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OPEN END RATCHET WRENCH

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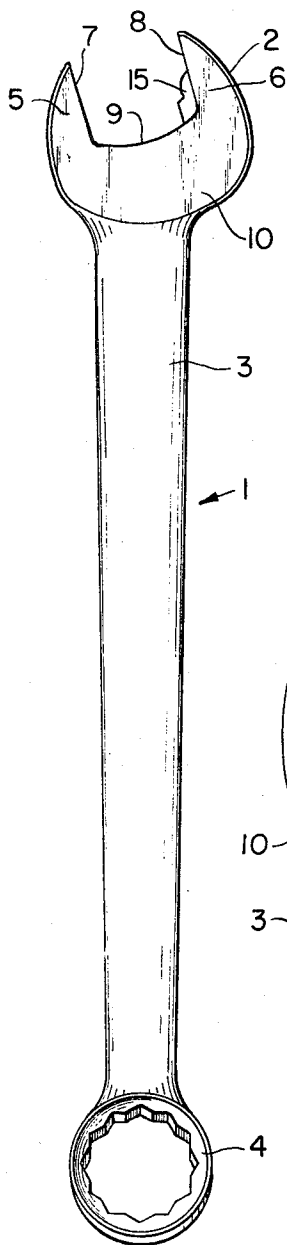


Fig. 1.

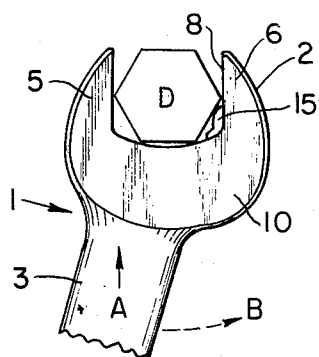


Fig. 2.

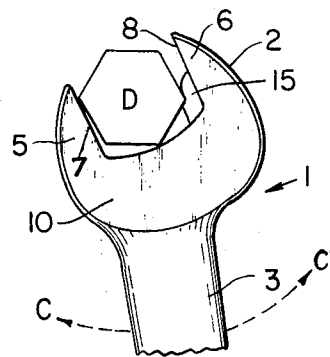


Fig. 3.

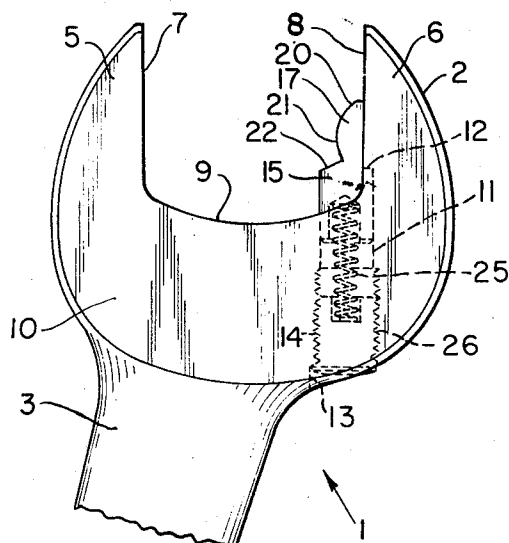


Fig. 4.

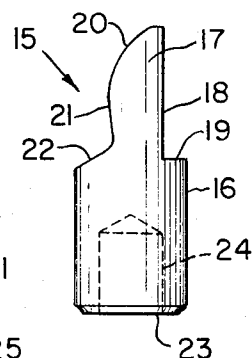


Fig. 5.

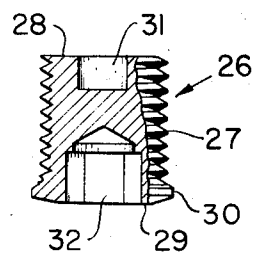


Fig. 6.

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OPEN END RATCHET WRENCH

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3 Claims. (Cl. 81-179)

This invention relates generally to open end wrenches having a depressible pawl face and specifically to improvements in the pawl face of such wrenches to improve their holding power.

