Nov. 23, 1971 O. V. NORTHCUTT 3,621,738

POWERED RATCHET WRENCH

Filed June 17, 1969 2 Sheets-Sheet 1

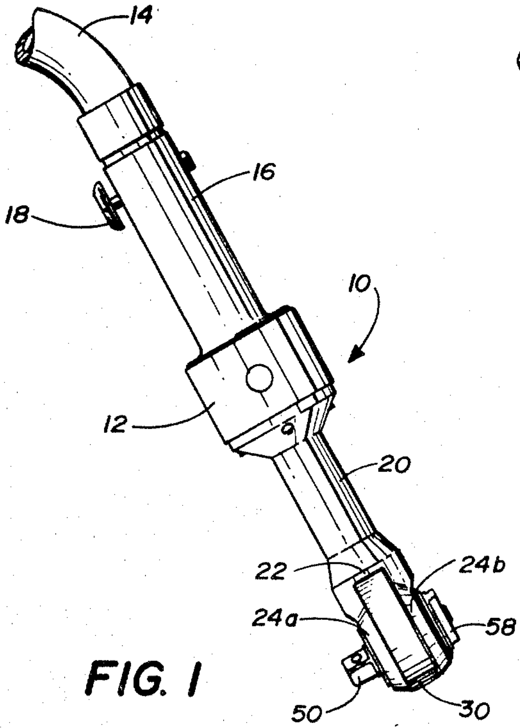


FIG. 1

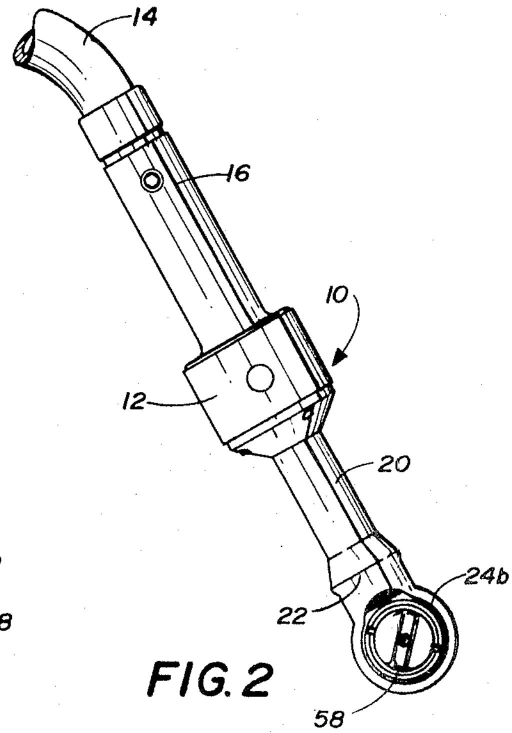


FIG. 2

FIG. 3

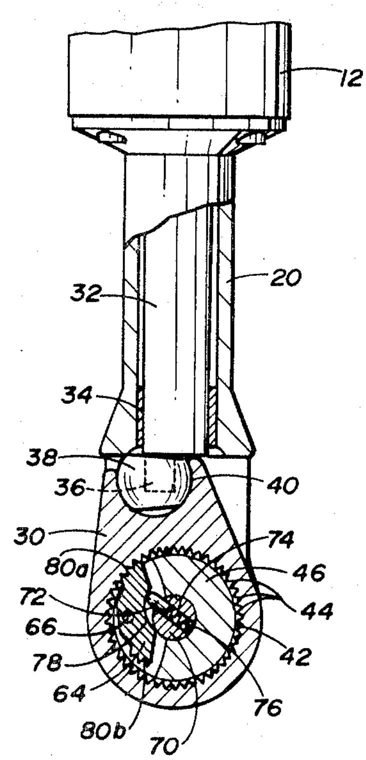
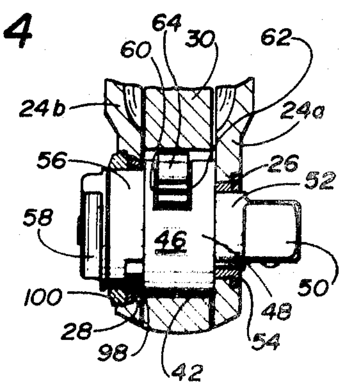


