March 29, 1955 L. A. MOOTER 2,704,952

POWER OPERATED MAGAZINE WRENCH

Filed Sept. 15, 1952 3 Sheets-Sheet 1

Fig. 1

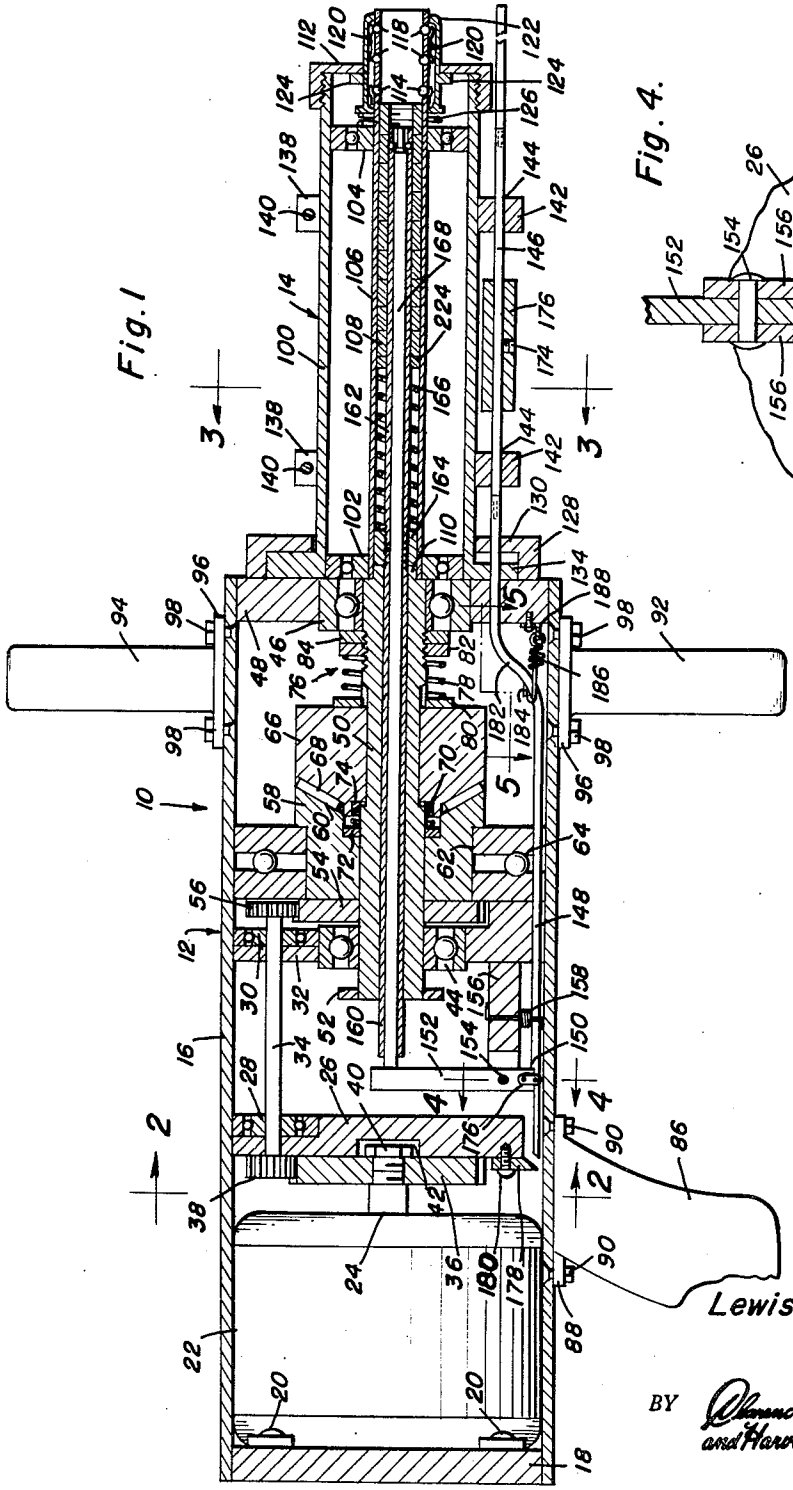
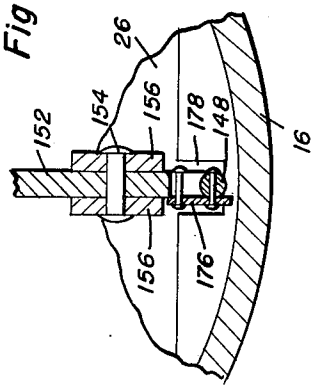


Fig. 4.



