

SPECIFICATION

Nut

The present invention relates to a nut for use in combination with a clamping bolt. More particularly, it relates to a nut to be tightened to a prescribed limiting torque.

The invention is particularly, but not exclusively, concerned with a nut to be used in combination with a bolt to clamp together a plurality of metal sheets, or a plurality of metal sheets and insulating sheets, to make an electrical connection, as in a distribution bus-bar.

It is necessary to tighten the nut on the bolt with a certain prescribed limiting torque. However, it may sometimes happen that the tightening supposed to have been done with the prescribed torque was in actuality insufficient because the tightening was stopped before it was complete, or that the tightening was omitted inadvertently, or that the tightening becomes loose for some reason or other at a later time. In such a case, the joined parts may become overheated eventually and the bus-bar may develop a short-circuit fault. As it has been impossible hitherto visually to detect insufficient tightening of a nut on a bolt, the only way of inspection has been to confirm the tightening torque of a nut and bolt by checking it with a special torque wrench. Special torque wrenches are expensive, and sometimes give erroneous values. Additionally, the number of work steps increases greatly due to this need for checking.

An object of the invention is to avoid these disadvantages and give a continuous visual identification that the prescribed tightening torque has been applied and that the nut has not been subsequently loosened or over-tightened.

The use of a thermo-label is known for the purpose of keeping a watch for an extraordinary rise of temperature which may occur during use of a part to which the thermo-label has been applied. However such a thermo-label is comparatively small and is difficult to see.

It has a drawback that it impairs the appearance of the part to which labels are attached and it calls for an additional number of work steps for attaching labels. Another object of the present invention is to avoid this drawback and especially to keep a watch on the heating condition of an electrical connection between parts through which there is an electric current flow, by means of a change in colour of a part of the nut which is used to effect the electrical connection.

According to the invention a nut has a tightening end part which is broken-off from the remainder of the nut when a prescribed torque has been reached, a clamping part between said tightening end part and the opposite end of the nut and a sleeve which covers the peripheral surface of said clamping part and engages with it, said tightening end part which is to be broken-off, said clamping part and said sleeve being coloured in different colours respectively for identification

one from another.

The sleeve may be made of or coated with a material which changes its colour at temperature above a predetermined temperature.

Other objects, characteristics and advantages of the present invention will be made clear by the following description with reference to the drawings.

By way of example an embodiment in accordance with the invention will be described with reference to the drawings; but the present invention is not limited to this embodiment.

In the drawings, Figures 1 (a), (b) and (c) are respectively a sectional axial view and both end views of a nut in accordance with the invention, and

Figures 2 (a), (b) and (c) are respectively sections showing three conditions of the nut shown in Figures 1 (a), (b) and (c) in use.

As is shown in Figures 1 (a), (b) and (c), the nut 14 is of the break-nut type. It is made of steel and has the following four parts:— a cylindrical end 15, a hexagonal clamping middle part 16, a circumferential groove of a round section 17 and a hexagonal tightening end 18. These four parts are integrated in one body and the hexagonal tightening end part 18 is not provided with an internal screw-thread, thereby enabling it to be broken off and separated from the part 16 when a prescribed tightening torque has been reached. The peripheral surface, at least, of the middle part 16 is coated with a first colour (e.g. yellow) paint or is otherwise coloured, and the peripheral surface, at least, of the hexagonal end part 18 is coated with a second colour (e.g. red) paint or is otherwise coloured.

Reference 19 denotes a cylindrical sleeve, conveniently made of a plastics material, and an end portion 20, 21 at each end thereof is bent inwardly to engage in the groove 17 against the end surface of the hexagonal clamping middle part 16. The sleeve 19 is coloured a third colour (e.g. blue or green), a colouring material having been added to the plastics material during manufacture of the latter to produce a finished plastics material which is coloured blue or green or other third colour.

