Aug. 20, 1963 A. F. ANDERSEN 3,101,018

CLAW-LEVER ACTUATED SLIDABLE SIDE JAW WRENCH

Filed Nov. 22, 1960

Fig. 1.

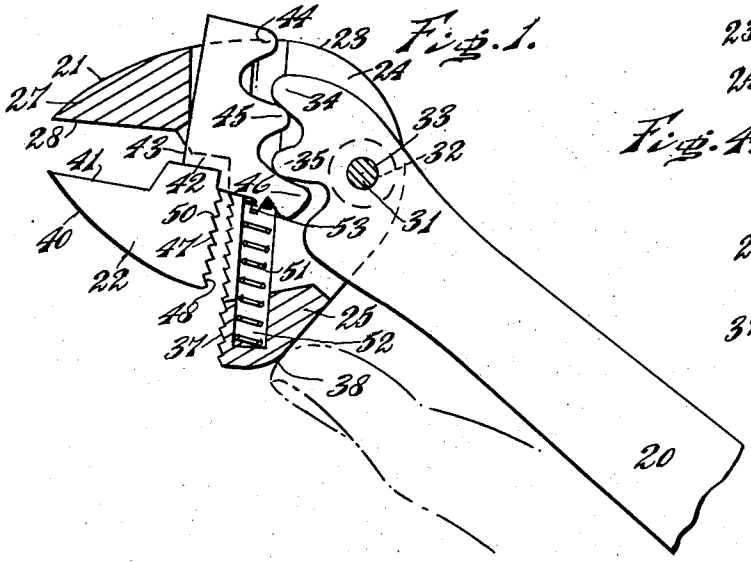


Fig. 4.

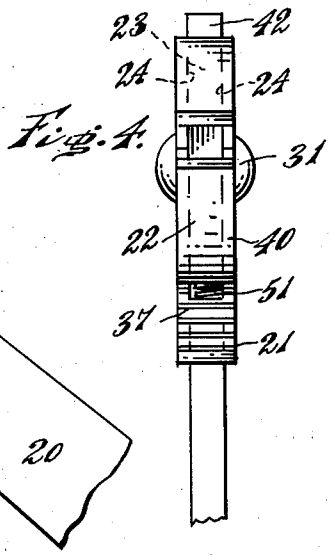


Fig. 2.

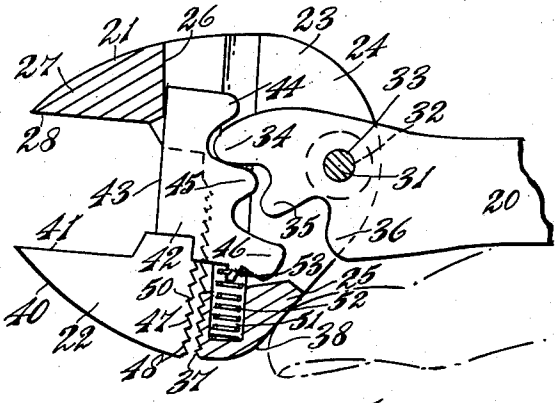


Fig. 3.

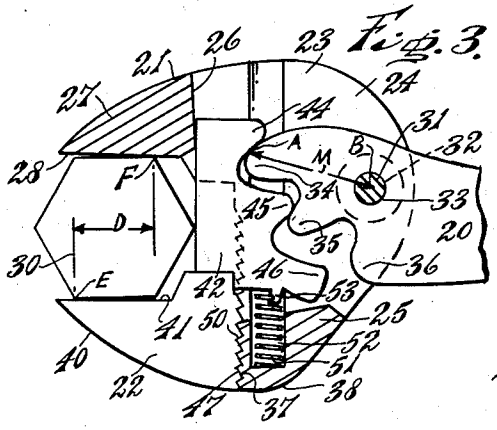


Fig. 5.

