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ONE-WAY ENGAGING WRENCH HAVING GUIDED WORK-ENGAGING ROLLERS

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Fig. 1

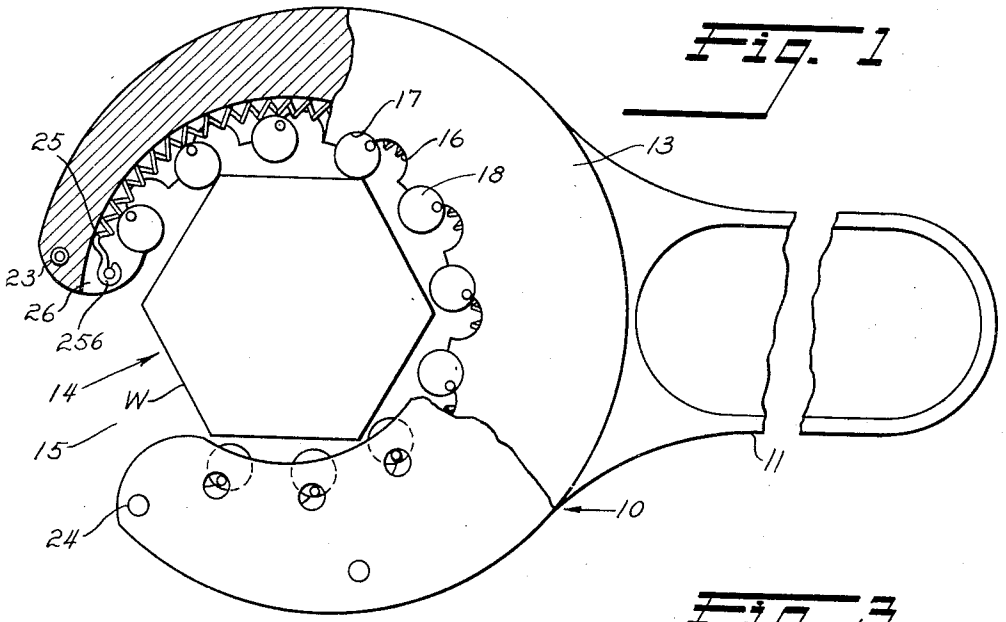

Fig. 3

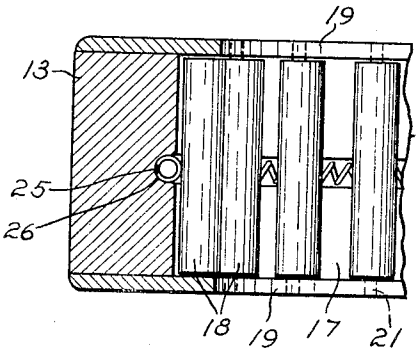

Fig. 2

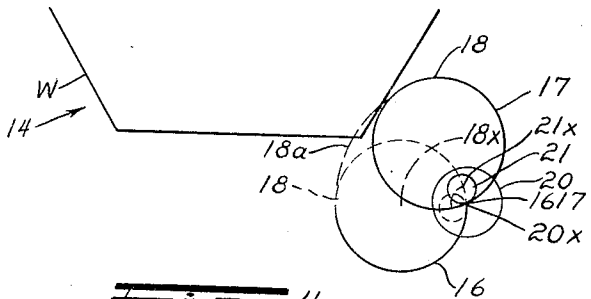

Fig. 4

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ONE-WAY ENGAGING WRENCH HAVING GUIDED WORK-ENGAGING ROLLERS

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3 Claims. (Cl. 81—58)

1

This application is a continuation in part of a pending application Ser. No. 684,900, filed July 19, 1946, for Ratchet Wrench, now abandoned.

This invention relates to wrenches, and particularly to ratchet wrenches of the type having a completely enclosed aperture or an open end adapted to receive the nut, pipe or other object to be turned in one direction or the other.

It is an object of this invention to produce a new and improved socket or open ratchet wrench adapted positively to engage a nut, pipe or the like when rocked in one direction and to slip over the nut, pipe or the like when rocked in the opposite direction selectively to actuate the nut, pipe or the like in one direction or the other.

Another object of this invention is to produce a new and improved ratchet wrench adapted partially or completely to circumscribe a nut, pipe or the like and effectively and quietly to turn the nut, pipe or the like in one direction or the other in response to reciprocal movements of the integral wrench handle, thereby manually or mechanically to tighten bolts, nuts, pipes or the like to a predetermined degree as measured by the applied torque.

A further object of this invention is to produce a wrench of the type described, in which the nut or pipe engaging section also houses the ratchet means providing a compact unit consisting of relatively few parts that are readily and economically assembled to produce a low cost durable and simple unit adapted for individual or mechanical operation as a mass production assembly tool for the application or removal of variously sized threaded members such as nuts, bolts, pipes, couplings, bushings or the like.

