

[54] **END WRENCH WITH RATCHETING CAPABILITIES**

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Related U.S. Application Data

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[52] U.S. Cl. **81/119, 81/186**

[51] Int. Cl. **B25b 13/02**

[58] Field of Search 81/119, 121 R, 121 B, 186

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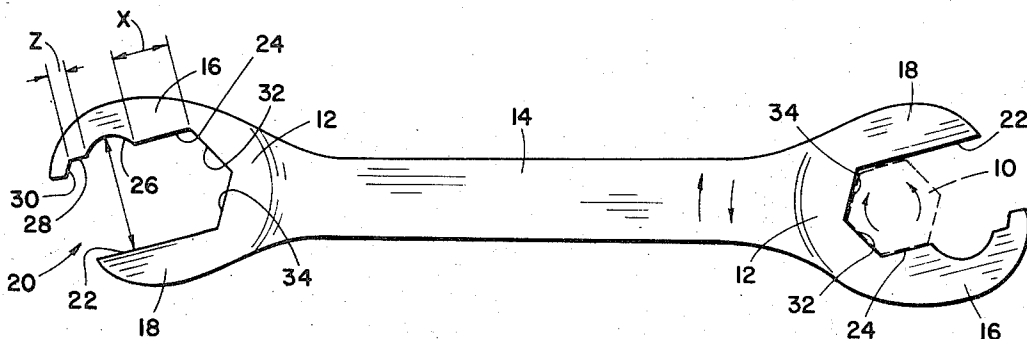
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[57] **ABSTRACT**

A combination open end wrench and ratcheting wrench for a hexagonal member, the wrench having a body and a handle extending in one direction and opposed, spaced apart jaws extending in the opposite direction, one of the jaws being a torquing jaw and the other being a back up jaw, the back up jaw having a planar working surface, the torquing jaw having a breaking surface adjacent the body and parallel to the back up jaw, the torquing jaw having an arcuate surface adjacent the breaking surface and the torquing jaw having a ratcheting surface adjacent the arcuate surface, the ratcheting surface being parallel the back up working surface, the ratchet surface being in length less than one half the length along one side of the hexagonal member to which the wrench is dimensioned to fit, and the torquing jaw having a retaining surface intersecting the ratcheting surface at an angle of 120 degrees.

