so that the use of a spanner or other suitable tool would be

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essential. Alternatively the resistance may be small enough so that the nut should be capable of being tightened with the fingers but not without substantial effort.

5 The required resistance can be achieved in various ways, but preferably the tubular member is a tube of stiff but deformable or frangible material which closely surrounds the screw shank and bears on the screw head and the nut. Such a tube may for example be formed (e.g. a flexible plastics injection moulding) having walls which are tapered from one end to the other with the thicker end of the tube bearing on the abutment member, or the tube may be formed of two parts telescoped together but weakly held against axial movement towards one another by friction or an adhesive. Alternatively it may be of cardboard, in which case it can be used once only, or it may be a thin-walled corrugated plastics or metal tube or a helical spring compressible to allow tightening of the nut and screw, in which case it may sometimes be re-usable.

25 Alternatively the tube, instead of bearing directly on the screwhead and the nut, may bear on whichever of those members constitutes the abutment member and on the fitting through which the screw is pre-inserted.

The invention is further illustrated by a description, by way of example, with reference to the accompanying drawings, in which:—

35 Figure 1 is a perspective sketch of a bracket with fixing devices for use in the method of the invention attached,

40 Figure 2 is a diagram showing the shape and function of a nut of one of the fixing devices in Figure 1,

Figure 3 is an enlarged plan of a tapered tube which is part of one of the fixing devices in Figure 1,

45 Figures 4 and 5 are partly sectioned elevations of part of the device in Figure 1, figure 4 showing it as sold and figure 5 showing it partly secured in a slotted channel,

50 Figures 6 and 7 are views similar to figures 4 and 5 respectively of an alternative fixing device for use in the method of the invention.

Figure 1 shows the fixing devices positioned in a bracket 2 ready to attach the bracket so as to form a right-angle joint between two slotted channels 3, 3. Each fixing device 1 comprises an ordinary right-handed hexagonal headed screw 4, a tapered high-density polyethylene tube 5 (shown on a larger scale in Figure 3) and a nut 6; each of the nuts 6 forms the abutment member of its fixing device and (as shown most clearly in Figure 2) has an approximately rectangular shape with two opposite corners 7 and 8 rounded as in usual for nuts used with this type of slotted channel. The bracket 2 is presented to the slotted channels 3, 3 so that

the nuts 6 pass through the slot 9 into the channel. Each screw and nut is then rotated together in the direction indicated by arrow 11 (Figure 2) until the nut 6 reaches the position shown in broken lines, where it is prevented from further rotation by engaging the side walls 13 and 14 of the channel. The ends 12 of the nut are now behind the flanges 15 and 16 defining the slot 9. Grooves 17 (Figures 1 and 4) in the nuts 6 help to locate the nuts on the flanges 15 and 16. Each fixing device 1 can now be tightened by turning each screw head 10 in the direction 11 to attach the bracket 2 to the channel 3; the tapered tube 5 is deformed, as shown in Figure 5, the nut 6 engages the flange 15 of the channel 3, and the tapered tube expands slightly to fill the clearance hole 18 in the bracket 2.

85 The fixing device shown in Figures 6 and 7 is identical except that the tapered tube 5 (Figures 1 and 3 to 5) is replaced by a spring 19 which bears on the nut 6 and the bracket 2.

90 In the examples hereinbefore described the screws and nuts have a right-hand thread. Left-hand threaded screws and nuts could be used, in which case the other two corners of the nut would be rounded.

95 The tapered tube 5 shown in Figures 1 and 3 to 5 has its thicker end abutting the nut 6, so that on tightening the tube expands slightly at the thinner end to fill the clearance hole 18 in the bracket 2 and deforms so as not to obstruct the nut. For ease of assembly or re-assembly the thicker end of the tube 5 is indicated by a spot 20 which may be merely the mark left at the injection port.

100 The invention may simplify assembly work, so reducing its cost; the risk of nuts being dropped (and the consequent risk of injury and/or damage, besides the cost of replacement or retrieval) is considerably reduced; ordering and stockholding in standardised systems is simplified as separate nuts and bolts are eliminated; and the assembly may be cheaper and in some cases more resistant to corrosion as the springs conventionally used with loose nuts (which are relatively expensive and may set up an electrolytic corrosion cell) are unnecessary.

WHAT WE CLAIM IS:—

1. A method of making a screw fixing comprising; presenting to a slotted channel member a fitting having a screw pre-inserted through a clearance hole therein and having a nut threaded on it, either the screw head or the nut constituting an abutment member; passing the abutment member through the slot; rotating the screw or the nut (whichever remains accessible) in the tightening direction, the screw and the nut being engaged by a tubular member which surrounds the screw shank, the tubular member offering resistance to, but not preventing relative rotation so that



essential. Alternatively the resistance may be small enough so that the nut should be capable of being tightened with the fingers but not without substantial effort.

