SELF-ADJUSTING, SELF-TIGHTENING MULTIPURPOSE WRENCH

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ABSTRACT
A self-adjusting wrench has a handle terminating at one end in a head having a rigid, pipe gripping jaw, connecting links swingably mounted on the head, a movable jaw carried by the links for swinging movement relative thereto, and meshing gear segments on the movable jaw and the head for positively swinging the links about the head and concurrently swinging the movable pipe gripping jaw relatively to the links to move the jaws toward and away from each other.

7 Claims, 4 Drawing Figures
3,851,549

SELF-ADJUSTING, SELF-TIGHTENING MULTIPURPOSE WRENCH

BACKGROUND OF THE INVENTION

This invention relates to a wrench and more particularly to a self-tightening, self-adjusting multipurpose wrench capable of use with pipes and the like of considerably different size.

One type of commonly used pipe wrench includes a handle having a fixed jaw at one end, a movable jaw mounted on the handle for movement toward and away from the fixed jaw, and an internally threaded nut in threaded engagement with externally threaded portions of the handle and the movable jaw for moving the latter toward and away from the fixed jaw. When such a wrench is used, the jaws work their way out of adjustment necessitating a delay during readjustment of the jaws. The jaws of such wrenches must be manually readjusted to accommodate each different diameter pipe.

The known pipe wrenches are not readily adaptable to turning irregular shaped objects and pipes which are positioned close to a wall or other obstruction. A wrench constructed according to the present invention, however, is particularly handy for turning such pipes and irregularly shaped objects since relatively little clearance is needed to receive the movable jaw and the wrench readily adapts to substantially any shape object.

An object of the present invention is to provide a self-adjusting, self-tightening wrench having a rigid jaw, a movable jaw pivoted to links which are swingably connected to the rigid jaw, and apparatus for swinging the movable jaw on the links as the links swing about the rigid jaw to effect positive movement of the fixed and movable jaws towards and away from one another.

The known self-adjusting pipe wrenches do not always exert sufficient gripping force to maintain a hold or purchase on the pipe being turned. When the resistance to turning of a pipe is high, added force must be exerted to turn the pipe. It frequently happens that a pipe wrench will have sufficient purchase when a low torque is being exerted but will slip when a high torque is exerted. It is during the high torque operating condition that sufficient purchase is particularly important since the user can then be most seriously injured if the wrench slips.

A further object of the present invention is to provide a self-adjusting, self-tightening pipe wrench for gripping and turning a pipe and including an elongate handle having a head provided with a rigid pipe gripping jaw for obtaining a mechanical hold on a pipe; link means swingably mounted on said head for swinging movement about a first axis; a movable pipe gripping jaw swingably mounted on the link means for swinging movement thereon about a second axis; the head and the movable jaw including meshing gear teeth for positively swinging the entire movable jaw bodily about the first axis and concurrently positively swinging the movable jaw on the link means to force the jaws toward each other when one of the jaws has a mechanical hold on the pipe.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A self-adjusting, self-tightening wrench constructed according to the invention is generally designated 10, and is particularly adapted for gripping an object, such as a pipe P, and exerting torque on the pipe to turn it about its longitudinal axis. The wrench 10 includes a handle 12 having a hand-gripping portion 14 at one end and an enlarged head portion 16 at the other end.

The underside 18 of the head 16 includes an integral, rigid, arcuate pipe-gripping jaw 17 comprising a plurality of pipe gripping serrations or teeth 18a arranged on the arc of a circle having its center at the point b. As viewed in FIGS. 1 and 3, each of the teeth 18a is clockwisely inclined and includes a front face surface 18b which lies in a radial plane r extending through the axis b, and a radially inwardly inclined back face surface 18c. The head 16 includes an integral gear segment generally designated 20 and having individual gear teeth 21 for a purpose to be described hereinafter.

