Aug. 11, 1942. H. H. MERRIMAN ET AL 2,292,391

WRENCH

Filed June 10, 1940

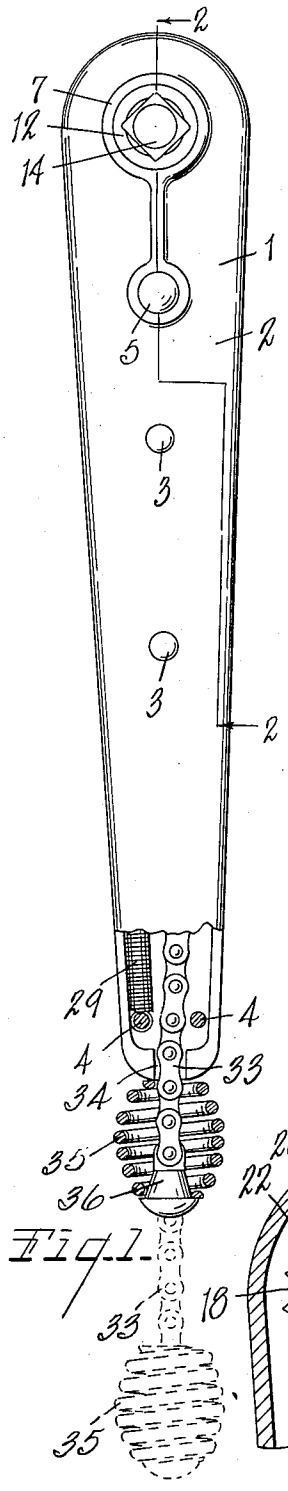


Fig. 1.

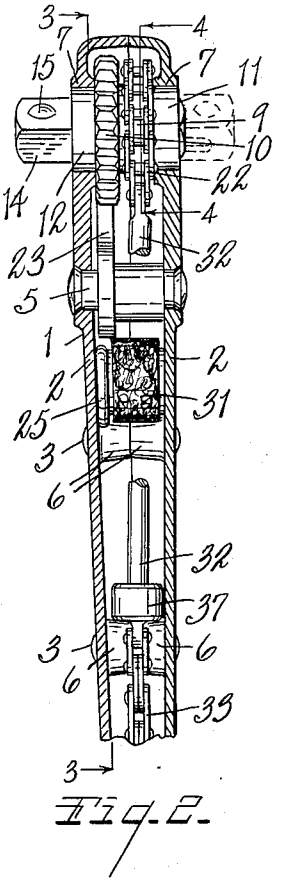


Fig. 2.

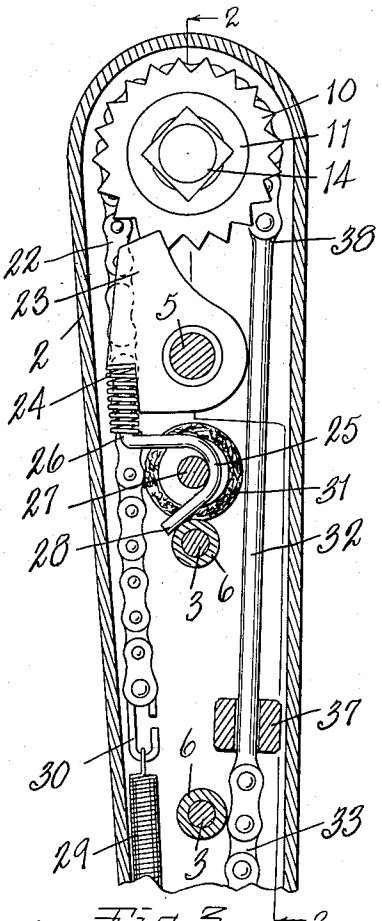


Fig. 3.