Lewis A. Mooter
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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POWER OPERATED MAGAZINE WRENCH

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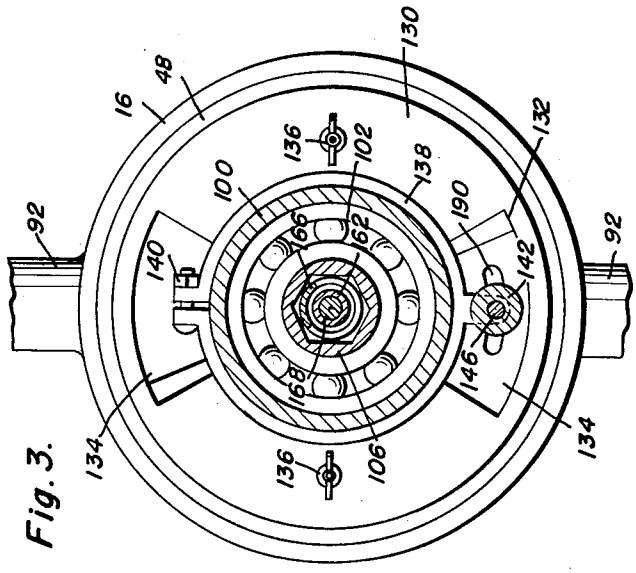


Fig. 3.

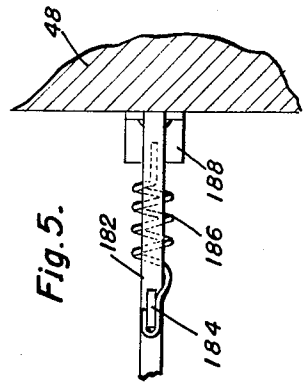


Fig. 5.

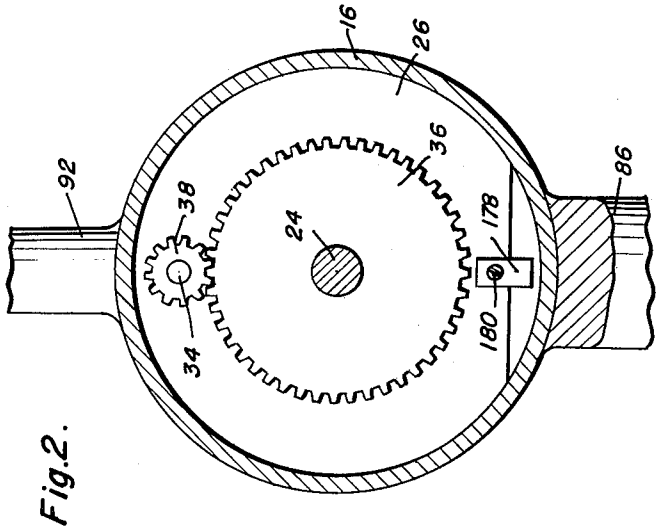


Fig. 2.

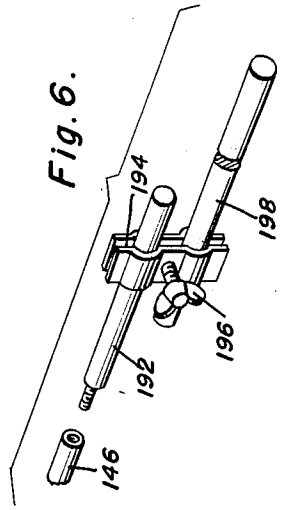


Fig. 6.

Lewis A. Mooter
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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POWER OPERATED MAGAZINE WRENCH