A pair of connecting links 22 are pivotally mounted on opposite sides of the head 16 by a pivot pin 24 having its longitudinal axis coinciding with the axis b. A movable pipe gripping jaw, generally designated 28, is mounted on the links 22 by a pivot pin 26 for swinging movement thereon about an axis f. The movable jaw 28 comprises a curvilinear body 30 having an internally serrated portion 32 comprising a plurality of pipe gripping teeth 34 which are of opposite hand relative to the pipe gripping teeth 18a. The teeth 34 are inclined in the same direction as the teeth 18a, but are inverted relative thereto. Each tooth 34 includes a front face 34a which lies in the radial plane r extending through the axis b, when the jaw 28 is in the closed position confronting the teeth 18a, and a radially outwardly inclined rear face 34b. When the movable pipe gripping jaw 28 is in the closed position, illustrated in FIG. 3, the front face 18b of each tooth 18a lies in the plane of a front face 34a on a tooth 34. The pipe gripping jaw teeth 34 are generally concentric to the pipe gripping teeth 18a when the movable jaw 28 is in the closed position illustrated in FIG. 3. The radial planes r may be spaced 8° and each tooth 18a and 34 may have a height.

SUMMARY OF THE INVENTION

A pipe wrench including a handle having an object-gripping, jaw portion, a movable jaw swingably mounted on connecting links which are swingably mounted on the handle, and means on the handle and movable jaw for relatively swinging the movable jaw on the links to move the fixed jaw and movable jaw toward and away from each other as the links swing about the handle.

Other objects and advantages of the present invention will become apparent to those of ordinary skill in the art as the description proceeds.

The present invention may more readily be understood by reference to the accompanying drawings, in which:

FIG. 1 is a side elevational view of a wrench constructed according to the present invention, part of one jaw mounting link being broken away;

FIG. 2 is a bottom plan view of the wrench illustrated in FIG. 1;

FIG. 3 is an enlarged, fragmentary, side elevational view, similar to FIG. 1, illustrating the object gripping jaws in the closed positions; and

FIG. 4 is a perspective view of the wrench gripping a pipe, part of one jaw mounting link being broken away.
3,851,549

3,851,549

33 of 0.090 inches deep and a base 35 of 0.100 inches wide.

The movable jaw 28 includes a gear segment 36 having individual gear teeth 37 in mesh with the gear segment 20 on the head portion 16 for positively driving the movable jaw 28 about the axis of the pin 26 toward the rigid jaw 17 as the wrench handle 14 is swung about the axis b in the direction of the arrow d. The links 22 couple the jaw 28 to the handle for bodily movement of the jaw 28 about the axis b toward the jaw 17 so as to enable a pipe P to be gripped between the jaws. Any increased pipe turning force exerted on the handle 12 tending to rotate it and the pipe P in the direction of the arrow d is not only transmitted through the links 22 tending to rotate the movable jaw 28 in the direction of the arrow d, but is also transmitted through the gear segments 20 and 36 to the movable jaw 28 tending to rotate it about the axis f and move it radially toward the pipe P to proportionally increase the gripping force on the pipe.

The distance R1 from the root of the gear teeth 18a on the head 16 to the axis b is twice the radius R2 from the axis f of the pivot pin 26 to the root of the gear teeth 37 on the movable jaw 28. Thus, when the handle 12 is rocked about the axis b, the movable jaw 28 is forced toward the jaw 18 with a two-to-one mechanical advantage. As force is continued to be exerted on the handle 12 and it swings about the axis b in the direction of the arrow d, the jaws 17 and 28 will continue to close, thereby substantially eliminating the chance of the jaws 17 and 28 slipping on the pipe. The jaws 17 and 28 thus exert circumferentially directed force as well as radially inwardly directed force on the pipe P. The gears 20 and 36 cooperate to provide the movable jaw 28 with a compound movement about the axis b as well as about the axis f to achieve maximum pipe gripping capabilities.