FIG. 4



INVENTOR:
OREN V. NORTHCUTT

Richards, Harris & Hubbard
ATTORNEY

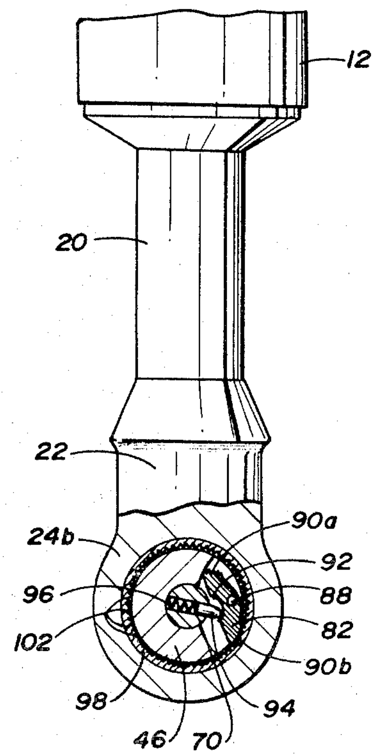


FIG. 5

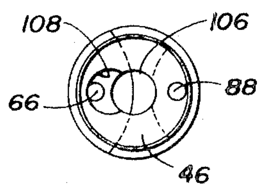


FIG. 6

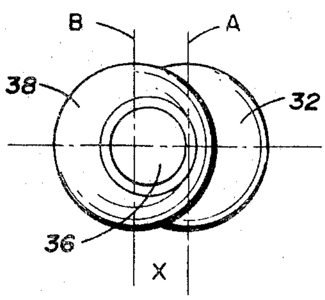


FIG. 8

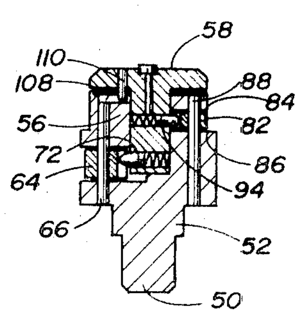
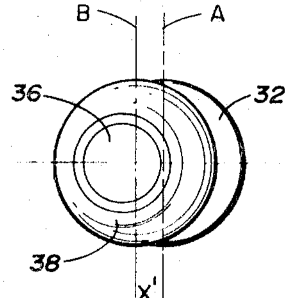


FIG. 7

FIG. 9



INVENTOR:
OREN V. NORTHCUTT

Richards, Harris & Hubbard
ATTORNEY

United States Patent Office

3,621,738

Patented Nov. 23, 1971

1

3,621,738

POWERED RATCHET WRENCH

Oren V. Northcutt, Rte. 1, Box 982, Dallas, Tex. 75216

Filed June 17, 1969, Ser. No. 834,033
Int. Cl. B25b 13/46
U.S. Cl. 81—57.39 21 Claims

ABSTRACT OF THE DISCLOSURE

A ratchet wrench includes a shaft rotatable by a motor with a stud at one end of the shaft parallel and eccentrically disposed with respect to the longitudinal axis of the shaft. A ball is carried by a ratchet head and has a hole therein for receiving the stud on the shaft. Rotation of the shaft causes the ratchet head to oscillate. A wrench drive is mounted within the ratchet head and includes a pawl which engages teeth in the ratchet head to rotate the wrench drive upon oscillation of the ratchet head. A friction pawl is carried by the wrench drive to provide a resistive force on the wrench drive only during one direction of oscillation of the ratchet head. The direction of the ratchet action of the wrench drive may be selectively changed without changing the direction of rotation of the motor.

RELATED APPLICATION

This invention is an improvement over the U.S. Pat. No. 3,529,498, issued Sept. 22, 1970, to Oren V. Northcutt.

FIELD OF THE INVENTION

This invention relates to powered wrenches, and more particularly to powered wrenches having reversible ratchet action.

THE PRIOR ART

A number of different types of powered wrenches have heretofore been developed for removing and setting studs, nuts and the like. In many such powered wrenches, the driving end of the wrenches are rather cumbersome and are unduly bulky for use in environments wherein sufficient headroom is not available. Accordingly, efforts have been made to provide a powered wrench requiring little headroom, examples of such wrenches being shown in U.S. Pats. 2,264,012; 2,086,261 and 2,758,569. However, such prior art powered wrenches have not generally met with success due to their rather complex and large structures. Moreover, such prior art wrenches have generally not been reversible.

In order to overcome many of the difficulties experienced with previously developed powered wrenches, a reversible powered wrench which was efficient, compact and comparatively simple in construction was developed and described in U.S. Pat. No. 3,529,498, issued Sept. 22, 1970 to Oren V. Northcutt. This powered wrench may be selectively ratcheted in two different directions and is self-regulating to increase the torque delivered, at reduced speed, when the load on the wrench becomes heavy. In order to ratchet without a lead being imposed on the wrench drive, this wrench utilizes a frustoconical washer which frictionally engages the wrench drive to provide sufficient resistance to cause ratcheting of the wrench.