Filed Sept. 15, 1952 3 Sheets-Sheet 3

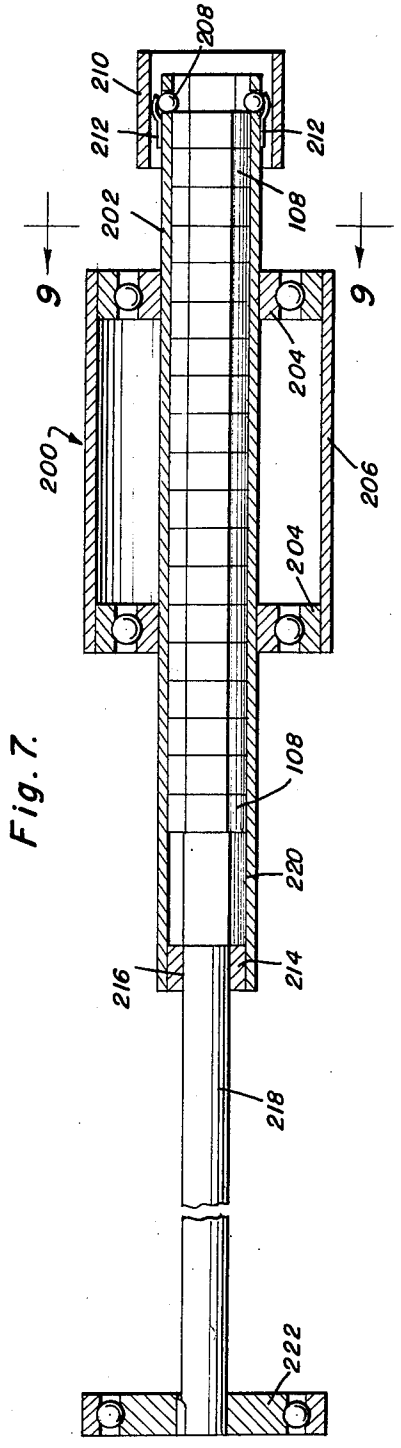


Fig. 7.

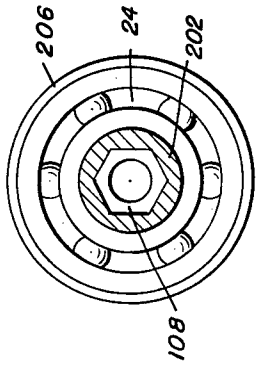


Fig. 9.

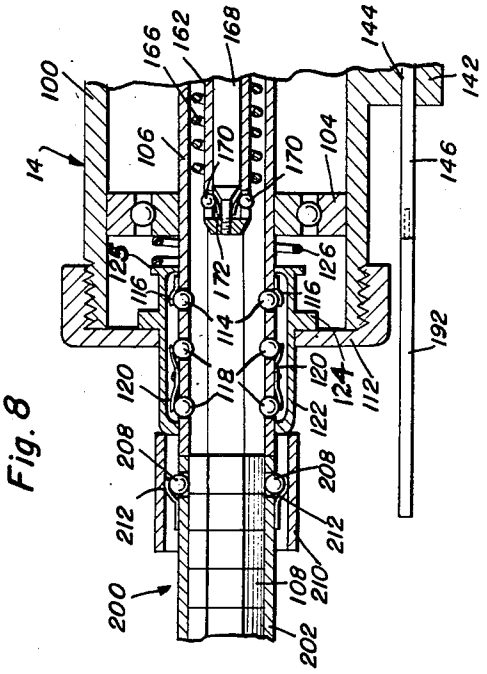


Fig. 8

Lewis A. Mooter
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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2,704,952

POWER OPERATED MAGAZINE WRENCH

Lewis A. Mooter, Huntington Park, Calif.

Application September 15, 1952, Serial No. 309,703

12 Claims. (Cl. 81—57)

This invention relates in general to wrenches, and more specifically to automatic wrenches for engaging and tightening nuts on threaded members.

The primary object of this invention is to provide an improved magazine wrench for positioning nuts on threaded members, said magazine wrench being so constructed and designed whereby the same be operated without stopping the rotation of the drive means thereof.

Another object of this invention is to provide an improved magazine wrench which includes a rotatable nut holder, said magazine wrench being provided with means for advancing nuts into a threaded member engaging position while the nut holder is being rotated.

Another object of this invention is to provide an improved magazine wrench which includes a drive unit and a nut holder unit, said nut holder unit being removably connected to said drive unit to facilitate the replacement and inspection of the same.

A further object of this invention is to provide an improved magazine wrench for positioning and tightening nuts on threaded members, said magazine wrench being provided with means for advancing nuts to a threaded member engaging position, said means including an operating shaft engageable with a surface which has projecting therefrom a threaded member adapted to receive a nut whereby advancement of nuts within the magazine wrench is automatic.

A still further object of this invention is to provide an improved nut magazine for loading nuts, said nut magazine being so constructed and designed whereby the same may be utilized to load nuts into a nut holder while the same is being rotated.

A further object of this invention is to provide an improved nut magazine for loading nuts into a rotating nut holder, said nut magazine including a nut receiving barrel having a plunger movable axially therethrough for moving nuts thereout, said barrel and plunger being adapted to be rotated and having rotatable support means.