THE OPERATION

The movable jaw 28 and the links 22 are manually swung clockwise about the axis b in the direction represented by the arrow e, and the gear segments 20 and 36 cooperate to drive the pipe gripping jaws 17 and 28 to the spread positions, illustrated in Fig. 1, for receiving a pipe P. The handle 12 is rocked about the pipe P, in the direction of the arrow d, to force the pipe gripping teeth 18a and 34 into engagement with opposite sides of the pipe P. When the teeth 18a or 34 of one of the jaws 20 or 36, for example the teeth 18a of the jaw 20, engage the pipe P, the teeth 18a act as an anchor or a "hook" so that the fixed jaw 20 provides a fulcrum for the movable jaw 28. As the handle 12 is continued to be rocked about the pipe P in the direction of the arrow d, the head 16 will roll on the pipe and the gear segment 20 will force the gear segment 36 in the direction of the arrow c. This will swing the jaw 28 about the axis b and thus will force the jaw 28 to swing about the axis f of the pin 26 toward the jaw 18.

The circumferentially directed turning force in the direction of the arrow d is coupled to the movable jaw 28 to also clockwise move the movable jaw with the handle 14 in the direction of the arrow d. The teeth 18a tend to move clockwise about the axis b to force the sharp edges of the teeth into the pipe P. The turning force is coupled through the gear segments 20 and 36 to swing the movable jaw toward the pipe P so that the sharp edges of the teeth 34 will dig into the pipe P as the jaw moves in the direction of the arrow d.

The operation of the wrench can be further appreciated if the links 22 are considered to be fixed elements. When the handle 14, which constitutes a lever is rotated about the axis b, the force is transmitted via the gearing 20, 36 to the movable jaw 28 causing the jaw 28 to be rotated about the axis f. The two-to-one gear ratio transmits the force from the larger gear segment 20 to the smaller gear segment 36 to cause the jaws 28 and 20 to tighten on an object to be gripped, such as the pipe P.

It should be understood, of course, that the wrench is usable to grip any objects and is not limited to a wrench for gripping pipes.

It is to be understood that the drawings and descriptive matter are in all cases to be interpreted as merely illustrative of the principles of the invention, rather than as limiting the same in any way, since it is contemplated that various changes may be made in various elements to achieve like results without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A self-adjusting, self-tightening, wrench for gripping and turning an object, such as a pipe, comprising:

an elongate handle having a jaw fixed at one end;
link means mounted on said jaw for swinging movement about a first axis;
a movable jaw mounted on said link means for movement therewith about said first axis and for swinging movement relative thereto about a second axis toward and away from said fixed jaw; and

drive means coupling said jaws for bodily swinging said movable jaw orbitally about said first axis and concurrently positively swinging said movable jaw on said link means about said second axis.

2. The wrench set forth in claim 1 wherein said drive means comprises cooperating members on each of said jaws.

3. The wrench set forth in claim 2 wherein said cooperating members comprise meshing gear means on said jaws.

4. The wrench set forth in claim 3 wherein each of said gear means includes gear teeth, the distance from the root of the teeth on said fixed jaw to said first axis being greater than the distance from the root of the gear teeth on said movable jaw to said second axis.

5. The wrench set forth in claim 1 wherein said jaws are toothed.

6. The wrench set forth in claim 5 wherein each of the teeth on said fixed and said movable jaws are inclined in the same direction about said first axis.

7. A self-adjusting wrench for gripping and turning an object, such as a pipe comprising:

a handle terminating at one end in a rigid, object-gripping jaw including curvilinearly arranged serrations for obtaining a mechanical hold on one side of said object;
link means swingably mounted on said handle for swinging about an axis;
a movable, object-gripping jaw mounted on said link means for movement therewith and swinging movement relative thereto; and

drive means, including a plurality of intermeshing gear teeth on each of said handle and said movable
jaw, operable in response to movement of said handle in one direction relative to said movable jaw for positively orbitally swinging said movable jaw relative to said rigid jaw about said axis in the opposite direction and concurrently swinging said movable jaw relative to said links to positively force said jaws toward and away from each other.

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