Ratchet type wrenches are preferred by industry since the wrench head remains in engagement with the nut or bolt throughout the entire tightening or loosening operation. The open end type wrench is further preferred since it is more readily engaged with the bolt head or nut in locations where manipulation of the wrench is restricted.

The open end wrench of the invention utilizes a spring-loaded pawl member, mounted adjacent one jaw of the wrench, for movement of the wrench in one direction to rotate the nut and upon movement of the wrench in the opposite direction to cause deflection of the ratchet permitting the wrench jaws to freely rotate relative to the nut. Open end wrenches, as heretofore known in the prior art, relied upon gripping the nut at the corners and normally had less holding power than common open end wrenches.

In the improvement forming my invention, tests have demonstrated that the improved pawl provides greater holding power than even plain open end wrenches and more positive engagement between nut and pawl than heretofore obtainable with ratchet type fixed jaw open end wrenches.

One object of the invention is to provide an open end fixed jaw type wrench with a spring-loaded pawl providing a three surface grip on the nut or bolt head when the wrench is rotated in one direction and ready release and depression of the pawl when the wrench is rotated in the opposite direction.

Another object of the invention is to provide a rigid jaw open end depressible pawl type wrench which provides for ready depression of the spring-loaded pawl in engaging the wrench with a nut or bolt head, regardless of the position of the nut or bolt head.

These and other objects of the invention will be made apparent from the following description and the drawing forming a part thereof wherein:

Fig. 1 shows a plan view of the wrench of the invention;

Fig. 2 shows a plan view of the wrench being moved into engagement with a nut with the pawl fully depressed;

Fig. 3 shows the wrench of Fig. 2, rotated slightly to the right for full engagement of the nut and pawl for tightening the same;

Fig. 4 shows an enlarged detail view of the head of the wrench of Fig. 1;

Fig. 5 shows an enlarged elevational view of the pawl;

Fig. 6 shows an enlarged elevational sectional view of the set screw.

Referring now in detail to the drawing, the wrench 1 comprises an open wrench head 2, handle portion 3 and a box wrench end portion 4. The parts thus described are well known standard open end wrench construction.

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The open end wrench head portion 2, as shown in Figs. 1 and 4, comprises spaced jaw portions 5 and 6 having parallel opposing flat faces 7 and 8 respectively. Faces 7 and 8 have an arcuate bottom connecting wall 9 and the jaws 5 and 6 are connected at 10 completing the head portion 2. As is customary in such wrench construction, the head portion 2 is offset relative to the handle 3 an angular distance of about 15°.

The head portion 10 of Fig. 4, adjacent jaw 6, has an opening 11 drilled therein, which extends through the wall 9 and extends longitudinally of a portion of the jaw 6 to form a shoulder 12. The opening 11, at the bottom face of head portion 10, is counter-bored at 13 for a purpose hereinafter discussed. Inwardly of the counter-bore 13, the drilled opening 11 is provided with internal threads 14.

Disposed within opening 11 of the jaw head is a spring-loaded pawl 15 having a cylindrical solid base portion 16 with a tongue portion 17 extending upwardly therefrom. The tongue portion 17 has a flat rear face 18 disposed inwardly from the adjacent periphery of base portion 16 to define a shoulder 19. Tongue portion 17 has a flat front face provided with an arcuate outer portion 20 and a straight inwardly inclined portion 21 which intersects with a flat upwardly and inwardly inclined shoulder portion 22. The bottom face 23 of pawl base portion 16 has an annular recessed portion 24 for reception of one end of a helical coiled compression spring 25. The tongue portion 17 of pawl 15 normally projects between the wrench head jaws 5 and 6, with pawl face 18 in adjacent overlapping relation to face 8 of jaw 6 and pawl shoulder 19 abutting shoulder 12 of jaw 6 under pressure from spring 25.