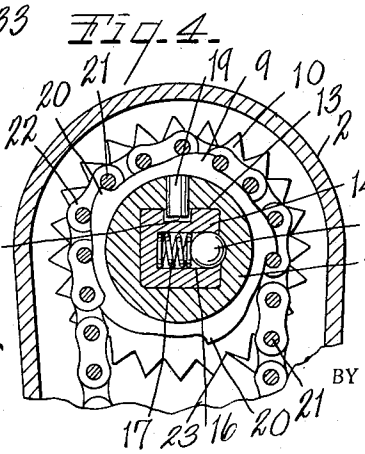


Fig. 4.

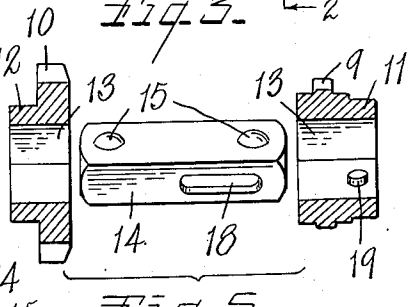


Fig. 5.

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2,292,391

WRENCH

Henry H. Merriman and Clifford D. Burbank,
Jackson, Mich.

Application June 10, 1940, Serial No. 339,652

12 Claims. (Cl. 81—61)

This invention relates to improvements in ratchet wrenches and particularly ratchet wrenches of the particular type shown in our application for letters patent, Serial No. 325,528 filed March 23, 1940, our present invention being an adaptation of and in some respects an improvement upon the structure of the said application.

The main objects of this invention are:

First, to provide an improved ratchet wrench which is very convenient in use in the application of or the taking off of nuts and one which is capable of withstanding relatively heavy stresses.

Second, to provide a wrench in which certain of the working parts are effectively lubricated.

Third, to provide a structure which is simple and economical in its parts and the assembly thereof.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a side view of our improved wrench partially broken away and in section.

Fig. 2 is a fragmentary view partially in section on line 2—2 of Figs. 1 and 3.

Fig. 3 is an enlarged fragmentary view partially in section on line 3—3 of Fig. 2.

Fig. 4 is an enlarged fragmentary view in section on line 4—4 of Fig. 2.

Fig. 5 is a diassembled view of the driving and holding sprockets and the spindle.

Our improved wrench comprises a chambered body unit designated generally by the numeral 1 which constitutes a combined housing and handle. This unit has generally flat sides, rounded edges, and is tapered for economy in stock and lightness in weight and also for convenience in grasping the smaller end constituting the handle.

This body unit 1 comprises a pair of members 2 of channel section disposed in facing relation with their flanges in edge to edge abutting relation and secured together by rivets 3, 3, 4, 4 and 5. Certain of these rivets perform functions in addition to rivets as will appear as the description proceeds. The members 2 are preferably provided with internal abutting bosses 6 receiving the rivets 3.

The body members are provided with opposed members 7 adjacent the head end of the body unit providing bearings for the driving ratchet 9 and the holding ratchet 10. These members 9 and 10 have hub-like journal portions 11 and 12 respectively journaled in the bearing openings 7.

The members 9 and 10 are disposed in side by side relation and have non-circular spindle receiving openings 13 receiving the non-circular socket spindle 14 which in a reversible wrench of the type illustrated is slidably arranged in the socket members and provided with ball detents 15 seated in bores 16 and yieldably supported by means of the springs 17. The outer ends of the bores are slightly upset to retain the balls.

The spindle is shifted axially to be projected at either side of the unit, the detents acting alternately to frictionally retain the spindle in its adjusted position and to retain a wrench socket. The spindle is provided with a longitudinal groove 18 which is engaged by the pin 19 for preventing the complete removal of the spindle.

The spindle driving ratchet is provided with ratchet teeth 20 adapted to coact with the cross members 21 of the actuating chain 22, this chain being similar to a sprocket chain and is arranged over the ratchet teeth so that a plurality of the link cross members are engaged at the same time, the chain being adapted to ratchet or slip over the teeth in one direction and to have driving engagement with the teeth in the opposite direction.