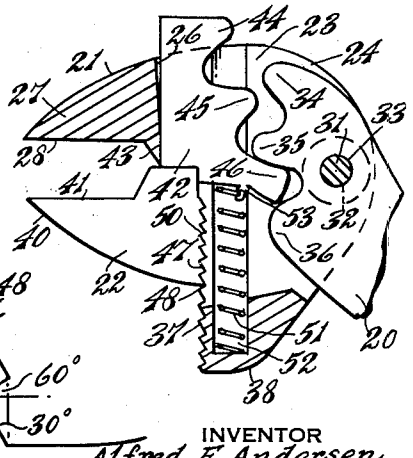
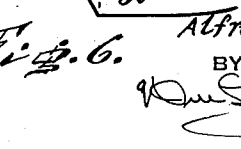


Fig. 6.



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CLAW-LEVER ACTUATED SLIDABLE SIDE JAW WRENCH

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3 Claims. (Cl. 81—127)

The present invention relates to wrenches for tightening and loosening nuts and bolts.

The present application is a continuation-in-part of my co-pending application Serial No. 828,577 filed July 21, 1959 for Instantaneously Adjustable Wrench, now abandoned.

A purpose of the invention is to provide a wrench for general use which can be instantaneously adjusted to the desired opening merely by the pressure of the thumb of the hand holding the wrench, without the necessity for using the other hand.

A further purpose is to provide a pivotal jaw wrench which has a slidable jaw on the pivotal jaw, the slidable jaw being capable of rocking, to adjust the slidable jaw with respect to the pivotal jaw by intermeshing tooth extensions on the slidable jaw and on the handle respectively, to rock the slidable jaw during opening into a position in which serrations on the slidable jaw are separated from cooperating serrations on the pivotal jaw, and in a particular position of engagement with a nut or bolt to rock the slidable jaw so that the serrations on it will engage those on the pivotal jaw.

A further purpose is to provide a spring acting between the slidable jaw and the pivotal jaw which tends to rock the slidable jaw into a position in which its serrations separate from those on the pivotal jaw, the action of the spring being overcome by force exerted by the nut or in closed position by the interengagement at the position of the jaws between the slidable jaw and the pivotal jaw.

A further purpose is to employ a succession of tooth extensions on the handle and tooth extensions on the slidable jaw which are of different radial lengths corresponding to the different sizes of nuts to be engaged in such a way that while still avoiding the danger of slipping around the corners of the nut, the maximum amount of adjustment is obtained for any given amount of arc displacement of the handle with respect to the pivotal jaw.

A further purpose is to provide protection against the tendency of a pivotal jaw wrench to slip around the engaged nut or bolt instead of turning it.

A further purpose is to provide interengaging serrations between the slidable jaw and the pivotal jaw which serrations have a steeper angle in the direction of gripping under nut-turning force applied to the handle of the wrench than in the opposite direction.

A further purpose is to provide serrations which are equally spaced by incremental variations in nut size, as, for example, 1/16 inch, 1/32 inch, 1/8 inch, 1 mm., 2 mm. etc., as desired.

A further purpose is to simplify the design and reduce the cost of manufacture of a pivotal jaw wrench.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which the invention may appear, selecting the form shown from the standpoint of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a side elevation partly in section in the plane of the handle showing the opening of the wrench under the thumb of the user who is holding the wrench handle, the handle being broken away at the end remote from the head.

FIGURE 2 is a view similar to FIGURE 1 with the handle broken away and showing the wrench more fully opened.

FIGURE 3 is a view similar to FIGURE 2 with the handle broken away, and the wrench acting to turn a nut or bolt.

FIGURE 4 is a fragmentary front elevation of the wrench in the position of FIGURE 1, with the handle broken away.

FIGURE 5 is a view similar to FIGURE 1, but showing the wrench fully closed.

FIGURE 6 is a fragmentary enlargement of the serrations 37 of FIGURE 1.