The lower end of opening 11 in wrench head 2 is closed by a set screw 26. This set screw has a cylindrical body portion having external threads 27 extending from end face 28 to outer end face 29. Adjacent end face 29 is a slightly enlarged portion 30 which seats on the counter-bored portion 13 of opening 11 of the wrench head 2. Extending inwardly from screw end face 28 is an annular recess 31 for reception of one end of spring 25. Extending inwardly from screw end face 29 is a hexagonal recess 32 for reception of a suitable tool for actuating screw 26 in the threaded end portion of wrench head opening 11. When screw 26 is driven its full length into opening 11, the enlarged portion 30 of the screw abuts the portion 13 at the outer end of opening 11 arresting further movement of the screw. In this position the exposed end of screw 26 lies substantially within the plane of the outer face of wrench portion 10.

Referring now to Figs. 2 and 3 of the drawing illustrating use of the wrench, the open jaws of the wrench may be moved into engagement with the nut D by thrusting the wrench in the direction of the arrow A to embrace nut D between faces 7 and 8 of wrench jaws 5 and 6. The spacing of the jaw faces 7 and 8 is preferably only slightly larger than the maximum diameter of the nut D to be turned by the jaws. As the wrench jaws of Fig. 2 move over the side faces of the nut D, the tongue 17 of pawl 15 upon engaging the nut, is depressed inwardly within wrench head opening 11 and compresses the spring 25 within said opening, as shown in Fig. 2. When the wrench of Fig. 2 is turned in the direction of the arrow B, the wrench jaws 5, 6 rotate relative to the faces of the nut moving pawl tongue 17 over the adjacent corner of the nut which frees the pawl 15 for outward movement by compressed spring 25. This position of the wrench is shown in Fig. 3. When the wrench of Fig. 3 is then rotated in the direction of arrow C the transversely opposite corners of the nut bear against the jaw face 7 and pawl faces 21, 22 causing rotation of the nut. A reverse movement of the wrench

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of Fig. 3 in the direction of arrow C' causes depression of pawl 15 permitting relative rotation between the wrench and nut. Thus a nut or bolt head, after being engaged between the wrench jaws, can be tightened by reciprocal oscillation of the wrench handle 3.

Upon reference to Figs. 2 and 3 of the drawing it will be noted that the spacing of the jaw faces 7 and 8 is only slightly larger than the greatest dimension across the bolt head or nut to be actuated by the wrench. This spacing is necessary to provide the ratchet action or rotation of the wrench to secure a new grip on the bolt head or nut. The pawl 15 has a flat planar rear face 18 which bears against the adjacent planar face 8 of the adjacent wrench jaw. The pawl thus supported against the jaw face under compression from the nut is restrained from lateral displacement. The front face 20 of the pawl is arcuate to facilitate reciprocal action of the pawl within the wrench opening 11 against compression spring 25. The pawl tongue front face 21 is inclined inwardly and the adjacent pawl shoulder 22 is inclined downwardly and outwardly from face 21 providing an open substantially V-shaped support for engagement with adjacent angularly disposed faces of the nut as shown in Fig. 3. When pressure is applied to the nut, through the pawl, the nut face adjacent wrench jaw face 7 is tending to present a flat surface to the wrench face and at the transversely opposite portion of the nut the pawl V-shaped portion is gripping adjacent angularly disposed flat faces of the nut. With such construction the wrench is prevented from displacement from the nut regardless of the pressure applied through handle 3.

It is well known to those skilled in the art of using open end wrenches that a new nut with sharp corners provides a good grip by the wrench but that any rounding of the nut corners proportionately impairs the grip between the nut and wrench. Rounding of the nut corners is a natural consequence of tightening and loosening of the same nut. It is also a consequence of the "springing" or deflection of the wrench jaws when high torque forces are applied through handle 3, resulting in some relative rotation between the nut and wrench jaws and placing the major torque force upon the corners of the nut.

The pawl construction of the instant invention, by reason of the V-shaped grip, distributes the major portions of the torque force upon the flat surfaces of the nut and thus prevents relative rotation between the nut and wrench under high torque load. Repeated tests of the wrench of the invention in comparison with known open end wrenches of the prior art have demonstrated that the wrench of the invention will transmit upwards to $\frac{1}{3}$ and more torque force on a nut than a standard open jaw type wrench without any slippage of the wrench on the nut. The results are correspondingly greater where the corners of the nut were rounded as hereinbefore discussed.

