Fig. 3

Inventor
Hans Pribitzer

By
Wenderoth, Lind & Ponack
Attorneys
The present invention relates to a screw element which may be a nut, a screw head, threaded sleeve or socket and the like, as well as to an appurtenant wrench for turning said screw element.

Known wrenches conventionally comprise two parallel jaw faces which may be applied to two opposed external faces of hexagonal or square screw elements to turn same. When exerting a turning moment through the wrench on the screw element, pressure is transmitted from the jaw faces of a conventional wrench on two edges only of the screw element, i.e. on the weakest points. It thus cannot be avoided that the edges of such screw elements become deformed or rounded off after repeated tightening and loosening operations, whereby are promoted the sliding-off of the applied wrench and, thereby, the occurrence of additional damages. Furthermore, the counter-forces arising on the wrench jaw faces when actuating the wrench, act in the sense of spreading apart the wrench jaws. From this springs the necessity to make such wrenches from special high-strength steel and of relatively large dimensions in order to keep the spreading apart in reasonable limits. In view of the requisite wrench dimensions, a relatively large free space always has to be available about the screw elements so that the wrench can be applied and turned after all. This space has to be considerably larger still when the wrench cannot be applied to or disengaged from the screw element in the axial direction thereof but has to be advanced or retracted in a direction parallel to the jaw faces.

The present invention aims to provide a screw element and a wrench therefor, in which the disadvantages mentioned above are avoided.

The features and advantages of the invention appear from the claims, the following specification and the accompanying drawing in which is illustrated a preferred form of the invention merely by way of example. In the drawing:

FIG. 1 shows a top plan view of a screw element, here a nut, and a wrench engaged to the nut for tightening same.

FIG. 2 is a section on the line II—II of FIG. 1, and

FIG. 3 is an illustration similar to FIG. 1 and shows how the wrench may be laterally disengaged from the nut without requiring any large space.

The nut 1 has basically a cylindrical shape 10 from which radially project six lugs 11 at regular angular spacing of 60°. Said lugs 11 preferably extend, in the axial direction of nut 1, over the entire width L1 of the nut. This width is equal to from 20 to 35% of the diameter of the basic cylindrical form 10 of the nut. Each lug 11 is symmetrical with respect to a radial plane and has two sideflanks 111 and 112 which are parallel to said plane of symmetry. The lugs 11 are in the edge portions of an imaginary regular hexagonal 12 of which the sides contact the basic cylindrical form 10. Hexagon 12 is shown in FIG. 1 by dash lines. Outwardly, the lugs 11 are limited by partial faces 110 of said hexagon 12. Said partial faces enclose an angle of 120°. The length B1 of each lug 11 is in the circumferential direction of nut 1 is from 7 to 15% of the diameter of the cylindrical basic form 10 so that the space between two successive lugs 11 is a multiple of the length B1 of a single lug 11.

The nut configuration described allows of using a conventional wrench 13 for turning the nut, which wrench is shown in FIG. 1 by dash-dot lines. In place of wrench 13, however, a wrench 2 disclosed by the present invention is used to advantage, of which the dimensions are much smaller.

Wrench 2 comprises a hollow cylindrical face 20 which extends approximately through half the circumference of nut 1. The radius of curvature of said face is equal to the radius of an imaginary cylinder which is circumscribed on hexagon 12 and thus comprises the corners of hexagon 12. From face 20 extend radially inwardly a few lugs 21, the number of the latter being less than the number of the lugs 11 of nut 1. In the present case, four lugs 21 are provided on wrench 2. Each lug 21 is symmetrical with respect to a plane standing radially to face 20, and the planes of symmetry of the lugs 21 have the same angular spacings as the planes of symmetry of the lugs 11 of nut 1. The lugs 21 comprise sideflanks 211 and 212 which are substantially parallel to the plane of symmetry of the respective lug 21 so that they may be applied flat to the sideflanks 111 and 112 respectively of the nut lugs, as shown in FIG. 1. At the points of transition from the sideflanks 211 and 212 to the hollow cylindrical face 20 are provided inclined, flat faces 220 of which each is engaged to one of the outwardly facing partial faces 110 of the lugs of nut 1 when wrench 2 is properly set for turning the nut. The lugs 21 of the wrench are limited radially inwardly by hollow cylindrical partial faces 210 of which the radius of curvature is equal to the radius of the cylindrical base shape 10 of nut 1. The length B2 of each lug 21 is from 7 to 15% of the diameter of the cylindrical base shape 10 of the nut and is not substantially different from the length B1 of each lug 11 of the nut. In any case, the space between two consecutive lugs 21 is a multiple of the length B2 of a lug 21 of the wrench. A lug 11 of the nut and a lug 21 of the wrench together have a length which amounts at the most to 30% of the diameter of the cylindrical basic shape 10 of the nut. The width L2 of the lugs 21 of the wrench may be slightly less than the width L1 of the nut lugs 11.

