March 29, 1938. C. N. DOUGLASS 2,112,693

PORTABLE HAMMER WRENCH

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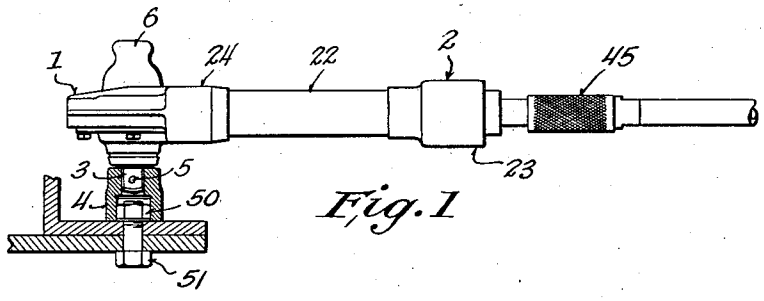


Fig. 1

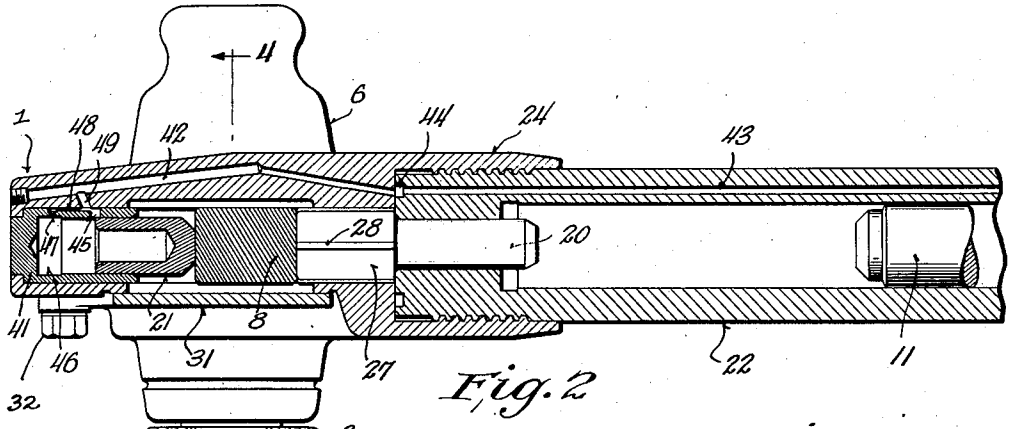


Fig. 2

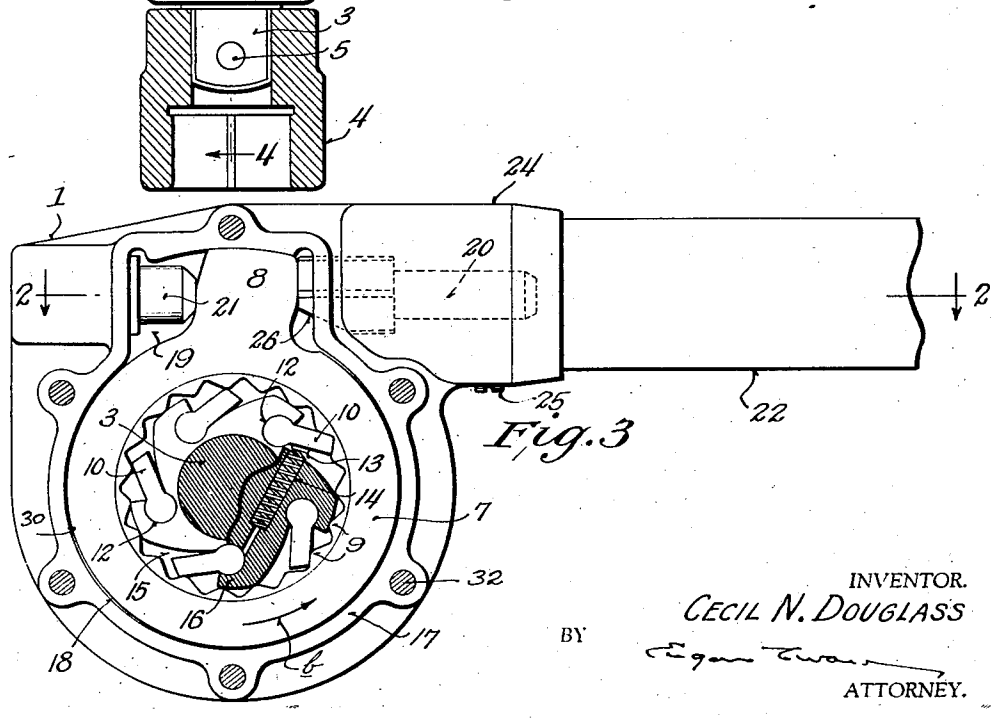


Fig. 3

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Fig. 4

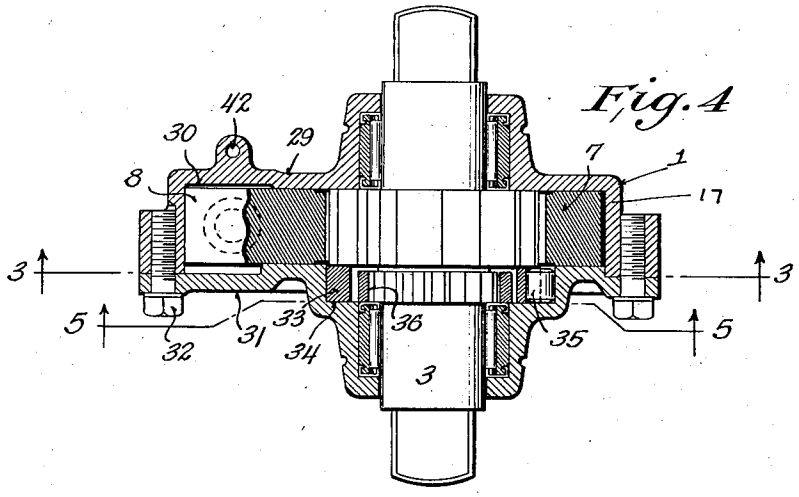
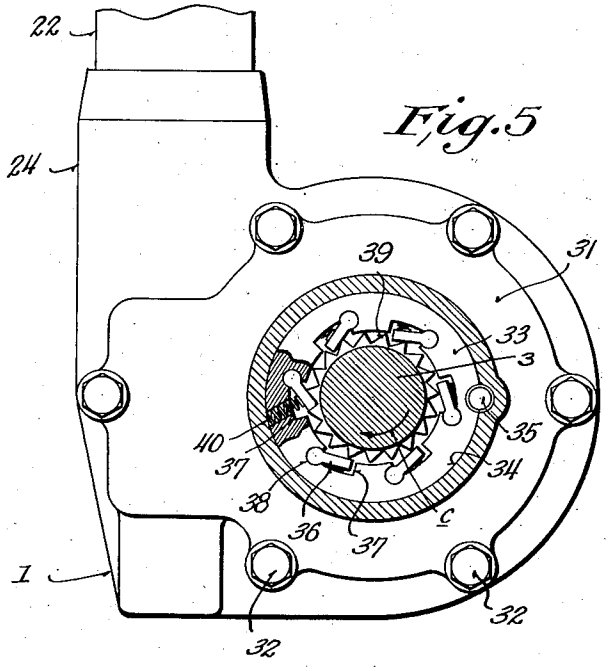


Fig. 5



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PORTABLE HAMMER WRENCH

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Application June 16, 1937, Serial No. 148,427

5 Claims. (Cl. 81—54)

This invention relates to portable power operated hammer wrenches, and more particularly to improvements with respect to the hammer wrench disclosed and claimed in my copending allowed application Serial No. 86,597, filed June 22, 1936 now Patent No. 2,086,261, granted July 6, 1937.

One of the improvements contemplated relates to the provision of reversely acting pawl and ratchet mechanisms in the wrench construction about the spindle, to positively hold the spindle against a reverse rotation in the resetting of the driving pawl and ratchet mechanism following the blows of the pneumatic hammer on the impact collar. This is an improvement over the friction clutch of the previous device in that a frictional connection will not positively hold the spindle against reverse rotation at all times in the resetting of the driving clutch.

Another improvement consists in holding the impact collar out of peripheral contact with the wrench housing by riding the collar directly on the spindle. The advantages of this improvement are that the wrench housing is relieved of the blows of the pneumatic hammer on the collar, and more power is assured as none of the energy is dissipated as heat by a frictional contact between the wrench housing and the periphery of the collar as in the previous construction. With the impact collar riding on the spindle, it is essential that a positive interlock be provided as in the first mentioned improvement to hold the spindle against turning with the impact collar on resetting the driving clutch.

A further improvement consists in so porting the cylinder for the plunger which turns the impact collar in its clutch resetting operation that live air pressure is entrapped in the cylinder to the rear of the plunger to insure an outward projection of the plunger at all times in the operation of the wrench.