Where the nut is made of steel the steel may be given a rust-preventive treatment, such as chromate treatment, for example, and therefore have a yellow surface as a result of that treatment. Thus the part 16 need not be given a subsequent coating of yellow or other first colour. The part 18 will however need to be painted red or other said second colour.

The afore-mentioned three colours, namely red, blue or green and yellow are the colours used most commonly for traffic signals to indicate danger, safety and caution and this is why they have been chosen in the nut provided by the invention, as will be evident from the description hereinafter. However, the colours used in the present invention need not be these specific colours.

Figures 2 (a), (b) and (c) show an application

where the nut provided by the present invention is used with a bolt 22 to clamp together a plurality of metal sheets A, B, C, etc. A flat washer 23 and a spring washer 24 are also shown. Figure 2(a) shows the condition where the afore-mentioned red-coloured hexagonal end part 18 has been turned for tightening by means of an ordinary wrenching tool and been broken off and removed upon attaining the prescribed limiting torque, the blue or green-coloured plastics cylindrical sleeve 17 remaining in position on the part 16. This indicates that the tightening has been effected to the prescribed torque and thus safety has been ensured.

Figure 2(b) shows the condition where tightening has been carried out to some degree but the red-coloured end part 18 still remains in position and has not broken away from the nut, thereby indicating that tightening to the prescribed torque has not been accomplished. That is to say, it indicates that this condition is dangerous.

Figure 2(c) shows the condition where both the red-coloured part 18 and the blue or green-coloured sleeve 19 are not present, the yellow coloured part 16 being visible. This indicates that the red-coloured hexagonal end part 18 has broken away and therefore that the nut has been tightened to the prescribed torque, that subsequently, the blue or green-coloured plastics sleeve 19 has been removed and that the nut may have been loosened or tightened by the hexagonal clamping part 16 for some reason or other. The absence of the sleeve 19 therefore indicates that caution must be used when using a part which has been fixed by the bolt 22 and the nut.

Furthermore, a thermo-paint which changes its colour at temperatures above a prescribed fixed temperature may be used to coat the surface of the plastics sleeve 19 or to colour the plastics material from which the sleeve is made. There will be the following advantage in the conditions shown in Figures 2(a) and (b), where the nut becomes overheated. This could occur where the plates A, B, and C are electric conductor plates.

In the event that the loosening of the bolt 22 and nut 14 occurs, the electrical contact between the electric conductor plates A, B and C may become poor, thereby causing the connection, including the bolt and the nut to become overheated and thereby the blue or green-coloured plastics sleeve 19 will become heated to a temperature above the temperature at which the colour change occurs. The consequent change in colour of the plastics material of the sleeve 19

will therefore become clearly discernible visually from the normal blue or green-coloured plastics sleeves 19 on the nuts at any other connections of the conductor plates or on any other nut which may be nearby. Thus it can be seen that a particular connection has become heated to a dangerous temperature.

As has been stated, the nut in accordance with the invention has a tightening end part 18 which is to be broken-off and removed, a cylindrical end part 15 at the other end, and a plastics cylindrical sleeve 19 which covers the circumference of the hexagonal clamping part 16 between the end parts 15 and 18 and is engaged with it. The tightening part 18 to be broken off and removed, the hexagonal clamping middle part 16 and the plastics sleeve 19 are coloured in different colours for identification. It is consequently easy to tell at a glance whether the nut has been tightened properly or not and whether subsequently the nut has been loosened or over-tightened and a special torque wrench is not required as hitherto. The nut 14, therefore, speeds up the clamping operation, thereby leading to economical assembly parts.

Furthermore, since the plastics sleeve 19 is coloured with a thermo-paint or material which changes its colour at temperatures above a predetermined temperature, it is possible to confirm the perfect tightening of all of the nuts and bolts of an assembly and easily to recognize visually the change of colour due to extraordinary over-heating caused by poor clamping of, for example, electrical connections during use of the circuit including the connection, without particularly, the use of thermo-labels as used hitherto for that purpose.