5 Claims, 9 Drawing Figures



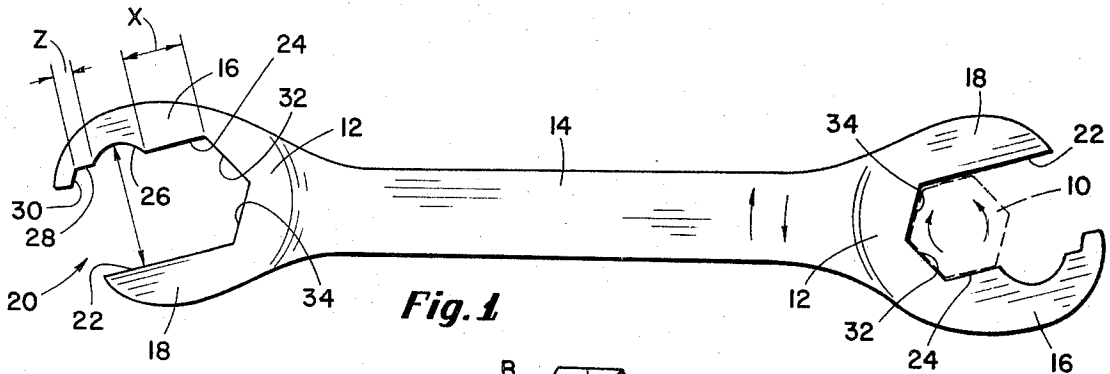


Fig. 1

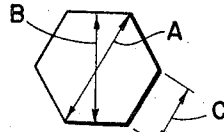


Fig. 8

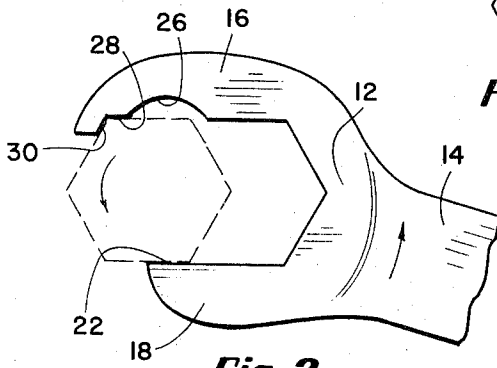


Fig. 2

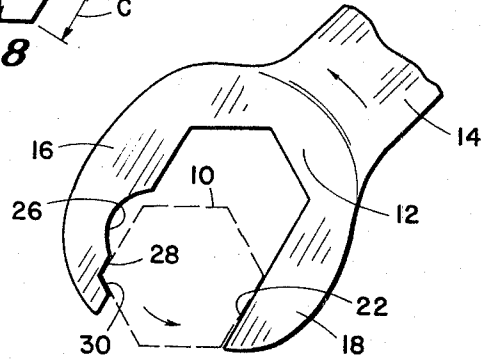


Fig. 3

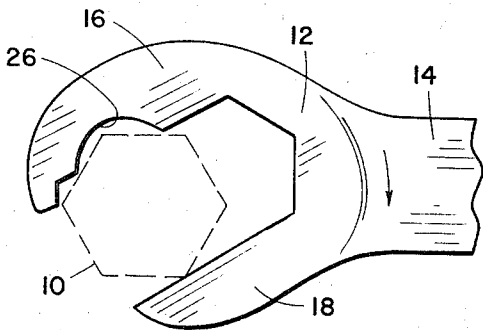


Fig. 4

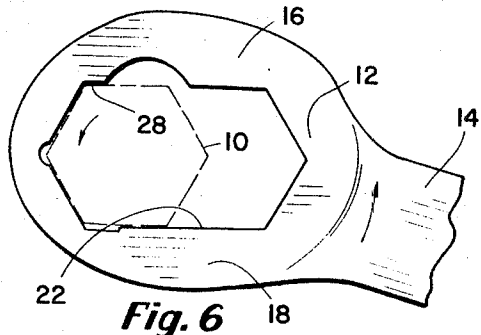


Fig. 6

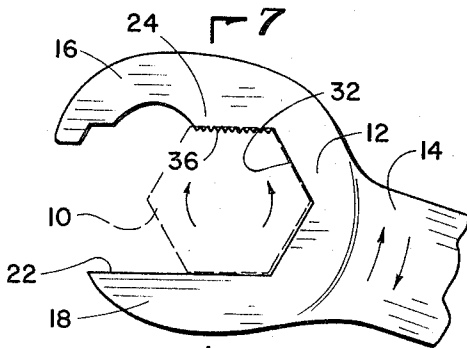


Fig. 5

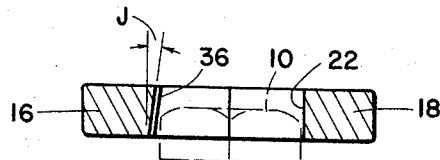


Fig. 7

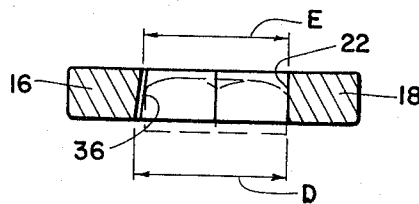


Fig. 7A

END WRENCH WITH RATCHETING CAPABILITIES

CROSS REFERENCE

This is a continuation-in-part application based on application Ser. No. 351,252 filed in the United States Patent Office on Apr. 16, 1973, entitled Reversible Ratcheting Wrench, James P. Evans, Inventor.