In the accompanying drawings illustrating the improvements referred to—

Fig. 1 is a side view of the hammer wrench shown engaged with a nut to be operated upon, the nut engaging socket of the wrench being shown in section;

Fig. 2 is a longitudinal sectional view on a larger scale, with parts in elevation of the wrench end of the tool and the adjacent portion of the barrel of the pneumatic hammer which operates the wrench, the view being taken on line 2—2 of Fig. 3;

Fig. 3 is a plan view of the wrench end of the tool, the cover section of the wrench housing being omitted to show the pawl and ratchet mechanism for driving the spindle, the view showing a portion of said mechanism in section and taken approximately on line 3—3 of Fig. 4;

Fig. 4 is a vertical sectional view taken on line 4—4 of Fig. 2, showing the reversely acting pawl and ratchet mechanisms about the spindle as heretofore referred to; and

Fig. 5 shows the second pawl and ratchet mechanism in plan, partly in section, the entire view being taken on line 5—5 of Fig. 4.

The power wrench shown in the drawings, except for the improvements herein described and claimed, is similar to the wrench construction disclosed in my co-pending application aforesaid and comprises generally a wrench housing 1, a pneumatic hammer 2 secured to the wrench housing at one side thereof, a spindle 3 journaled in the wrench housing in roller bearings and in right angular relation to the pneumatic hammer, and a nut driving socket 4 engageable with either of the exposed ends of the spindle. The socket 4 has non-rotative, but releasable, connection with the ends of the spindle, the latter having at each end a spring biased detent 5 engageable in a recess in the socket as in the previous construction. With the socket operable at either end of the spindle, nuts may be run on and off of bolts without reversing the direction of rotation of the spindle. Hence, by merely reversing the position of the tool, the latter may apply and remove nuts by power.

A cap 6 fits over and encloses the end of the spindle not in use. This cap has detachable connection with the wrench housing about the spindle, and not rotating with the spindle provides a hand rest for the operator using the wrench.

Located in the wrench housing about the spindle is an impact collar 7 having a radially disposed anvil projection 8 on its outer periphery and ratchet teeth 9 on its inner periphery. Spring biased pawls 10 carried by the spindle co-operate with the teeth 9 for rotating the spindle when the collar 7 is turned in one direction by the blows of the hammer piston 11 on the anvil projection 8 of the collar. The teeth 9 are disposed continuously about the collar 7, and the pawls are circumferentially spaced as shown.

The arrow *b* in Fig. 3 indicates the direction in which the collar 7 is turned to rotate the spindle. It will be observed from Fig. 3 that the pawls face this direction of rotation and have abrupt outer ends to abut the teeth 9 for a driving en-

gagement. In the embodiment shown, five pawls 10 are employed and each pawl has alternate driving engagement with the teeth 9 in the back and forth or oscillatory movement given to the impact collar. With this arrangement, the third pawl from the driving one is at the top of its associate tooth so as to drop quickly into driving engagement with said tooth on turning the collar even though slightly with respect to the spindle.

The pawls 10 have their inner ends pivotally mounted on the spindle in semi-circular grooves 12 in the spindle and are pressed against the teeth 9 by coiled springs 13, also carried by the spindle, there being a spring for each pawl as shown. The spindle is provided with bores 14 to accommodate the springs as detailed in Fig. 3.

The pawls 10 and the teeth 9 are co-extensive with the width of the impact collar providing a heavy duty driving clutch for the spindle 2. The grooves 12 open through the spindle portion carrying the pawls enabling each pawl to be dropped into its groove from an end thereof when assembling the device. This spindle portion is cut away or otherwise fashioned at its outer periphery to provide spaces 15 for movement of the pawls in ratcheting over the teeth of the collar 7. This also provides the spindle portion with spokes 16 on the outer ends of which the collar 7 rides at its teeth 9 as shown in Fig. 3. These spokes have their outer ends concentric with the axis of the spindle and thus, the impact collar may ride on the spindle and be held thereby with its outer periphery out of contact with the enclosing wall 17 of the housing 1 as indicated by a clearance space 18 in Fig. 3. The advantage of this as heretofore stated, is to relieve the wrench housing of the blows of the hammer on the collar, and conserve power as none of the energy is dissipated as heat by frictional engagement between the periphery of the collar and wrench housing as in the previous construction.

The anvil projection 8 works in a chamber 19 in the wrench housing and is engaged on its opposite sides by a tappet 20 and a plunger 21 shown in Fig. 2. The tappet 20 is carried by the barrel 22 of the pneumatic hammer and extends into the chamber 19 for engagement with the anvil projection 8 as shown in Figs. 2 and 3. The tappet receives the blows of the hammer piston 11, said piston being reciprocated back and forth in the barrel 22 by compressed air admitted alternately to the opposite ends of the barrel by the automatic action of a distributing valve (not shown) in the valve section 23 of the hammer.