Pivotal jaw wrenches which adjust by pivoting of the pivotal jaw with respect to the handle are well known in the art. Such wrenches in the prior art have had limited resistance to the danger of slipping because of the nuts forcing the jaws apart during attempted operative turning of the nut. One of the accomplishments of the invention is to provide such greater resistance to separation of the jaws by the nut, by providing interengaging serrations between the relatively movable jaws. Due to the use of serrations in resisting the tendencies of the nut to spread the jaws apart during engagement, it is possible to increase the radial lengths of the tooth extensions on the handle and still avoid the danger of the nut forcing the jaws apart. This factor of safety provided by the serrations is particularly great in the case of engaging the larger nuts so that the tooth extensions on the handle which are employed in engaging the larger nuts can be safely increased in radial length even more than the tooth extensions employed in engagement of the smaller nuts. Thus, one of the important features of this invention is that the tooth extensions on the handle employed in the engagement of the larger nuts are greater in radial length than those employed in the engagement of the smaller nuts and this is true continuously so that throughout the entire range of the wrench the radial length increases continuously so as to make for continuity of operation throughout the entire range for which the wrench is designed.

When reference is made herein to a nut it is intended to include a bolt.

The invention also has the advantage of providing a very simplfied construction in which it is no longer necessary and in fact undesirable to provide an accurate guideway which restrains the slidable jaw against rocking. In fact rocking of the slidable jaw is very desirable in the device of the invention, and permits adjustment without engaging serrations between the slidable jaw and the pivotal jaw, and then permits subsequent engagement of such serrations when nut moving force is applied to the handle of the wrench.

The device of the invention comprises a handle which is preferably gripped by the right hand with the thumb pressing against the pivotal jaw which pivots on a pin extending through the handle.

To open the wrench for adjustment purpose, the user grasps the handle, and presses the thumb against the pivotal jaw, and this causes the handle to pivot with respect to the pivotal jaw. Since the handle is meshed with the slidable jaw, any movement of the handle with respect to the pivotal jaw results in the movement of the slidable jaw with respect to the pivotal jaw.

The intergearing is accomplished by tooth extensions on the handle and on the slidable jaw, the tooth extensions on the handle in effect constituting a segment and the tooth extensions on the slidable jaw in effect constituting a rack. The adjustment of the spacing between the nut engaging surfaces of the jaws is therefore under the control of the thumb of the operator.

Serrated or jagged surfaces are provided on the slidable jaw and the pivotal jaw in a position which can cooperate with one another. During adjustment the slidable

jaw rocks so that these serrated surfaces do not engage. But during operative turning of a nut or bolt the serrated surfaces lock together so that further sliding of the slidable jaw is not at that time possible.

The wrench of the invention comprises a handle **20**, a pivotal jaw **21** and a slidable jaw **22**. The handle extends into a recess or cavity **23** of the pivotal jaw which comprises side walls **24**, an end wall **25** at the side toward the opening motion of the slidable jaw and a slidable jaw guiding wall **26** which adjoins a jaw portion **27** which has a nut-engaging face **28** adapted in operative position to engage one side of a nut **30**.

The end of the handle enters the cavity **23** of the pivotal jaw **21** and is pivoted thereon by a riveted pivot pin **31** which passes through openings **32** in the side walls of the cavity and through an opening **33** in the handle so that the handle is freely swingable with respect to the pivotal jaw.

The handle has at the end inside the cavity **23** of the pivotal jaw **21** beyond the pivot a series of tooth extensions **34**, **35** and **36** which are successively of less radial extent beyond the pivot in the preferred embodiment.

On the opposite side of the pivotal jaw from the cavity and generally parallel to the guiding face for the slidable paw there is a line of serrations **37**, across walls **25** and the portions of walls **24** until the base of jaw portion **27** is encountered, which are adapted in operation to engage similar serrations on slidable jaw **22** to be described.

The outside of the pivotal jaw **21** is curved at **38** to make a convenient point for engagement by the thumb of the user when he is holding the handle in the right hand.