A still further object is to produce a wrench of the type described, having one or more rollers or the like adapted to be disposed between two positions of adjustment, in the one position of adjustment to protrude in a manner positively to engage the adjacent element, actuating the same to turn in one direction, and in another position of adjustment to recede enabling the wrench freely to turn about the element.

More specifically, it is intended now to provide a wrench having rollers of the type which roll from one recess, in which they are in position for engagement with the work, to another recess in which they can pass the work. By this arrangement it is proposed to provide the advantages of a positive, predictable roller action while still obtaining the structural advantages

2

of a roller which fits in a groove and is backed up by the groove wall when in working position.

Another object is to provide mounting pins for the swinging rollers of a ratchet wrench wherein the pins serve to guide the movement of the rollers, but do not carry any substantial work load. Moreover, it is intended that the guide pins fit loosely in over-size retaining holes so that they too may swing with the rollers about common axes during the movement of the rollers from work-engaging to work-passing positions.

These and other objects and advantages of the invention will hereinafter appear, and for purposes of illustration but not of limitation, and embodiment of the invention is shown on the accompanying drawings in which:

Fig. 1 is a plan view, broken away to successive levels, illustrating the assembly;

Fig. 2 is an elevation of a single roller showing the offset pins;

Fig. 3 is a fragmentary vertical section showing the arrangement of the rollers, grooves and springs; and,

Fig. 4 is a diagram illustrating the swinging action of the rollers.

In the illustrated embodiment of the invention, 10 indicates an open end wrench consisting of an elongate handle 11 of metal or the like, the other end having an integral enlarged cylindrical head plate 13 provided with a circular aperture 14 contiguous with a slot 15 providing the open end through the forward portion of the head plate.

Equally spaced about the inner peripheral surface of the head plate 13 are a series of contiguous and intersecting grooves 16 and 17 of equal diameter but having offset centers so that one groove 16 is further recessed and to one side of the upper intersecting groove 17, thus to provide a series of cam surfaces for receiving rollers 18.

The illustrated embodiment of the invention is directed to the use of circular rollers, but it is to be understood that elements of other shapes and contours may be equally used as will hereinafter be explained. As illustrated in Fig. 3, the rollers 18 are in the form of cylindrical rods having a diameter equal to that of the grooves 16 and 17 so that the roller surfaces are substantially in contact with the groove surfaces when disposed in one groove or the other. As previously pointed out, the grooves 16 and 17 are so arranged that when the rollers are disposed in the deeper grooves 16, they do not protrude substantially into the aperture 14, en-

abling the wrench freely to turn about objects therein. However, when the rollers are disposed in the adjacent upper grooves 17, a substantial portion of each roller extends into the aperture to provide the nut locking or gripping action as will be hereinafter explained.

The rollers 18 are held between the two positions of adjustment by means of side plates 19 consisting of a pair of thin metallic rings apertured for registry with the opening through the head member, each ring having a series of small apertures 20 adapted to receive pins 21. Registered openings 23 and 24 in the side plates and in the head plate respectively are provided for purposes of riveting the side plates in the assembled position. Other metal joining means such as welding or brazing might equally be used for plate assembly purposes.

Each roller 18 is urged to the optimum outwardly extended position, as illustrated in Fig. 1, by means of an elongate coil spring 25 disposed underneath each roller in a slot 26 extending inwardly from the openings 14 and 15 and intermediate the faces of the head plate 13. The hooked ends 27 of the coil spring are secured in position by pins 256 extending into the head plate 13.

Other means for urging the rollers 18 toward their outermost extended position might equally be used. For example, the coil spring might be replaced by a tensioned rubber band. Similarly, individual springs positioned beneath the rollers or else rubber-like cushioning material disposed within the grooves, might be readily adapted.

Referring particularly to the Fig. 4 diagram, it will be observed that apertures 20 in side plates 19 are considerably larger in diameter than pins 21, and that apertures 20 overlie the intersection of grooves 16 and 17, with the axis 20X of aperture 20 substantially over the intersection 1617 of the side walls of the grooves. In the swinging movement of roller 18 from its full line to its dash line position, it swings about axis 20X of aperture 20 while rolling over intersection 1617 of the groove walls. Roller 18 thus stays always in contact with a wall of one or the other of grooves 16, 17 or their intersection 1617.

The axis 21X of pin 21 also swings about axis 20X of aperture 20 in the movement of roller 18 between its dash and full line positions. The engagement of pin 21 with the side wall defining aperture 20 merely serves to guide roller 18 in its swinging movements, to limit the inward displacement of roller 18 by spring 25, and to keep roller 18 always in contact with the side wall of one of grooves 16 or 17. Pin 21 thus does not bear the work load of roller 18, this being directly transmitted to the wall of groove 17 when in work-engaging position.