The barrel 22 has screw threaded connection with the wrench housing in a tubular projection 24 thereon, a set screw 25 being employed to hold the barrel against turning when the parts are assembled. The end of the tappet adjacent the anvil projection is beveled-off as shown at 26 so that the tappet will not strike against the base of the anvil projection where it joins the collar 7. This provides for a rugged construction and permits the tappet to be brought relatively close to the collar so as to reduce the overall dimension of the assembly. The portion 27 of the tappet in the wrench housing has a non-rotative connection therewith to hold the tappet against rotation and thus keep the beveled end of the tappet in proper relation to the collar. This non-rotative connection may be made by having the tappet and its receiving recess in the wrench housing square in cross-section with the covers on the tappet cut-off as indicated at 28.

The impact collar 7 is enclosed within the wrench housing being held against the bottom wall 29 of the chamber 30 for the collar by the cover section 31 of the housing. This cover section 31 is secured in place against the collar 7 by cap screws 32 as shown. As indicated in Fig. 4 the spindle 3 is journaled adjacent one end in the body portion of the wrench housing and adjacent its other end in the cover section 31.

The second pawl and ratchet clutch about the spindle is shown in Fig. 5. This clutch comprises a ring 33 located in a chamber 34 in the cover portion 31 of the wrench housing immediately below the spindle portion carrying the driving pawls 10. In practice the ring 33 is held in its chamber 34 by the spokes 16 of the spindle overlapping the ring as shown in Fig. 4. The ring 33 is fixed to the wrench housing by a pin 35 as shown in Fig. 5. This holds the ring 33 against rotation and provides non-rotative support for a number of spring biased pawls 36 extending inwardly from the inner periphery of the ring and operating in spaces 37 provided in the inner edge of the ring as shown. The pawls 36 are mounted in grooves 38 in the ring and are pressed into engagement with ratchet teeth 39 on the portion of the spindle 3 surrounded by the ring by coiled springs 40. The pawls 36 have abrupt outer ends and these ends abut against the teeth 39 to hold the spindle 3 against reverse rotation when the impact collar 7 is turned to reset the driving pawls 10. The pawls 36 ratchet over the teeth 39 when the spindle 3 is driven by these pawls. The reverse direction of rotation referred to is indicated by the arrow *c* in Fig. 5, and it will be noted that the pawls 36 are arranged to face this direction. Six pawls 36 are spaced about the ring 33 to alternately engage the teeth 39. Hence, a slight rotation of the spindle in a reverse direction is prevented.

With the impact collar 7 rotatably supported by the spindle 3 and riding directly on the spindle as heretofore stated, the impact collar by reason of its frictional engagement with the spindle would drag the spindle around with the collar except for the positive check provided by the second clutch.

The plunger 21 is mounted in a cylinder 41 carried by the wrench housing and supplied with compressed air from the same source as the pneumatic hammer 2. The porting arrangement for this purpose follows the disclosure in my copending application, namely, having live air passages 42, 43 in the wrench housing and barrel 22, respectively, connected by an annular channel 44 in the end of the barrel, as shown in Fig. 2. The passage 43 connects into the live air pressure ahead of the throttle valve 45 of the hammer. This by-passes the live air about the throttle valve and insures a supply to the plunger 21 as soon as the air supply is turned on.

The air passage 42 in the wrench housing, as shown in Fig. 2, is connected into the cylinder 41 between the ends of the cylinder through a port 45. This port is closed by the plunger 21 on its return movement and live air will be entrapped behind the plunger to maintain a pressure on the plunger. Hence, the plunger is prevented from going all the way back into the cylinder and becoming ineffective. The bore of the cylinder 41 at its rear end is slightly larger than the diameter of the plunger as indicated at 46 to provide a clearance space which is fed with live air from the passage 42 by a leak port 47. This insures starting the plunger on its outward stroke, even

when the plunger is at the bottom of the cylinder. The leak port is connected with a groove 48 in the exterior of the cylinder 41, and this groove leads to a port 49 in the wrench housing connected with the passage 42 and the port 45, respectively.