The slidable jaw **22** slides in the cavity **23** and also is free to rock to a limited extent in the cavity. The slidable jaw has a jaw portion **40** which is opposed to the jaw portion **27** on the pivotal jaw and which has a nut engaging face **41** adapted to engage the opposite side of the nut **30** from that engaged by the pivotal jaw **21**. The slidable jaw **22** has an extension **42** which has a width which permits it to enter and slide freely in the cavity **23** without great lateral wobble. The extension **42** has a generally straight guiding portion **43** which engages on the guideway **26** in the cavity and in effect pivots on such guideway. The slidable jaw has a series of tooth extensions **44**, **45** and **46** progressively of greater extent which cooperate with the series of tooth extensions **34**, **35** and **36** on the handle as previously described, the tooth extensions on the slidable jaw acting in effect like a rack.

The slidable jaw has a line of serrations **47** which are adapted in force-applying position of the handle to engage the cooperating line of serrations **37** on the pivotal jaw.

The serrations of both sets preferably have steep angles at **50** (preferably about 60°) on the side which resists opening motion and more gradual angles **48** (preferably about 30°) on the opposite side, these angles being in effect tooth angles measured in respect to the longitudinal line of motion of the slidable jaw. See FIGURE 6.

The slidable jaw is urged toward retracted position and prevented from coming out of the pivotal jaw by a helical compresion spring **51** in the cavity **23** which engages in a spring recess **52** in the pivotal jaw **21** and also engages a spring retaining ear **53** on the slidable jaw **22**. The spring is so disposed and positioned that when the slidable jaw is closed in FIGURE 5 it tends to hold it closed. When the slidable jaw begins to open due to the intergearing between the handle and the slidable jaw, the spring rocks the slidable jaw as shown in FIGURES 1 and 2 and causes separation between the serrations on the slidable jaw and the pivotal jaw. This rocking action is contributed both by the axial force of the spring and by the lateral action of the spring since the spring is socketed firmly in the spring recess **52**.

In operation the wrench in inactive position remains with the jaws closed, as shown in FIGURE 5, the closing force being exerted by the spring. When the user grasps the handle and rotates the pivotal jaw with respect to the handle, the successive teeth extensions on the handle urge the corresponding tooth extensions on the slidable jaw **22** into opening position. When this takes place, since the slidable jaw is free to rock and since the spring tends to urge the slidable jaw **22** into rocking position, the slidable jaw **22** rocks slightly as shown in FIGURES 1 and 2 to maintain the cooperating serrations **37** on the pivotal jaw and **47** on the slidable jaw out of contact as the slidable jaw opens. This is important because it assures that there will be no objectionable interference by the serrations with the opening movement which is imparted by the thumb of the user. When now the wrench is placed against a nut or bolt **30** and force is applied to turn the nut or bolt, this rocking which has caused separation of the serrations on the pivotal ojaw and on the slidable jaw reverses, and the serrations **37** and **47** engage and grip. This renders the wrench effective to overcome completely any tendency to slip. It is because of this that it is possible to turn nuts which cannot be turned by a conventional wrench of this general type.

It will also be evident that the lateral movement of the spring is limited and the spring therefore tends to limit the extent of separation of the serrations.

The importance of the serrations will be understood by reference to the following discussion:

Let A be the point where the long tooth extension on the handle contacts the shortest tooth extension on the slidable jaw in nut-turning action (FIGURE 3). The distance from the point A to the center B of the pivot is M as shown in FIGURE 3. This distance M becomes less and less as other teeth come into action to bring the jaws closer together for smaller nuts.

The point at which the nut presses against the slidable jaw is E and the point at which the nut presses against the pivotal jaw is F, assuming that the handle is being moved in a direction to turn the nut clockwise. It will of course be evident that to turn the nut or bolt in the opposite direction the wrench is reversed. D is the distance between the normals at E and F. If there are no serrations which engage between the pivotal jaw and the slidable jaw, the wrench will turn the nut without slipping only when the distance M remains smaller than the distance D. This is a serious restriction on the design of a conventional wrench of this general type.