BACKGROUND, SUMMARY AND OBJECTS OF THE INVENTION

The above identified co-pending application describes a wrench for rotating hexagonal members. The wrench is further characterized by being of a type which ratchet rotates the hexagonal member to which it is sized, that is, by reciprocation of the handle the wrench can be employed to rotate a hexagonal member without removing contact of the wrench from the member peripheral surface. The pending application is further characterized by providing means wherein the same wrench end may be employed to ratchet rotate a hexagonal member in either direction without removing contact of the wrench from engagement with the member, and without requiring the wrench to be turned over. In one embodiment the wrench employs no moving parts and in another embodiment the wrench includes an adjustable arrangement wherein it may be utilized on a variety of sizes of hexagonal members.

The present invention is directed towards a unique alternate arrangement of the basic concept of the referenced co-pending application. The present invention provides a wrench having means within one end of the wrench, and without employing any movable parts, of applying high torque to a hexagonal member and at the same time, using other wrench surfaces, of ratchet rotating the hexagonal member.

It is therefore an object of this invention to provide an improved wrench for rotating and torqueing hexagonal members.

More particularly, an object of this invention is to provide an improved ratcheting wrench for rotating and torqueing hexagonal members including improved means of engaging a hexagonal member to apply increased torque to the member while at the same time providing means at the same end of the wrench, and without employing movable parts, of ratcheting the hexagonal member.

Still more particularly, an object of this invention is to provide a wrench for rotating a hexagonal member including improved means for engaging the hexagonal member to be rotated in a non-slip arrangement for applying increased torque to a hexagonal member which is "rounded off" or otherwise non-symmetrical.

These and other objects and a better understanding of the invention will be had by reference to the following description and claims, taken in conjunction with the attached drawings.

DESCRIPTION OF VIEWS

FIG. 1 is a plane view of a wrench embodying the invention in the form of a hand wrench having a wrench configuration on each end. The left end of the wrench is dimensioned to engage one size hexagonal member and the right end of the wrench is dimensioned to engage a different, and smaller size, hexagonal member.

FIGS. 2, 3 and 4 show the wrench utilized to ratchet rotate a hexagonal member.

FIG. 5 shows the wrench in the position relative to a hexagonal member for applying maximum torque to the hexagonal member and shows, as an alternate embodiment, means of gripping and applying increased torque to a "rounded off" or otherwise deformed hexagonal member.

FIG. 6 shows an alternate embodiment of the invention wherein the wrench is closed at the end.

FIGS. 7 and 7A are cross sectional views taken along the line 7-7 of FIG. 5 and showing the arrangement wherein the wrench may be provided with improved means of applying increased torque to "rounded off" or non-symmetrical hexagonal members.

FIG. 8 is a plane view of a hexagonal member showing representative dimensions.

DETAILED DESCRIPTION

Referring to the FIG. 8, the outline of a hexagonal member is shown with representative dimensions. The distance between opposed corners is indicated by A, the distance between opposed flat surfaces by B, and the length along one side of the member by C.

FIG. 1 shows an embodiment of the wrench including the wrench configuration of this invention at two ends of the wrench, the right end is dimensioned to receive a smaller size hexagonal member than the left end. Referring to the left end, the wrench includes a wrench body 12 having a handle portion 14 extending therefrom. Extending from the body 12 in the direction generally opposite handle 14 is a torqueing jaw 16 and a back up jaw 18. Torqueing jaw 16 and back up jaw 18 are spaced apart from each other providing an opening 20 therebetween to receive and rotate hexagonal members.

The back up jaw has a planar working surface 22. The torqueing jaw 16 has a surface facing the back up jaw working surface 22 defined by four portions as follows: a breaking surface 24; an arcuate surface 26; a ratcheting surface 28; and a retaining surface 30.

Breaking surface 24 is parallel to back up jaw working surface 22 and spaced from it a distance W equal to and just slightly greater than B for the hexagonal member to which the wrench is sized. The length Y of breaking surface 24 is equal to or at least substantially equal to the length C of the hexagonal member.