In order to turn nut 1 with the aid of wrench 2 clockwise, the wrench is applied to the nut as shown in FIG. 1 so that the four lugs 21 of the wrench with their sideflanks 212 sit flat against the sideflanks 111 of four of the lugs 11 of the nut. The pressure exerted thereby tends to shear the lugs 11 and 21 from their bases. Appreciable components of forces which might spread apart wrench 2 or deform the lugs 11 and 21, do not arise. Neither is there any risk of wrench 2 sliding incidentally off from nut 1. The four loaded lugs of the nut and wrench are capable to transmit relatively large turning moments without damage. When turning nut 1 counterclockwise, the other sideflanks 211 of the wrench lugs 21 are brought into engagement with the sideflanks 112 of the nut lugs 11.

A great advantage of the wrench 2 is founded in the fact that its head which coacts with nut 1, requires much less space for actuation than a conventional wrench, whereby it is better possible to tighten or loosen the nut at a point difficult of access. A further advantage of the wrench and the nut is that they can be manipulated laterally, i.e. radially of the nut, even when there is not enough room for removing a conventional wrench. After tightening the nut 1, the wrench 2 may be swung away from the nut as shown by the arrow R in FIG. 3, one of the terminal lugs 21 of the wrench serving as fulcrum, and the other terminal lug of the wrench being swung over and away from the cylindrical lug 11 of the nut, as clearly shown in FIG. 3. In like manner, wrench 2 also may be engaged to nut 1.

The advantageous properties resulting from the configuration described with respect to the mechanical
strength of nut 1 and wrench 2, allow for many purposes of application the use of materials of lesser strength such as light metal or plastic, or also a substantial decrease of the dimensions when using high-strength material.

Obviously a screw head, a threaded sleeve or socket or the like may be used in place of the nut described.

I claim:

1. A wrench for use with screw elements in the form of a hexagon having six lugs spaced equally around the circumference thereof on a cylinder which is tangent to said hexagon at the mid point of its sides, said lugs having sideflanks oriented substantially parallel to a radial plane of symmetry of each lug, the space between two consecutive lugs being at least twice the length of one lug, said wrench comprising a wrench head with a concave cylindrical partial face having a radius of curvature which is equal to the radius of an imaginary cylinder which comprises the corners of said hexagon, four projections on said concave face extending a distance equal to the differences of the radii of said cylinders, said projections having sideflanks oriented substantially in radial direction of said concave face and being arranged so that at a time one side flank of all the projections will contact one side flank of four consecutive lugs of the screw element, the space between two consecutive lugs being at least twice the length of one lug, said wrench being applicable directly to said screw element by movement at right angles to its axis.

2. A wrench for use with screw elements in the form of a hexagon having six lugs spaced equally around the circumference thereof on a cylinder which is tangent to said hexagon at the mid point of its sides, said lugs having sideflanks oriented substantially parallel to a radial plane of symmetry of each lug, the space between two consecutive lugs being at least twice the length of one lug, said wrench comprising a wrench head with a concave cylindrical partial face having a radius of curvature which is equal to the radius of an imaginary cylinder which comprises the corners of said hexagon, four projections on said concave face extending a distance equal to the differences of the radii of said cylinders, said projections having sideflanks oriented substantially in radial direction of said concave face and being arranged so that at a time one side flank of all the projections will contact one side flank of four consecutive lugs of the screw element, the space between two consecutive lugs being at least twice the length of one lug, said wrench being applicable directly to said screw element by movement at right angles to its axis.

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