With these objects definitely in view, this invention resides in certain novel features of construction, combination and arrangement of elements and portions as will be hereinafter described in detail in the specification, particularly pointed out in the appended claims, and illustrated in the accompanying drawings which form a material part of this application and in which:

Figure 1 is a longitudinal sectional view taken through the center of the magazine wrench which is the subject of this invention and shows the general construction of the same;

Figure 2 is an enlarged fragmentary transverse vertical sectional view taken substantially upon the plane indicated by the section line 2—2 of Figure 1 and shows the general construction of the drive means for the magazine wrench;

Figure 3 is an enlarged fragmentary transverse vertical sectional view taken substantially upon the plane indicated by the section line 3—3 of Figure 1 and shows the general construction of the nut holder unit and the manner in which it is detachably connected to a drive unit of the magazine wrench;

Figure 4 is an enlarged fragmentary transverse vertical sectional view taken substantially upon the plane indicated by the section line 4—4 of Figure 1 and shows the construction of an automatic unconnectable link to permit rearward movement of a nut advancing shaft by a threaded member passing through a nut advanced by the same;

Figure 5 is an enlarged fragmentary longitudinal horizontal sectional view taken substantially upon the plane indicated by the section line 5—5 of Figure 1 and shows the general construction of means for urging the nut advancing means to an inoperative position;

Figure 6 is an enlarged fragmentary perspective view of the forward end of an operating shaft for the nut advancing means, said operating shaft being adjustable in length so as to permit the adaptation of the same to various type surfaces having threaded members on which nuts are adapted to be positioned;

Figure 7 is a longitudinal vertical sectional view on an enlarged scale through the center of a nut magazine for loading the magazine wrench of Figure 1 and shows the general construction thereof, a portion of a plunger for ejecting nuts being broken away;

Figure 8 is a rotated fragmentary enlarged longitudinal sectional view showing the connection between the abutting ends of the nut magazine and the magazine wrench when the same are positioned for the loading of nuts into the nut holder of the magazine wrench; and

Figure 9 is a transverse vertical sectional view taken substantially upon the plane indicated by the section line 9—9 of Figure 7 and shows the general cross-section of the nut magazine.

Similar characters of reference designate similar or identical elements and portions throughout the specification and throughout the different views of the drawings.

Referring now to the drawings in detail, it will be seen that there is illustrated a magazine wrench, which is the subject of this invention, the magazine wrench being referred to in general by the reference numeral **10**. The magazine wrench **10** includes a drive unit **12** and a nut holder unit **14**, the nut holder unit being removably connected to the drive unit in a manner to be described in more detail hereinafter.

The drive unit **12** includes an elongated cylindrical housing **16** which has a rear end thereof closed by an end plate **18**. Rigidly secured to the end plate **18** by suitable fasteners **20** is a suitable power unit **22**. The power unit **22** is disposed within the rear portion of the housing **16** and has a forwardly extending shaft **24**.

Positioned forwardly of the power unit **22** is a transversely extending bulkhead **26** which has mounted in the upper portion thereof a suitable bearing **28**. In alignment with the bearing **28** is a similar bearing **30** which is positioned in the upper portion of a transverse bulkhead **32** which is similar to the bulkhead **26**. Extending between the bulkheads **26** and **32** and mounted in the respective bearings **28** and **30** is a drive shaft **34**.

Mounted on the shaft **24** of the power unit **22** is a drive gear **36** which is intermeshed with a driven gear **38** mounted on the rear end of the drive shaft **34**. It will be noted that the drive gear **36** is retained on the shaft **24** by a nut **40** which is positioned within a recess **42** formed in the rear surface of the bulkhead **26**.

Mounted within the forward bulkhead **32** is a centrally positioned bearing **44** which is in alignment with a centrally positioned bearing **46**, the bearing **46** being mounted within an end wall **48** at the front end of the housing **16**. Carried by the bulkhead **32** and the end wall **48** and positioned within their respective bearings **44** and **46** for rotation is a hollow drive shaft **50**. The drive shaft **50** is retained within the bearings **44** and **46** by a removable nut **52** threadedly engaged on the rear end thereof.

Rotatably mounted on the rear portion of the drive shaft **50** forwardly of the bearing **44** is an enlarged gear **54** which is intermeshed with a gear **56** mounted on the forward end of the drive shaft **34** and is driven by the same. The gear **54** is connected to the rear end of a male clutch member **58** which is provided with a bevelled serrated front face **60**. It will also be noted that the male clutch member **58** is provided with an annular recess **62** in the rear portion thereof in which is seated a portion of a thrust bearing **64**, the thrust bearing **64** being mounted within the housing **16** and preventing rearward movement of the male clutch member **58**.