Open end wrenches of the type disclosed herein have extra utility when used under circumstances preventing application of the wrench on the nut in a direction axially of the bolt. It is also well known that only open end wrenches can be used where the nut is partially enclosed by adjacent structure making it difficult to apply the wrench to the nut so as to initially engage the wrench jaws with only opposite flat faces of the nut. The depressible pawl type open end wrench of the invention permits ready engagement of the open jaws of the wrench with any portion of the nut and upon slight rotation of the handle to engage opposite flat nut faces as in Fig. 3 of the drawings. This results from the improved shape of pawl 15. Pawl front face 20 being arcuate in shape, upon engagement with the nut deflects the pawl inwardly of the wrench head and away from the nut. Pawl face 21 being inclined inwardly permits the pawl to be moved outwardly, under pressure from spring 25, immediately after the arcuate face 20 passes out of engagement with the nut. When the pawl begins to move

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outwardly of the wrench head under pressure from spring 25, sufficient pressure is present in the spring to position the faces 21 and 22 to engage adjacent flat faces of the nut upon subsequent rotation of the wrench in rotating the nut in the desired direction.

As in all types of depressible pawl wrenches the wrench applies torque force to the nut when rotated only in one direction. It will be obvious from an examination of Fig. 3 that the wrench is positioned to apply a clock-wise rotation to the nut D. However, if the wrench head is turned over to dispose the ratchet to the left side of Fig. 3 the wrench cannot apply a clock-wise rotation but only counter clock-wise rotation to the nut.

The pawl 15 as shown in Fig. 5 has the faces 18 and 21 shown as of the same width as that of the adjacent base 16 and of the same shape at the sides of faces 18 and 20, 21. This is preferable so as to obtain the greatest possible pawl bearing surface upon the nut or bolt head and also to prevent cocking of the pawl when deflected inwardly of wrench head opening 11.

The presently preferred construction of the wrench has been shown and described. Those skilled in the art may see possible variations thereof which may be made without departing from the invention and it is to be understood that I do not wish to limit myself to the exact details of construction shown and described, except as made necessary by the scope of the appended claims.

I claim:

1. An open end wrench having a depressible pawl comprising a wrench head, a handle portion extending from one side of said wrench head, a pair of spaced jaws extending outwardly from the opposite side of said wrench head, opposing faces on said jaws having their outer ends spaced to receive the maximum dimension of a nut to be turned by the wrench, said head having a passageway therein between said jaws and adjacent one said jaw face, a pawl member, said pawl member having a base portion retained within said passageway for axial movement therein and normally projecting outwardly between said jaw faces, a tongue portion forming an outward continuation of said base portion and having a rear face slidably engaging the said adjacent jaw face, said tongue portion having a front face for engagement with a nut disposed between said jaw faces, said tongue front face having an outer end portion curving downwardly and outwardly from the adjacent jaw face and terminating in a flat portion extending downwardly and inwardly towards said pawl base portion, said pawl base portion having an inwardly and upwardly extending flat portion joining the inner lower end of said tongue flat portion, said pawl flat portions gripping adjacent angularly disposed intersecting flat portions of the nut and positioning the diametrically opposite flat portion of the nut relative to its adjacent jaw face in imparting turning movement to said nut, and means within said passageway for resiliently opposing inward movement of the pawl base portion therein.

2. The wrench as defined in claim 1 wherein, said passageway adjacent one said jaw face has a portion recessed into the adjacent jaw face for a portion of the length thereof outwardly of said wrench head, said pawl tongue portion has the rear face thereof offset inwardly from the periphery of the base portion providing a shoulder on the base portion engaging the end of the recessed passageway opening within the adjacent jaw restricting outward movement of the pawl relative to the wrench head portion.

3. The wrench as defined in claim 1 wherein, the intersection of the pawl tongue curved and flat front faces is spaced from the opposite jaw face a distance not less than the minimum distance across the flats of the nut disposed between them and said distance is less than the spacing between the said opposite jaw face and the intersection of the angularly disposed faces of the pawl tongue and base portions, providing an initial turning

torque to the nut upon flat surfaces adjacent diametrically opposite corners of the nut.

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