5 The required resistance can be achieved in various ways, but preferably the tubular member is a tube of stiff but deformable or frangible material which closely surrounds the screw shank and bears on the screw head and the nut. Such a tube may for example be formed (e.g. a flexible plastics injection moulding) having walls which are tapered from one end to the other with the thicker end of the tube bearing on the abutment member, or the tube may be formed of two parts telescoped together but weakly held against axial movement towards one another by friction or an adhesive. Alternatively it may be of cardboard, in which case it can be used once only, or it may be a thin-walled corrugated plastics or metal tube or a helical spring compressible to allow tightening of the nut and screw, in which case it may sometimes be re-usable.

25 Alternatively the tube, instead of bearing directly on the screwhead and the nut, may bear on whichever of those members constitutes the abutment member and on the fitting through which the screw is pre-inserted.

The invention is further illustrated by a description, by way of example, with reference to the accompanying drawings, in which:—

35 Figure 1 is a perspective sketch of a bracket with fixing devices for use in the method of the invention attached,

40 Figure 2 is a diagram showing the shape and function of a nut of one of the fixing devices in Figure 1,

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Figure 1 shows the fixing devices positioned in a bracket 2 ready to attach the bracket so as to form a right-angle joint between two slotted channels 3, 3. Each fixing device 1 comprises an ordinary right-handed hexagonal headed screw 4, a tapered high-density polyethylene tube 5 (shown on a larger scale in Figure 3) and a nut 6; each of the nuts 6 forms the abutment member of its fixing device and (as shown most clearly in Figure 2) has an approximately rectangular shape with two opposite corners 7 and 8 rounded as in usual for nuts used with this type of slotted channel. The bracket 2 is presented to the slotted channels 3, 3 so that

the nuts 6 pass through the slot 9 into the channel. Each screw and nut is then rotated together in the direction indicated by arrow 11 (Figure 2) until the nut 6 reaches the position shown in broken lines, where it is prevented from further rotation by engaging the side walls 13 and 14 of the channel. The ends 12 of the nut are now behind the flanges 15 and 16 defining the slot 9. Grooves 17 (Figures 1 and 4) in the nuts 6 help to locate the nuts on the flanges 15 and 16. Each fixing device 1 can now be tightened by turning each screw head 10 in the direction 11 to attach the bracket 2 to the channel 3; the tapered tube 5 is deformed, as shown in Figure 5, the nut 6 engages the flange 15 of the channel 3, and the tapered tube expands slightly to fill the clearance hole 18 in the bracket 2.

70 The fixing device shown in Figures 6 and 7 is identical except that the tapered tube 5 (Figures 1 and 3 to 5) is replaced by a spring 19 which bears on the nut 6 and the bracket 2.

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90 The invention may simplify assembly work, so reducing its cost; the risk of nuts being dropped (and the consequent risk of injury and/or damage, besides the cost of replacement or retrieval) is considerably reduced; ordering and stockholding in standardised systems is simplified as separate nuts and bolts are eliminated; and the assembly may be cheaper and in some cases more resistant to corrosion as the springs conventionally used with loose nuts (which are relatively expensive and may set up an electrolytic corrosion cell) are unnecessary.

WHAT WE CLAIM IS:—

1. A method of making a screw fixing comprising; presenting to a slotted channel member a fitting having a screw pre-inserted through a clearance hole therein and having a nut threaded on it, either the screw head or the nut constituting an abutment member; passing the abutment member through the slot; rotating the screw or the nut (whichever remains accessible) in the tightening direction; the screw and the nut being engaged by a tubular member which surrounds the screw shank, the tubular member offering resistance to, but not preventing relative rotation so that



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the screw and the nut rotate together until the abutment member engages the side walls of the slotted channel member to prevent it rotating further; and continuing to rotate the screw or the nut, as the case may be, in the same direction so as to draw the nut towards the screw head until an abutment surface on the abutment member engages inside the flanges defining the slot in the channel member.

2. A method as claimed in Claim 1 in which the abutment member has an approximately rectangular shape with those two opposite corners which move towards a position that previously lay inside the abutment member when the abutment member is rotated with respect to the nut or the screw head, as the case may be, in the direction that draws the nut towards the screw head rounded or otherwise relieved so as to lie wholly within an imaginary cylinder concentric with the screw axis and having a diameter equal to the length of the long side of the rectangle.

3. A method as claimed in either one of Claims 1 or 2 in which the tubular member is a tube of stiff but deformable or frangible material which closely surrounds the screw shank and bears on the screw head and the nut.

4. A method as claimed in Claim 3 in which the tube is formed of two parts telescoped together, but weakly held against axial movement towards one another by friction or an adhesive.

5. A method as claimed in either one of Claims 3 or 4 in which the tube is a flexible plastics injection moulding.

6. A method as claimed in either one of Claims 3 or 4 in which the tube is made of cardboard.

7. A method as claimed in either one of Claims 3 or 4 in which the tube is made of thin-walled corrugated plastics or metal.