Arcuate surface 26, as measured perpendicularly from the back up jaw working surface 22, has a distance Y which is greater than the length A of the hexagonal member to which the wrench is sized.

The ratcheting surface 28 is parallel to back up jaw working surface 22 and thus in the same plane with breaking surface 24. The distance between the back up jaw working surface 22 and the torqueing jaw ratcheting surface 28 is equal to or just slightly greater than the distance B of the hexagonal member to which the wrench is sized. The length of the ratcheting surface 28, as indicated by Z, is less than one half of C.

The outer end of torqueing jaw 16 has a retaining surface 30 which intersects ratcheting surface 28, preferably at an angle of 120°. The retaining surface 30 serves to keep the wrench in contact with the hexagonal member to which the wrench is applied during ratcheting of the hexagonal member, as will be described subsequently.

At the rearward end of the torqueing jaw 16, at the wrench body portion 12, is a torqueing jaw positioning surface 32 which intersects the breaking surface 24 at an angle of 120°, and in like manner, the rearward end of back up jaw 18 is provided with a positioning surface 34 which intersects the back up jaw working surface 22 at an angle of 120°. Surfaces 32 and 34 intersect each other at an angle of 120°. Surfaces 32 and 34 are optional as the surface at the wrench body 12 may be of a U-shaped configuration as is common in many types of open end wrenches presently marketed.

With a hexagonal member 10 received between the torqueing jaw breaking surface 24 and back up jaw working surface 22, as shown in the right hand side of the FIG. 1, the hexagonal member 10 may be rotated in either direction, as indicated by the arrows, by rotation of the handle in either direction. In this mode the wrench functions in exactly the same way as the normal end wrench. Positioning surfaces 32 and 34 also engage the hexagonal member and assist in applying torque to it, however, the primary torque is applied by surface 22 and 24.

When it is desired to ratchet the hexagonal member 10, that is, rotate the member without removing engagement of the wrench from the member, the outer ends of the wrench jaws are utilized as illustrated in FIGS. 2, 3 and 4. In FIG. 2 the hexagonal member 10 is engaged by the ratcheting surface 28 and the back up jaw working surface 22. The torqueing jaw retaining surface 30 maintains the wrench in the correct position relative to the hexagonal member 10. When the handle is rotated in a counterclockwise direction, as indicated by the arrow, the surface 22 and 28 engage the member 10 and rotate it also in the counterclockwise direction, as illustrated in FIG. 3. However, when the handle 14 is rotated in the clockwise direction, as indicated in FIG. 4, no torque is applied to the hexagonal member 10 and the wrench surfaces slide upon the exterior peripheral surfaces of the member. During ratcheting operation the user pulls the wrench lightly in the direction of handle 14 so that the forward surfaces 28 and 30, along with working surface 22, engage the member 10. By alternate rotation of the handle 14 clockwise and counterclockwise, moving at least 60° in each cycle, the member 10 can be rotated without taking the wrench from engagement with the member.

The user can apply as much torque as is necessary to a hexagonal member positioned between breaking surface 24 and back up surface 22 and at the same time, without removing the wrench from engagement with the member, ratchet it to rotate it as desired. FIGS. 2, 3 and 4 show the arrangement for rotating the member in the counterclockwise direction. To rotate the member in the clockwise direction the user simply turns the wrench over. Thus the user can use the wrench to break a bolt or nut from tightened engagement and then ratchet the loosened nut or bolt to completely unthread it. When reversing the procedure, that is when installing a nut or bolt, the user can ratchet it until it approaches the tightened condition at which time the user can engage the bolt between breaking surface 24 and back up jaw working surface 22 to apply the final tightening torque required.

In the illustration of FIG. 1 the wrench is of the open end type. FIG. 6 shows an embodiment of the wrench in which the ends of the jaw are closed making it, in effect, a box end wrench which can perform the dupli-

cate service of applying high torque or ratcheting a hexagonal member.