This means that for small nuts, where distance D is very small, the distance M must be extremely small. However, it is impossible to make the distance M small beyond a certain practical point. This means that there is a physical limit imposed on the smallness of the nut which can be turned without slipping if no serrations are employed. When the corners of nuts to be turned become rounded, as they will through repeated engagement, the effective distance D becomes reduced still further even for the large nuts. Thus, the problem of slipping occurs not only with small nuts but also with large nuts which have rounded corners. It will be evident, of course, that when slipping is referred to it is meant that the nut forces the jaws apart.

Apart from the physical limitations which are imposed in making the distance M shorter than the distance D for a rounded nut, the smaller the distance M becomes, the greater is the arc through which the handle must be turned to move the jaws relative to one another and this is a feature of great inconvenience and awkwardness.

The serrations, and the rocking of the slidable jaw which makes it possible to open without the serrations' engaging and then allows the serrations to engage automatically, thus make it possible to increase the distance M to whatever length is convenient for design and operation of the device while still avoiding the danger of slipping.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art,

to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An adjustable wrench comprising a handle, a jaw member pivotally mounted on said handle having a gripping face, a second jaw member slidably mounted on said pivotal member having a gripping face opposed to the other member face, means including tooth extensions on the handle and on the second member for moving one member face relative to the other face to receive a nut, spring means for moving said faces into gripping relation, serrations coacting between said pivotal member and said second member which serrations are forced together during engagement and forced apart during adjustment, the tooth extensions on the handle progressively increasing in radial length and the tooth extensions on the second jaw member progressively decreasing in radial length for continuity of operation at all nut sizes within the range of the wrench.

2. An adjustable wrench comprising a handle, a pivotal jaw pivotally mounted on said handle and having a nut-gripping face, a slidable jaw slidably mounted on said pivotal jaw and rockable in any position of sliding motion with respect to said pivotal jaw and having a second nut-gripping face opposed to that on the pivotal jaw, tooth extensions on said handle progressively increasing in radial length, tooth extensions on said slidable jaw intergearing with said tooth extensions on said handle and progressively decreasing in radial length, and moving said slidable jaw to a position at which its nut-gripping face is relatively displaced from the nut-gripping face of the pivotal jaw in response to pivoting of the pivotal jaw with respect to the handle, the respective tooth extensions on the handle and on the slidable jaw continuously meshing to provide continuity of operating at all nut sizes within the range of the wrench, serrations on the pivotal jaw along the path of movement of the slidable jaw, serrations on the slidable jaw opposed to the serrations on the pivotal jaw, said slidable jaw when it is moved by relative pivoting of the pivotal jaw and by the handle rocking with respect to the pivotal jaw to maintain the serrations on the pivotal jaw and those on the slidable jaw relatively separated, and said slidable jaw when operatively engaging a nut rocking into interengagement of the serrations on the slidable jaw with the serrations on the pivotal jaw.

3. An adjustable wrench comprising a handle, a pivotal jaw pivotally mounted on said handle and having a nut-gripping face, a slidable jaw slidably mounted on said pivotal jaw and rockable in any position of sliding motion with respect to said pivotal jaw and having a second nut-gripping face opposed to that on the pivotal jaw, tooth extensions on said handle, tooth extensions on said slidable jaw intergearing with said tooth extensions on said handle, and moving said slidable jaw to a position at which its nut-gripping face is relatively displaced from the nut-gripping face of the pivotal jaw in response to pivoting of the pivotal jaw with respect to the handle, serrations on the pivotal jaw along the path of movement of the slidable jaw, serrations on the slidable jaw opposed to the serrations on the pivotal jaw, and helical spring means acting in the direction of jaw-closing movement between said pivotal jaw and said slidable jaw, tending to move said slidable jaw toward said pivotal jaw, and creating force which tends to separate and limit the separation of the serrations on the slidable jaw from the serrations on the pivotal jaw, said slidable jaw when it is moved by relative pivoting of the pivotal jaw and the handle rocking with respect to the pivotal jaw to maintain the serrations on the pivotal jaw and those on the slidable jaw relatively separated, and said slidable jaw when operatively engaging a nut rocking into interengagement of the serrations on the slidable jaw with the serrations on the pivotal jaw.

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