In operation, when the open end of the wrench is disposed about a nut 28, as illustrated in Figure 1, and rocked in the clockwise direction, the near corner surfaces of the substantially circumscribed nut 28 engages the adjacent extending rollers thereby first to displace each of the contacted rollers toward the seated position within the upper groove 17. Further displacement is thereafter prevented so that the continuing rocking movement of the wrench in the clockwise direction causes the immovable rollers securely to engage the nut, concomitantly to effect rotational movement thereof in the same direction. Movement of the wrench in the counterclockwise direction causes the rollers, when contacted by the nut edges, to be displaced in the direction towards the deeper grooves 16 so that they are withdrawn from the aperture enabling the nut to remain stationarily within the aperture while the wrench is turned thereabout. While it is apparent that the part of roller 18 which lies innermost with respect to circular aperture 14 describes the movement indicated by the arrows 18a, this movement is still away from the center of aperture 14 and, thus, is a disengaging movement with respect to the work indicated at W. Manifestly, the nut may thus be tightened, as by turning in the clockwise direction, merely by reciprocal movement of the open end wrench in engagement therewith.

Obviously, automatically operating mechanical means might be adapted for use with a wrench of the type described merely by attachment of a reciprocating arm to the head plate or handle, the reciprocating movement thereof being regulated to continue until a predetermined force is required to overcome the resistance to further turning movements of the nut. Similarly, disposition of the wrench so that the groove 17 is disposed clockwise of the deeper groove 16, enables actuation of the nut 28 in the counterclockwise direction in response to the reciprocal movement of the wrench, effecting the removal of the nut or bolt.

Other shaped rollers, such for example, as triangular, square or polygonal rods, might equally be used, it being only necessary that the contiguous grooves be similarly contoured to receive each rod as it is disposed within the respective groove so that a seating action is effectively provided as previously pointed out.

From the standpoint of operability, the wrench is capable of working with but a single roller and its corresponding grooves. However, the effectiveness ordinarily is increased with the use of multiple rollers and grooves as illustrated in the drawings.

A wrench of the type described provides a distinct advantage over the ordinary open end wrenches generally supplied as a set for use with different sized nuts. In the use of the latter, the point of effective contact between the wrench and the nut occurs at only two of the nut corners, so that, as a result of repeated use of the nut or excessive tightening, the nut corners soon become rounded, thereafter militating against its further use, and, not infrequently, preventing removal of the nut from the bolt. In such instances, other means such as severing the bolt or the like are necessitated, complicating and delaying the operations. In contrast, as previously pointed out, the rollers of the new and improved wrench engage the near edge portions of the nut, and, as a result of repeated usage or excessive pressures, permanent grooves are formed in the surfaces of the nut adjacent the corners, causing even more ideal operation, the rollers readily seating in the grooves militating against slippage, wear or the like.

A wrench of the type described is also adapted for use with pipe or other rounded surfaces. In some instances, tapered rollers might be required to facilitate the disposition of the open end wrench about the surfaces of the pipe. Similarly, use of the wrench as a pipe wrench or as a nut wrench might be made with a unit having the opening completely enclosed so as to comprise a socket wrench of the ratchet type, or even with the span between open ends equal to that of the diameter of the opening.

From the above description, it is manifest that

I have produced a new and improved open end ratchet wrench having novel features of construction and operation that not only provide more effective and ideal operation, but is so compact, low cost and simple in construction and operation that the use thereof may be readily adapted for individual or mass production assemblies by manual or mechanical means.

It is to be understood that numerous changes in the details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

I claim:

1. A ratchet wrench having a head plate with upper and lower sides and a transverse aperture therethrough for receiving a member to be actuated, said plate having an inner wall defining said aperture, said wall having a plurality of pairs of intersecting socket grooves therein contiguous with and bounding at least a portion of said aperture, one groove in each pair being radially offset from the other, a roller associated with each pair of grooves, retaining rings respectively affixed on the upper and lower sides of said head plate and overlying the ends of said grooves, said retaining rings having pin-receiving holes therein, said holes being disposed substantially over the intersection of said grooves, pins rotatably supporting said rollers in said holes, said pins being eccentric of said rollers whereby the latter may shift from one to the other of the grooves with which it is associated, and means resiliently urging said rollers to shift towards the grooves lying innermost with respect to said aperture.

2. A ratchet wrench comprising a generally annular body having opposite ends and an inner arcuate side wall defining a central opening

adapted to receive a workpiece, said side wall having at least one pair of angularly spaced grooves extending therein from end to end, said grooves being defined by curved recesses in said side wall intersecting one another at a common boundary with the recess defining one groove extending deeper in said side wall than the other, a roller having a side wall nestable in said groove and similarly offset pins at each end, generally annular end plates on each end of said body, said end plates at least partially overlying said recesses and having holes therein for receiving said pins, said holes being disposed substantially over said common boundary whereby said roller may roll from one groove to the other and resilient means for urging said roller radially inward with respect to said central opening.

3. The combination claimed in claim 2, said hole being substantially larger than said pin and overlying an arcuate zone radially inward of said central opening with respect to said common boundary whereby said roller and said pin swing about a common axis substantially at said boundary.

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