8. A method as claimed in Claim 1 or Claim 2, in which the tubular member is a helical spring which closely surrounds the screw shank, and bears on the screw head and the nut.

9. A method as claimed in Claim 1 or Claim 2 in which the tubular member is a helical spring which closely surrounds the screw shank, and bears on the abutment member and the fitting.

10. A method as claimed in Claim 1 or Claim 2 in which the tubular member is a tube of stiff but deformable or frangible material which closely surrounds the screw shank and bears on the fitting and on the abutment member.

11. A method as claimed in Claim 10 in which the tube is formed of two parts telescoped together but weakly held against axial movement towards one another by friction or an adhesive.

12. A method as claimed in either one of Claims 10 or 11 in which the tube is a flexible plastics injection moulding.

13. A method as claimed in either one of Claims 10 or 11 in which the tube is made of cardboard.

14. A method as claimed in either one of Claims 10 or 11 in which the tube is made of thin-walled corrugated plastics or metal.

15. A method as claimed in Claim 1 or Claim 2 in which the tubular member is a tube which closely surrounds the screw shank and has walls which are tapered from one end to the other with the thicker end of the tube bearing on the abutment member and the thinner end bearing on the fitting, or the screw head or the nut, as the case may be.

16. A method as claimed in Claim 15 in which the tube is a flexible plastics injection moulding.

17. A screw fixing made by the method as claimed in any one of Claims 1 to 16.

18. A screw fixing substantially as hereinbefore described with reference to and as shown in Figures 1 to 5 of the accompanying drawings.

19. A screw fixing substantially as hereinbefore described with reference to and as shown in Figures 6 and 7 of the accompanying drawings.

20. A screw fixing as claimed in Claim 18 or Claim 19 for connecting two slotted channels at right angles.

21. A device for making a screw fixing by the method claimed in Claim 1, comprising a fitting having a screw pre-inserted through a clearance hole therein and having a nut threaded on it, either the screw head or the nut constituting an abutment member shaped to pass through the slot in the slotted channel member, and on rotation to engage the side walls of the slotted channel member, and which on drawing the nut towards the screw head will engage the slotted channel member inside the flanges defining the slot, the screw and the nut being engaged by a tubular member which surrounds the screw shank, the tubular member offering resistance to, but not preventing, relative rotation between the screw and the nut.

22. A device as claimed in Claim 21 in which the abutment member has an approximately rectangular shape with those two opposite corners which move towards a position that previously lay inside the abutment member when the abutment member is rotated with respect to the nut or screw head, as the case may be, in the direction that draws the nut towards the screw head rounded or otherwise relieved so as to lie wholly within an imaginary cylinder concentric with the screw axis and having a diameter equal to the length of the long side of the rectangle.

23. A device as claimed in Claim 21 or Claim 22 in which the tubular member is a



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tube of stiff but deformable or frangible material which closely surrounds the screw shank and bears on the screw head and the nut.

5 24. A device as claimed in Claim 23 in which the tube is formed in two parts telescoped together, but weakly held against axial movement towards one another by friction or an adhesive.

10 25. A device as claimed in Claim 23 or Claim 24 in which the tube is a flexible plastics injection moulding.

15 26. A device as claimed in Claim 23 or Claim 24 in which the tube is made of cardboard.

27. A device as claimed in Claim 23 or Claim 24 in which the tube is made of thin walled corrugated plastics or metal.

20 28. A device as claimed in Claim 21 or Claim 22 in which the tubular member is a helical spring which closely surrounds the screw shank, and bears on the screw head and the nut.

25 29. A device as claimed in Claim 21 or Claim 22 in which the tubular member is a helical spring which closely surrounds the screw shank and bears on the abutment member and the fitting.

30 30. A device as claimed in Claim 21 or Claim 22 in which the tubular member is a tube of stiff but deformable or frangible material which closely surrounds the screw shank and bears on the fitting and the abutment member.

35 31. A device as claimed in Claim 30 in which the tube is formed of two parts telescoped together but weakly held against

axial movement towards one another by friction or an adhesive.

32. A device as claimed in Claim 30 or Claim 31 in which the tube is flexible plastics injection moulding. 40

33. A device as claimed in Claim 30 or Claim 31 in which the tube is made of cardboard. 45

34. A device as claimed in Claim 30 or Claim 31 in which the tube is made of thin-walled corrugated plastics or metal.

35. A device as claimed in Claim 21 or Claim 22 in which the tubular member is a tube which closely surrounds the screw shank and has walls which are tapered from one end to the other with the thicker end of the tube bearing on the abutment member and the thinner end on the fitting, or the screw head or the nut, as the case may be. 55

36. A device as claimed in Claim 35 in which the tube is a flexible plastics injection moulding.

37. A device for making a screw fixing substantially as hereinbefore described with reference to and as shown in Figures 1 to 5 of the accompanying drawings. 60

38. A device for making a screw fixing substantially as hereinbefore described with reference to and as shown in Figures 6 and 7 of the accompanying drawings. 65

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