The tool herein shown and described is held in the hands of the operator the same as in the previous construction and will be used for running on as well as running off nuts by power. The wrench shown is of a size to apply and remove nuts from ¾" to 1½" diameter. For this size of wrench a pneumatic hammer is employed delivering approximately 1800 blows or strokes per minute. For a smaller size wrench blows as high as 4000 per minute may be used, while for a larger wrench the number of blows may be as low as 1200 per minute. The improvements disclosed add to the effectiveness of the wrench and render the construction well adapted for the heavy duty work. In Fig. 1, the wrench is shown applied to a nut 50 on a bolt 51. The socket 4 is shaped to fit the particular nut with which it is used. The pneumatic hammer provides a permanent handle member for the wrench.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. A portable power wrench comprising a housing, a rotary spindle journaled in the housing, an impact collar revolubly mounted in the housing about the spindle and having an anvil projection, an intermittent grip device between the collar and the spindle for rotating the spindle when the collar is turned in one direction, a pneumatic hammer connected to the housing and having a piston for imparting blows on the anvil projection for turning the collar in a direction to rotate the spindle, and means carried by the housing and operable on the collar in opposition to the piston for turning the collar in the opposite direction to reset the grip device following the blows of the piston on the collar, said housing having a chamber enclosing the collar and said collar riding on the spindle and having a diameter less than the surrounding wall of the chamber whereby the spindle holds the collar out of peripheral contact with the housing to relieve the housing of the blows of the piston on the collar.

2. A portable power wrench comprising a housing, a rotary spindle journaled in the housing, an impact collar revolubly mounted in the housing about the spindle and having ratchet teeth on its inner periphery and an anvil projection on its outer periphery, spring biased pawls carried by the spindle and cooperating with said teeth for rotating the spindle when the collar is turned in one direction and for ratcheting over said teeth when the collar is turned in the opposite direction, a pneumatic hammer connected to the housing and having a piston for imparting blows on the anvil projection for turning the collar in a direction to rotate the spindle, and means carried by the housing and operable on the collar in opposition to the piston for turning the collar in the opposite direction to reset the pawls with respect to the teeth following the blows of the piston on the collar, said collar riding at its teeth on the spindle and held thereby out of peripheral contact with the housing to relieve the housing of the blows of the piston on the collar.

3. A portable power wrench comprising a housing, a rotary spindle journaled in the housing and having a spoke-shaped portion, an impact collar revolubly mounted in the housing about the spoke-shaped portion of the spindle and having ratchet teeth on its inner periphery, spring biased pawls carried by the spokes of the spindle and cooperating with said teeth for rotating the spindle when the collar is turned in one direction and ratcheting over said teeth when the collar is turned in the opposite direction, a pneumatic hammer connected to the housing and having a piston for imparting blows on the collar for turning the collar in a direction to rotate the spindle, and means carried by the housing and operable on the collar in opposition to the piston for turning the collar in the opposite direction to reset the pawls with respect to the teeth following the blows of the piston on the collar, said collar riding at its teeth on the outer ends of the spokes of the spindle and held thereby out of peripheral contact with the housing to relieve the housing of the blows of the piston on the collar.

4. A portable power wrench comprising a housing, a rotary spindle journaled in said housing, an impact collar revolubly mounted in the housing about the spindle and provided with an anvil projection, a pawl and ratchet connection between the collar and the spindle for rotating the spindle when the collar is turned in one direction, a pneumatic hammer connected to the housing and having a piston for imparting blows on the anvil projection for turning the collar in a direction to rotate the spindle, means carried by the housing and operable on the collar in opposition to the piston for turning the collar in the opposite direction to reset the pawl and ratchet connection between the spindle and the collar following the blows of the piston thereon, said housing having a chamber enclosing the collar and said collar riding on the spindle and having a diameter less than the surrounding wall of the chamber whereby the spindle holds the collar out of peripheral contact with the housing, and a second pawl and ratchet mechanism in the housing about the spindle and cooperating therewith to positively hold the spindle against turning with the impact collar on resetting the same.

5. A portable power wrench comprising a housing, a rotary spindle and an intermittent grip device for turning the spindle in one direction, both journaled in the housing, said grip device having an impact collar about the spindle and provided with an anvil projection, a plunger and a tappet reciprocably mounted in the housing on opposite sides of the anvil projection for contact therewith, a pneumatic hammer connected to the housing and having a piston for imparting blows on the tappet for turning the collar in a direction to rotate the spindle, and means for subjecting the plunger to the live air pressure for the hammer for forcing the plunger against the anvil projection to turn the collar in a direction to reset the grip device following the blows of the piston on the collar, said means having an inlet port opened and closed by the plunger its back and forth movement to entrap live air behind the plunger to maintain a live air pressure thereon during the operation of the wrench.

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