Oct. 10, 1961 H. PRIBITZER 3,003,379

OPEN END SPANNER WRENCH

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Fig. 2

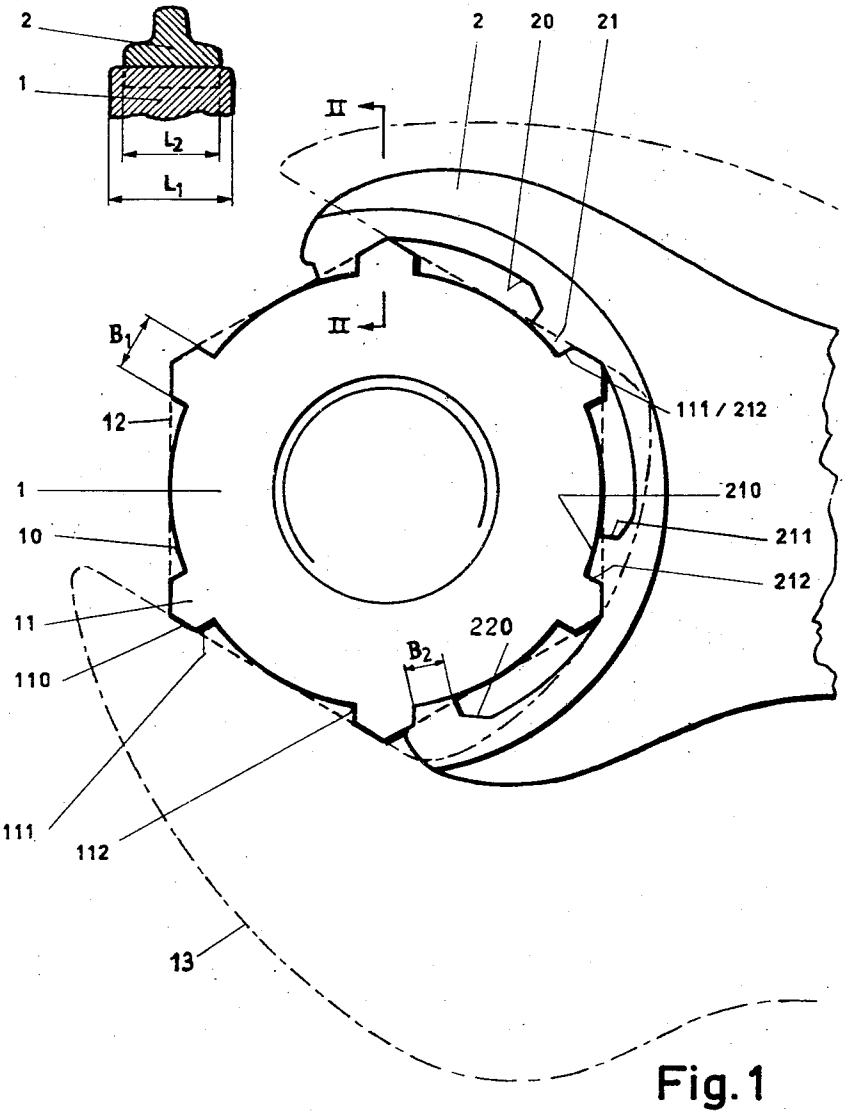


Fig. 1

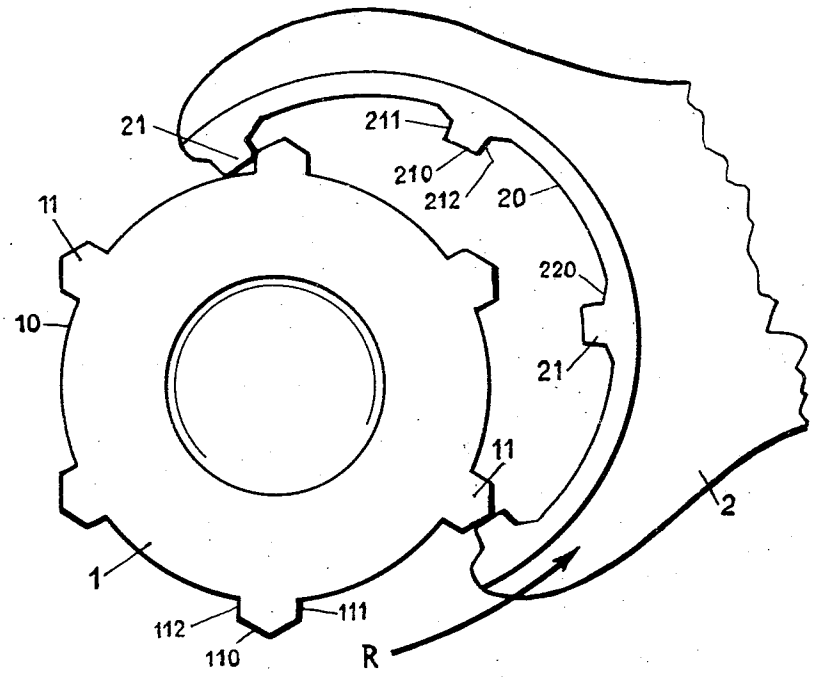
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Fig. 3



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OPEN END SPANNER WRENCH

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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 opposite 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 counterforces 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 spacings of 60°. Said lugs **11** preferably extend, in the axial direction of nut **1**, over the entire width L_1 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 hexagon **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 B_1 of each lug **11** 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 B_1 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-and-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 **20** 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 B_2 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 B_1 of each lug **11** of the nut. In any case, the space between two consecutive lugs **21** is a multiple of the length B_2 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 L_2 of the lugs **21** of the wrench may be slightly less than the width L_1 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** flatly abut against the sideflanks **111** of four 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 the wrench may 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 critical 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 sideflank of four consecutive lugs of the screw element, the space between two consecutive projections being at least twice the length of one projection, the 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 side flanks 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 projections being at least twice the length of one projection, inclined faces interposed between each side flank of said projections and said concave face, said inclined faces contacting said end-faces of the lugs of the screw element when the wrench is applied thereto, the wrench being applicable directly to said screw element by movement at right angles to its axis.

3. 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 edges 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 first and second side flanks oriented substantially in radial direction of said concave face, the space between two consecutive projections being at least twice the length of one projection, the form of all said projections being identical and symmetrical to four planes inclined at an angle of 60° to each other so that at a time the first or the second side flank of all the projections will contact the first or the second side flank of four consecutive lugs of the screw element, respectively, the wrench being applicable directly to said screw element by movement at right angles to its axis.

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