Also mounted on the drive shaft **50** is a female clutch member **66** which has a complementary bevelled serrated face **68** for engagement with the bevelled serrated

face 60 of the male clutch member 58. The female clutch member 66 is slidably mounted on the drive shaft 50 by a splined connection so that the same may be utilized to rotate the drive shaft 50 when engaged with the male clutch member 58.

Mounted on the drive shaft 50 between the male clutch member 58 and the female clutch member 66 is a coil spring 70 for urging the two apart. The coil spring 70 engages a washer 72 at one end thereof, the washer 72 being disposed between the coil spring and a forward face of the male clutch member 58. A similar washer 74 is positioned between the forward end of the coil spring 70 and the rear face of the female clutch member 66. The main purpose of the washers 72 and 74 is to permit the coil spring 70 to remain stationary while the clutch members are rotating with respect to each other.

In order that the clutch members may normally be in engagement, there is mounted on the shaft 50 forwardly of the female clutch member 66 a clutch adjusting mechanism which is referred to in general by the reference numeral 76. The clutch adjusting mechanism 76 includes a coil spring 78 carried by the shaft 50 and being positioned between spaced washers 80 and 82. The washer 80 engages the forward face of the female clutch member 66 while the washer 82 engages the rear face of an adjusting nut 84. The adjusting nut 84 is threadedly mounted on the shaft 50 and is utilized for adjusting the tension of the coil spring 78 whereby the required torque to disengage the clutch members 58 and 66 may be varied as desired.

In order that the drive unit 12 may be conveniently handled, the rear portion of the housing 16 has secured to the underside thereof a pistol-type grip 86. The pistol-type grip 86 has a flange portion 88 at the upper end thereof which is secured directly to the housing 16 by suitable fasteners 90.

The drive unit 12 may be also gripped by utilizing tubular grip elements 92 and 94 which are disposed at the forward end of the drive unit and which extend vertically above and below the housing 16. The tubular grip elements 92 and 94 each are provided at their ends adjacent the housing 16 with a flange 96, the flange 96 being secured to the surface of the housing 16 by suitable fasteners 98.

The nut holder unit 14 includes an elongated tubular housing 100 which is removably connected to the end wall 48 of the drive unit 12 in a manner to be described in more detail hereinafter. Positioned in the rear end of the housing 100 is a suitable bearing 102 which is aligned with a suitable bearing 104 disposed in the forward portion of the housing 100. Mounted within the bearings 102 and 104 for rotation is an elongated tubular nut holder 106. The nut holder 106 has a hexagonal or other polygonal shaped interior adapted to conform to the shape of nuts 108 carried thereby and has the rear end thereof telescoped over a reduced forward end portion 110 of the shaft 50 whereby the same is rotated in unison. The housing 100 also has removably connected to the forward end thereof a forward closure cap 112 through which passes the forward end of the nut holder 106.

The nut holder 106 has positioned rearwardly from the forward end thereof inwardly urged balls 114 adapted to engage forward ends of nuts to form stop means for the same. The balls 114 are urged inwardly and held in their respective positions by spring elements 116.

Positioned adjacent the extreme forward end of the holder 106 are spaced pairs of balls 118 which project inwardly into the interior of the nut holder 106. The balls 118 are so spaced that a nut may be positioned between the same and held in that position for engagement with a threaded member. The balls 118 are urged inwardly by spring elements 120.

Carried by the forward end of the nut holder 106 and enclosing the spring elements 116 and 120, and the balls 114 and 118 is a movable dust cap 122. The dust cap 122 has an outwardly extending annular flange 124 on the rear end thereof which engages behind the closure cap 112 and limits outward movement of the same. The dust cap 122 is urged outwardly to a position with its annular flange 124 in engagement with the closure cap 112 by a coil spring 126, the coil spring engaging the bearing 104 and another outwardly extending annular flange 125 on the inner end of dust cap 122.

Referring now to Figures 1 and 3 in particular, it will be seen that the end member 48 has extending forwardly therefrom a cylindrical projection 128 which terminates at its forward end in an inwardly directed annular plate 130. The annular plate 130 is provided with diametrically opposed upper and lower wedge shaped recesses 132. The recesses 132 have received therethrough outwardly extending diametrically opposite upper and lower wedge-shaped extensions 134 carried by the housing 100. The extensions 134 are also tapering in thickness whereby the same, after being placed within the wedge-shaped recesses 132, may be turned so as to jam edge portions thereof behind the annular plate 130 and prevent the accidental removal of the nut holder unit 14 from the drive unit 12. The annular plate 130 is also provided with diametrically opposed screws 136 which tightly clamp the same with respect to the end member 48.