FIGS. 5, 7, and 7A show an additional alternate arrangement of the invention. As shown in FIG. 5, the breaking surface 24 is formed of notches or serrations which provide sharp, spaced teeth 36. The parallel teeth are perpendicular to the length of the breaking surface 24. In addition, as shown in FIGS. 7 and 7A, the plane of the teeth parallel the length of breaking surface 24 is inclined at an angle J which preferably is between three and ten degrees. The angle J is relative to the perpendicular of the wrench body 12. In this embodiment the spacing between the teeth at one side of the wrench, as indicated by the letter D, is substantially equal to or greater than the distance B of the hexagonal member to which the wrench is sized. The spacing at the other side of the wrench, as indicated by the letter E, is less than B. Thus, the wrench can be forced into a non-slip engagement with hexagonal member 10 by pushing the wrench down onto the member. As shown in FIG. 7A the teeth 36 dig into the member 10 to achieve increased non-slip contact with the member. The arrangement of FIGS. 5, 7 and 7A permits the wrench to engage a hexagonal member with more torque imparting ability than does a wrench with only smooth contacting surfaces. The wrench is thereby adapted to engage hexagonal members which have "rounded off" corners which might otherwise be difficult to remove with a normal end wrench.

The invention fulfills all of the objectives initially set forth. The wrench can be used to apply the maximum torque in a normal end wrench configuration while at the same time providing means of ratcheting a hexagonal member. The embodiments set forth herein are for purposes of exemplification and it is understood that the actual wrench design utilizing the invention may vary considerably in detail and appearance. The wrench has been described with a certain degree of particularity, however, it is understood that the invention is not limited to the embodiments set forth herein but is limited only by the scope of the attached claim or claims, including the full range of equivalency to which element thereof is entitled.

What is claimed:

1. A combination open end wrench and ratcheting wrench for a hexagonal member wherein the member has a width across opposing corners of A, a width across opposing sides of B, and a length along one side of C, the wrench comprising:

a wrench body portion having a handle portion extending in one direction therefrom and opposed, spaced apart jaws extending in the opposite direction, one of the jaws being a torqueing jaw and the other being a backup jaw, the backup jaw having a planar working surface facing the torqueing jaw, the torqueing jaw having:

1. a breaking surface adjacent the body portion parallel the backup jaw and spaced from the backup jaw a distance slightly greater than B, the length of the breaking surface being greater than $\frac{1}{2}$ C,

2. an arcuate surface adjacent said breaking surface, the distance of the arcuate surface from said backup jaw working surface as measured perpendicular the working surface being greater than A,

3. a ratcheting surface adjacent said arcuate surface, the ratcheting surface being parallel to said backup jaw working surface and spaced from it a distance slightly

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greater than B, the length of the ratcheting surface being less than $\frac{1}{2}$ C, and

4. a retaining surface intersecting said ratcheting surface at an angle of 120° , the plane of the retaining surface intersecting the plane of backup jaw working surface at an angle of 60° .

2. A wrench according to claim 1 wherein said torqueing jaw has a positioning surface at the wrench body portion intersecting said breaking surface at an angle of 120° , and wherein said backup jaw includes a positioning surface at the wrench body intersecting said working surface at an angle of 120° , the two positioning surfaces intersecting each other at an angle of 120° .

3. A wrench according to claim 1 wherein said torqueing jaw breaking surface includes a plurality of paralleled grooves therein perpendicular the length of the torqueing jaw, the grooves forming teeth in the

breaking surface which serve to more effectively engage a hexagonal member to be rotated by the wrench.

4. A wrench according to claim 3 wherein the plane of the torqueing jaw breaking surface is inclined towards the plane of the backup jaw working surface, the spacing between said backup jaw working surface and said torqueing jaw breaking surface at one edge thereof being less than B, whereby the breaking surface and the opposed backup jaw working surface may be forced to securely engage the opposite sides of a hexagonal member.

5. A wrench according to claim 1 wherein said torqueing jaw and said back up jaw are closed to each other at the outer ends whereby the wrench is of a box end configuration.

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