Claims

1. A nut having a tightening end part which is broken-off from the remainder of the nut when a prescribed torque has been reached, a clamping part between said tightening end part and the opposite end of the nut and a sleeve which covers the peripheral surface of said clamping part and engages with it, said tightening end part which is to be broken-off, said clamping part and said sleeve being coloured in different colours respectively for identification one from another.

2. A nut as claimed in Claim 1 wherein said sleeve is made of or coated with a material which changes its colour at temperature above a predetermined temperature.

3. A nut constructed and arranged substantially as described herein and shown in the accompanying drawings.



where the nut provided by the present invention is used with a bolt 22 to clamp together a plurality of metal sheets A, B, C, etc. A flat washer 23 and a spring washer 24 are also shown. Figure 2(a)

5 shows the condition where the afore-mentioned red-coloured hexagonal end part 18 has been turned for tightening by means of an ordinary wrenching tool and been broken off and removed upon attaining the prescribed limiting torque, the
10 blue or green-coloured plastics cylindrical sleeve 17 remaining in position on the part 16. This indicates that the tightening has been effected to the prescribed torque and thus safety has been ensured.

15 Figure 2(b) shows the condition where tightening has been carried out to some degree but the red-coloured end part 18 still remains in position and has not broken away from the nut, thereby indicating that tightening to the
20 prescribed torque has not been accomplished. That is to say, it indicates that this condition is dangerous.

Figure 2(c) shows the condition where both the red-coloured part 18 and the blue or green-coloured sleeve 19 are not present, the yellow
25 coloured part 16 being visible. This indicates that the red-coloured hexagonal end part 18 has broken away and therefore that the nut has been tightened to the prescribed torque, that
30 subsequently, the blue or green-coloured plastics sleeve 19 has been removed and that the nut may have been loosened or tightened by the hexagonal clamping part 16 for some reason or other. The absence of the sleeve 19 therefore
35 indicates that caution must be used when using a part which has been fixed by the bolt 22 and the nut.

Furthermore, a thermo-paint which changes its colour at temperatures above a prescribed fixed
40 temperature may be used to coat the surface of the plastics sleeve 19 or to colour the plastics material from which the sleeve is made. There will be the following advantage in the conditions shown in Figures 2(a) and (b), where the nut
45 becomes overheated. This could occur where the plates A, B, and C are electric conductor plates.

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50 become poor, thereby causing the connection, including the bolt and the nut to become overheated and thereby the blue or green-coloured plastics sleeve 19 will become heated to a temperature above the temperature at which the
55 colour change occurs. The consequent change in colour of the plastics material of the sleeve 19

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As has been stated, the nut in accordance with the invention has a tightening end part 18 which
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70 parts 15 and 18 and is engaged with it. The tightening part 18 to be broken off and removed, the hexagonal clamping middle part 16 and the plastics sleeve 19 are coloured in different colours for identification. It is consequently easy to tell at
75 a glance whether the nut has been tightened properly or not and whether subsequently the nut has been loosened or over-tightened and a special torque wrench is not required as hitherto. The nut
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85 predetermined temperature, it is possible to confirm the perfect tightening of all of the nuts and bolts of an assembly and easily to recognize visually the change of colour due to extraordinary over-heating caused by poor clamping of, for
90 example, electrical connections during use of the circuit including the connection, without particularly, the use of thermo-labels as used hitherto for that purpose.

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95 broken-off from the remainder of the nut when a prescribed torque has been reached, a clamping part between said tightening end part and the opposite end of the nut and a sleeve which covers the peripheral surface of said clamping part and
100 engages with it, said tightening end part which is to be broken-off, said clamping part and said sleeve being coloured in different colours respectively for identification one from another.

2. A nut as claimed in Claim 1 wherein said
105 sleeve is made of or coated with a material which changes its colour at temperature above a predetermined temperature.

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110 the accompanying drawings.