Carried by the housing 100 adjacent the ends thereof are spaced collars 138. The collars 138 are of the split ring type and are clamped on the housing 100 by fasteners 140. The collars 138 are provided with downwardly extending projections 142 which have aligned bores 144 therethrough. Carried by the collars 138 and slidably mounted within the bores 144 is an intermediate section 146 of an operating rod.

Mounted within the housing 16 of the drive unit 12 is an elongated shaft 148 which is offset intermediate its ends and which has a forward portion extending through the end member 48, one of the wedge-shaped extensions 134 and the wedge-shaped openings 132. The intermediate section 146 is threadedly engaged in the forward end of the shaft 148 and is removably connected thereto.

The rear portion of the shaft 148 is of a reduced cross-section to form a shoulder 150. The shoulder 150 is normally in engagement with the lower end of a lever 152 pivotally carried by a pivot pin 154. The pivot pin 154 is mounted in a bifurcated rear end portion of a rearwardly extending extension 156 carried by the bulkhead 32. The shoulder 150 is normally retained in engagement with the lower end of the lever 152 by a spring which extends between and is secured to the extension 156 and the shaft 148, the spring being referred to by the reference numeral 158.

Extending through the shaft 50 is an elongated sleeve 160, the sleeve 160 extending out of the rear end of the shaft. The sleeve 160 is connected at its forward end to a forward sleeve 162 by a connecting member 164. The connecting member 164 is threadedly mounted on the abutting ends of the sleeves 160 and 162 and is disposed within the nut holder 106. Mounted on the sleeve 162 and extending forwardly from the connector 164 is a spring 166 which engages the innermost nut 108 and urges the plurality of nuts disposed within the nut holder 106 forwardly out of the forward end thereof. The nuts are retained within the nut holder 106 by the balls 114.

Extending through the sleeves 160 and 162 is an elongated shaft 168 which extends out of the rear end of the sleeve 160 and is engaged by the upper end of the lever 152. As is best illustrated in Figure 8, the forward end of the shaft 168 has mounted therein outwardly projecting balls 170, the balls 170 being urged outwardly by springs 172 disposed within the forward end of the shaft 168, the forward end of the shaft being of a greater diameter than the forward end of the sleeve 162 so as to limit the retraction of the shaft 168.

Mounted on the intermediate section 146 and secured thereto by a suitable fastener 174 is an actuating handle 176. When the handle 176 is moved rearwardly, the lever 152 has its lower end moved rearwardly by the shoulder 150 and results in the forward movement of the shaft 168. The balls 170 at the forward end of shaft 168 engage behind a first nut disposed within the nut holder 106 and urge the same forwardly to a position between the balls 118 whereby the same is in a position for engagement over the end of a threaded member.

The rear portion of the shaft 148 is connected to the lower end of the lever 152 by a link 176. The link 176 is connected to the lower end of the lever 152 by a pin which is disposed in a vertical slot to permit downward movement of the rear portion of the shaft 148 so that the shoulder 150 may be moved out of engagement with the lever 152. This is accomplished by engagement of the rear end of the shaft 148 with a bevelled face of a guide member 178 secured to the rear face of the bulkhead 26 by a suitable fastener 180.

As the shaft **148** continues to move rearwardly after the shaft **168** has been advanced to position a nut between the balls **118**, the rear end thereof engages the bevelled face of the guide member **178** and causes downward movement thereof with the resultant movement of the shoulder **150** out of engagement with the lever **152**. When so positioned, the shaft **168** is free to be moved rearwardly by a projecting end of a threaded member which may have passed through a nut positioned between the balls **118**.

Referring now to Figures 1 and 5 in particular, it will be seen that the offset portion of the shaft **148**, which is referred to by the reference numeral **182** has formed on the rear end thereof a shoulder **184**. Engaged around the offset portion **182** and behind the shoulder **184** is one end of a spring **186**. The other end of the spring **186** is hooked through a flange **188** of an L-shaped member. The L-shaped member is secured to the rear surface of the end member **48** in alignment with the shoulder **184**. As the shaft **148** is moved rearwardly, the spring **186** is tensioned and automatically returns the shaft **148** to the position illustrated in Figure 1 upon release of the handle **176** or other operating means which will be explained in more detail hereinafter.

Referring now to Figure 3 in particular, it will be noted that the lowermost wedge shaped extension **134** of the housing **100** is provided with an arcuate slot **190**. The arcuate slot has passed therethrough a forward portion of the shaft **146** and permits the twisting of the nut holder unit **14** whereby the same may be removed from engagement with the drive unit **12**.