The ratchet wheel 10 is provided with a holding pawl 23, which is pivoted on the rivet 5—that is, the element 5 constitutes in this assembly the double function of a rivet and a pivot mounting for the pawl. The pawl is yieldingly urged to the ratchet wheel by means of the coiled spring 24 which is supported by the U-shaped holder 25, one arm of which has a laterally turned end 26 engaging within the spring. The bight portion of this holder is engaged with the spindle 27 while its other arm 28 is engaged with one of the bosses 6 so that the pawl is yieldingly urged against the ratchet wheel. This provides a very simple and effective mounting for the spring.

The actuating chain 22 is connected at one end to the coiled retracting spring 29 by means of the coupling link 30, the other end of the spring being connected to one of the rivets 4, see Figs. 1 and 3.

To lubricate the chain, I provide a lubricating roller 31 preferably of felt or other lubricant absorbing material, this roller being mounted on the spindle 27 so that the roller engages or is engaged by the chain as the chain is actuated, thus lubricating the links and the lubrication is transferred by the links to the driving ratchet which being continuously driven in one direction results in an effective lubrication of both the chain and the ratchet wheel.

The pull rod 32 is connected to the other end of the actuating chain, this pull rod being in turn connected to the pull chain 33. It will be understood, however, that the pull chain 33 might be any desired flexible member or element.

The pull chain extends through an opening 34 in the end of the handle to receive the combined grip and return spring 35, the chain being provided with a headed coupling member 36. This grip constitutes a resilient stop, absorbing the shock when the pull chain is released while in extended position and suddenly retracted by the retracting spring 29. It also serves a further purpose—namely, that of permitting limited yielding movement in the event that actuating stress is applied to the handle prior to the complete seating of the pawl 23. In the event that occurs, there is some retracting movement on the actuating chain and this combined stop and grip may yield to prevent injury to the chain and other parts of the wrench.

A stop 37 is slidably mounted on the pull rod 32 to coact with one of the bosses 6 which constitutes a stop on the body unit and also to coact with the enlarged end 38 of the rod which constitutes a stop, thus limiting the actuating stroke of the pull chain and preventing injury to the retracting spring 29 or displacement of the parts.

In operation, the spindle is projected to the desired side for putting on or taking off a nut as the case may be, and in the event of putting on the nut, the nut is started and quickly turned up by manipulation of the actuating chain. When the nut is substantially seated or its turning resistance is such as to render further manipulation by means of the actuating chain inconvenient, the wrench may be manipulated by swinging the handle. The manipulation in removing the nut is the reverse.

Our improved wrench is economical in its parts and the parts are easy to assemble. The structure is compact and may be used in many restricted places where it is not very practical to use an ordinary wrench. Also it has the advantage of permitting very rapid work.

We have illustrated and described our improvements in an embodiment which we have found very satisfactory. We have not attempted to illustrate or describe other embodiments or adaptations as it is believed this disclosure will enable those skilled in the art to embody or adapt our improvements as may be desired.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a ratchet wrench, the combination of a body unit, a rotatable ratchet mounted on said unit, a pawl coacting therewith, a coiled pawl actuating spring, and a U-shaped holder for said spring having one arm terminating in a lateral extension receiving said spring, said body unit being provided with a member with which the bight of said holder loosely engages and with a second member with which the other arm of said holder engages, said spring engaging said pawl under compression and biasing the holder to maintain the holder arms against said members.

2. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and a pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to one end of said chain, a pull rod connected to the other end of said chain, a stop member on said rod loosely mounted on said rod and with which said rod is slidably associated, said rod having a coacting stop at its inner end, said body being provided with a stop for said slidable stop member, and a flexible pull element connected to the outer end of said rod and provided with a grip.

3. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and a pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to one end of said chain, a pull rod connected to the other end of said chain, a stop member operatively associated with said rod to limit the actuating movement of the chain, a flexible pull element connected to the outer end of said rod, and a coiled spring on said pull element constituting a return stop member, said coiled spring being yieldable to permit a limited retracting movement of the actuating chain in the event that the holding pawl is not in completely seated engagement with the holding ratchet when actuating stress is applied to the handle.

4. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and a pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to one end of said chain, a pull rod connected to the other end of said chain, a stop member operatively associated with said rod to limit the actuating movement of the chain, a flexible pull element connected to the outer end of said rod, and a yieldable return stop for said chain.

5. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and a holding pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to one end of said chain, a pull rod connected to the other end of said chain, a step member operatively associated with said rod to limit the actuating movement of the chain, and a yieldable cushion element engaging said chain and body unit at the completion of the retracting movement of the chain to permit further limited retracting movement thereof in

the event the holding pawl is not in completely seated engagement with the holding ratchet.

6. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to one end of said chain, and a combined grip and a return stop connected with said chain externally of said unit, said return stop being upon engagement with said unit yieldable to permit a limited retracting movement of the actuating chain in the event that the holding pawl is not in completely seated engagement with the holding ratchet when actuating stress is applied to the handle.

7. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and a holding pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to one end of said chain, and a yieldable return stop for said chain coacting with said unit and permitting limited retracting movement of the chain in the event the holding pawl is not completely seated when actuating stress is applied to the handle of the wrench.

8. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet rotatable with said driving ratchet and a holding pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to said body unit and to one end of said chain, yieldable means disposed between said chain and body unit constituting a cushion therebetween adapted to yield following completion of the normal retracting movement of the chain to permit further limited movement thereof in the event the holding pawl is not completely seated on the holding ratchet, and stop means limiting the actuating stroke of said chain.

9. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle driving ratchet rotatably mounted on said unit provided with chain engaging ratchet teeth, a spindle drivingly connected to said ratchet, a spindle holding ratchet and a holding pawl coacting therewith, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, yieldable means disposed between said chain and body unit constituting a cushion therebetween adapted to yield following completion of the normal retracting movement of the chain to permit further limited movement thereof in the event the holding pawl is not completely seated on the holding ratchet, and a retracting spring connected to said body unit to one end of said chain.

10. In a ratchet wrench, the combination of a body unit, a rotatable spindle driving wheel rotatably mounted on said unit, a spindle drivingly connected to said wheel, a spindle holding ratchet rotatable with said wheel, a pawl coacting with said holding ratchet, a coiled pawl actuating spring, a U-shaped holder for said spring having one arm terminating in a lateral extension receiving said spring, said body unit being provided with a member with which the bight of said holder loosely engages and with a second member with which the other arm of said holder engages, said spring engaging said pawl under compression and biasing the holder to maintain the holder arms against said members, and a flexible actuating member operatively associated with said driving wheel.

11. In a ratchet wrench, the combination of a chambered body unit, a spindle driving ratchet rotatably mounted on said unit and provided with driving ratchet teeth, a spindle drivingly connected to said ratchet, a holding ratchet operatively associated with said driving ratchet, a holding pawl coacting with said holding ratchet, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring conneced to said chain, pull means for said chain, a lubricant roller mounted to be engaged by said chain as the chain is actuated and retracted for supplying lubricant thereto, and means associated with said holding pawl and lubricant roller simultaneously resiliently urging the pawl against the holding ratchet and the roller against the chain.

12. In a ratchet wrench, the combination of a chambered body unit, a spindle driving ratchet rotatably mounted on said unit and provided with driving ratchet teeth, a spindle drivingly connected to said ratchet, a holding ratchet rotatable with said driving ratchet, a holding pawl coacting with said holding ratchet, an actuating chain coacting with said driving ratchet, said chain having transverse members drivingly engaging the driving ratchet teeth on the actuating stroke thereof and sliding over the teeth on the retracting movement of the chain, a retracting spring connected to said chain, pull means for said chain, a lubricant supply means positioned within said body unit to be engaged by said chain as the chain is actuated and retracted for supplying lubricant thereto, and means associated with said holding pawl and said lubricant supply means simultaneously resiliently urging the pawl against the holding ratchet and the supply means against the chain.

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