Referring now to Figure 6 in particular, it will be seen that removably connected to the intermediate section **146** of the operating shaft is a forward section **192**. Adjustably mounted on the forward end of the forward section **192** is a two-piece clamp **194** whose elements are selectively clamped together by a suitable fastener **196**. Mounted in the lower end of the two-piece clamp **194** is a forwardly extending extension **198**.

The forwardly extending extension **198** may be adjusted within the two-piece clamp **194** so that the same may engage a surface having threaded members projecting therefrom. When it is desired to mount one of the nuts **108** on the threaded member (not shown), the magazine wrench **10** is moved into alignment with the threaded member and the forward end of the extension **198** engages the surface to move the operating shaft and position a nut between the balls **118**. As the magazine wrench **10** is continued to move forward, the nut **108** so positioned engages the threaded member and is threadedly engaged thereon. When the nut has been tightened to the desired torque the clutch members **58** and **66** move out of engagement and rotation of the nut holder **106** and the nut is stopped. The magazine wrench **10** is then removed and the operation repeated with respect to another threaded member.

Referring now to Figure 7 in particular, it will be seen that there is illustrated a nut magazine which is adapted for loading the nut holder **106** while the same is rotating, the nut magazine being referred to in general by the reference numeral **200**. The nut magazine includes an elongated barrel **202** which has substantially the same cross-section as the nut holder **106**. The barrel **202** is mounted within a pair of spaced suitable bearings **204** which are carried by the barrel **202** intermediate the ends thereof. The bearings **204** are mounted within a suitable cylindrical support **206** which forms a first handle for the nut magazine **200**.

The forward end of the barrel **202** has positioned therein inwardly extending balls **208** which are adapted to engage a forward nut **108** and prevent the removal of the same from the barrel **202**. Mounted around the forward end of the barrel **202** is a cylindrical member **210** which has mounted therein a pair of spring members **212** which engage the balls **208** and urge the same inwardly towards the center of the barrel **202**.

The rear end of the barrel **202** has positioned therein an end member **214** which has a bore **216** extending axially therethrough. Positioned within the bore **216** and slidable therethrough is a plunger shaft **218**. Mounted on the forward end of the plunger shaft **218** and positioned within the barrel **202** is a plunger head **220** which engages the rearmost nut **108**. Carried by the rear end of the plunger shaft **218** is a suitable bearing **222** which forms a suitable handle for moving the plunger shaft and head axially through the barrel **202** while the same is rotating.

Referring now to Figure 8 in particular, it will be seen that there is illustrated the nut magazine **200** in the process of loading the nut holder **106** of the nut holder unit **14**. The forward end of the barrel **202** is in engagement with the forward end of the nut holder **106** and the cylindrical member **210** engages the forward end of the dust cap **122**. Inasmuch as both the nut holder **106** and the dust cap **122** are rotated, rotary motion will also be imparted to the barrel **202** and the cylindrical member **210**. However, since the nut magazine **200** is held by both the stationary handle **206** and the outer race of the bearing **222**, the barrel **202** and the cylindrical member **210** are free to rotate.

While the barrel **202** and the elements of the plunger are rotating, the plunger shaft **218** is moved forwardly through the bore **216** by imparting a forward pressure on the bearing **22**. This results in the forward movement of the plunger head **220** and the resultant movement of the nuts **108** out of the barrel **202** into the nut holder **106**. The length of the plunger shaft **218** is such that all of the nuts **108** are moved on the sleeve **162** and retained behind the balls **170** at the forward end of the shaft **168**. After the magazine wrench **10** has been loaded in the above manner, it may be utilized in the manner described above.

In order that spring **166** may be prevented from falling out of the nut holder **106**, there is provided a spring retainer **224**. The spring retainer is slidably mounted on shaft **168** in snug engagement therewith and closely fits the interior of nut holder **106**. Outward movement of the spring retainer **224** is limited by engagement thereof with the balls **170** on the ends of shaft **168**.

While the nut holder unit **14** has been described as being removable for purposes of replacement, inspection, and repair, the invention is not so limited. Nut holder units designed to receive different size nuts may be interchangeably used with the drive unit **12**.

The operation of this device will be understood from the foregoing description of the details thereof, taken in connection with the above recited objects and drawings. Further description would appear to be unnecessary.

Minor modifications of the device, varying in minor details from the embodiment of the device illustrated and described here, may be resorted to without departure from the spirit and scope of this invention, as defined in the appended claims.

Having described the invention, what is claimed as new is:

1. For use in a magazine wrench including a rotatable nut holder and drive means for rotating said nut holder, means for advancing nuts in said nut holder, and means for holding a nut in an advanced position for engagement with a threaded member, said means for advancing nuts including an operating shaft for automatically operating said nut advancing means.

2. For use in a magazine wrench including a rotatable nut holder and drive means for rotating said nut holder, means for advancing nuts in said nut holder, and means for holding a nut in an advanced position for engagement with a threaded member, said nut advancing means including a nut receiving shaft positioned within said nut holder and movable axially thereof, means carried by said nut receiving shaft graspingly engageable with a nut for moving the same within said nut holder.

3. A magazine wrench comprising a rotatable nut holder, drive means for rotating said nut holder, means for advancing nuts in said nut holder, means for holding a nut in an advanced position for engagement with a threaded member, said nut advancing means including a nut supporting and advancing shaft for receiving nuts in spring urged relation, linkage for selectively advancing said shaft, said linkage being provided with means automatically disconnecting the same from said shaft.

4. A magazine wrench comprising a rotatable nut holder, drive means for rotating said nut holder, means for advancing nuts in said nut holder, means for holding a nut in an advanced position for engagement with a threaded member, said nut advancing means including a nut supporting and advancing shaft for receiving nuts in spring urged relation, linkage for selectively advancing said shaft, said linkage being provided with means automatically disconnecting the same from said shaft, said

linkage including an operating shaft for automatically operating said nut advancing shaft.

5. A magazine wrench comprising a rotatable nut holder, drive means for rotating said nut holder, means for advancing nuts in said nut holder, means for holding a nut in an advanced position for engagement with a threaded member, said nut advancing means including a nut supporting and advancing shaft for receiving nuts in spring urged relation, linkage for selectively advancing said shaft, said linkage being provided with means automatically disconnecting the same from said shaft, said drive means being continuously operable during the advancing of a nut.

6. A magazine wrench comprising a single rotatable nut holder, drive means for rotating said nut holder, means for advancing nuts in said nut holder, means for holding a nut in an advanced position for engagement with a threaded member, and a nut magazine loader for loading said nut holder while the same is operating, said nut magazine loader including a rotatable barrel, a plunger carried by said barrel for urging nuts from said barrel into said nut holder.

7. A magazine wrench comprising a single rotatable nut holder, drive means for rotating said nut holder, means for advancing nuts in said nut holder, means for holding a nut in an advanced position for engagement with a threaded member, and a nut magazine loader for loading said nut holder while the same is operating, said nut magazine loader including a rotatable barrel, a plunger carried by said barrel for urging nuts from said barrel into said nut holder, said plunger being of a length to seat nuts behind nut stop means of said nut holder.

8. A magazine wrench comprising a single rotatable nut holder, drive means for rotating said nut holder, means for advancing nuts in said nut holder, means for holding a nut in an advanced position for engagement with a threaded member, and a nut magazine loader for loading said nut holder while the same is operating, said nut magazine loader including a rotatable barrel, a plunger carried by said barrel for urging nuts from said barrel into said nut holder, said barrel and plunger being provided with non-rotatable supports.

9. A nut magazine loader for loading nuts into a rotating nut holder of a magazine wrench, said loader including a rotatable barrel, a plunger carried by said barrel for urging nuts from said barrel into the nut holder.

10. A nut magazine loader for loading nuts into a rotating nut holder of a magazine wrench, said loader including a rotatable barrel, a plunger carried by said barrel for urging nuts from said barrel into the nut holder, said barrel and plunger being provided with non-rotatable supports.

11. For use in a magazine wrench including a rotatable nut holder and drive means for rotating said nut holder, means for advancing nuts in the nut holder, and means for holding a nut in an advanced position for engagement with a threaded member, said nut advancing means including a nut receiving shaft positioned within said nut holder and movable axially thereof, means carried by said nut receiving shaft graspingly engageable with a nut for moving the same within the nut holder, an operating shaft for automatically advancing said nut receiving shaft.

12. For use in a magazine wrench including a rotatable nut holder and drive means for rotating said nut holder, means for advancing nuts in the nut holder, and means for holding a nut in an advanced position for engagement with a threaded member, said nut advancing means including a nut receiving shaft positioned within said nut holder and movable axially thereof, means carried by said nut receiving shaft graspingly engageable with a nut for moving the same within the nut holder, an operating shaft for automatically advancing said nut receiving shaft, said operating shaft being connected to said nut receiving shaft by a lever, means for effectively disconnecting said lever and said operating shaft.

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