While the reversible powered wrench described in the previously identified U.S. Pat. No. 3,529,498 has been advantageouly utilized in a plurality of applications, the friction washer results in some loss of speed and power, as well as overheating of the wrench during long periods of use. The constant friction imposed by the washer also produces excessive wear of the wrench. Moreover, when the wrench is used with accessories such as long extensions and universal joints, or worn sockets, the wrench

2

sometimes will not ratchet due to the spring-like action imposed by the accessories.

SUMMARY OF THE INVENTION

In accordance with the present invention, a powered wrench is provided wherein an oscillated wrench head engages a pawl carried by a wrench drive in order to rotate the wrench drive. A spring-loaded friction pawl is carried by the wrench drive and is engageable with the wrench frame for placing a restrictive force on the wrench drive during one direction of reciprocation of the oscillated wrench head. The friction pawl becomes disengaged from the wrench frame and places substantially no restrictive force on the wrench drive during the other direction of reciprocation of the oscillated wrench head.

In accordance with a more specific aspect of the invention, a spring-loaded friction pawl is carried by the wrench drive and is engageable with a ring carrying teeth about the inner periphery thereof. The engagement of the pawl with the ring places a restrictive force on the wrench drive during only one direction of oscillation of the wrench head. When an excessive load is placed upon the wrench drive, the ring slips to prevent damage to the friction pawl.

In accordance with a more specific aspect of the invention, a wrench frame is provided with a slot in the end thereof and a circular opening therethrough extending normal to the slot. An oscillatory head is dimensioned to fit within the slot and has a hole therein for regsitration with the circular opening, the hole having teeth defined about the periphery thereof. A shaft is rotatable by a suitable motor and extends through the wrench frame for engagement with the oscillatory head. A wrench drive is rotatably mounted within the circular opening in the hole. A driving pawl is carried by the wrench drive and engageable with the teeth in the oscillatory head for rotating the wrench drive. A friction pawl is carried by the wrench drive for engaging the wrench frame in one direction of oscillation of the oscillatory head to place a restrictive force on the wrench drive.

DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and for further objects and advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side view of the powered wrench of the invention;

FIG. 2 is a front view of the wrench shown in FIG. 1;

FIG. 3 is a fragmentary partially sectioned view of FIG. 2;

FIG. 4 is a fragmentary end view of the structure of FIG. 1, with portions thereof sectioned for clarity;

FIG. 5 is an end view, partially sectioned, of the wrench shown in FIG. 2;

FIG. 6 is a top view of the wrench drive of the invention, with the ratchet reversing member removed;

FIG. 7 is a sectional view of the wrench drive of the invention;

FIG. 8 is an end view of the crank shaft of the invention with the ball element in the position of maximum stroke; and

FIG. 9 is a view of the structure shown in FIG. 8 with the ball element rotated into the position of minimum stroke.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1 and 2 illustrate a powered wrench **10** constructed in accordance with the present invention. The wrench 10 may be powered by a variety of different types of motors. The preferred embodiment utilizes an air motor 12 operated by a source of pressurized air fed through an air hose 14. A suitable air motor is described and disclosed in the copending patent application Ser. No. 639,767, filed May 19, 1967, now Pat. No. 3,498,186, by Oren V. Northcutt. A conduit-handle 16 includes therein an air control valve button 18. Depression of button 18 controls the admission of air to motor 12 in order to rotate the present wrench. It will be understood that, if desired, other types of motors such as an electric motor may be substituted for the air motor 12.

An annular casing 20 extends from the motor 12 and includes a bifurcated wrench frame 22. Frame 22 has a slot therein which defines spaced apart ear portions 24*a–b*. As best shown in FIG. 4, ear 24*a* includes a circular opening 26 therethrough normal to the slot through frame 22. Ear 24*b* includes a larger circular opening 28 therethrough, openings 26 and 28 being aligned with one another. An oscillatory ratchet head 30 is dimensioned to fit within the slot in frame 22 and is mounted for oscillation between the ears 24*a–b*.

A shaft 32 is rotatably journaled in a bearing 34 within the annular casing 20, as best shown in FIG. 3. Shaft 32 is connected at its driven end to the rotor of the motor 12, not shown. The end of the shaft 32 which is remote from the motor 12 includes a cylindrical projection or stud 36. The longitudinal axis of stud 36 is parallel to, but eccentric from, the axis of rotation of the shaft 32.

The stud 36 is received by a mating circular opening formed in a ball member 38. In the preferred embodiment of the invention, the axis of the circular opening is offset from the central axis of the ball member 38, i.e. the opening is not concentric with a diameter of the ball member 38.

The ball member 38 is carried within an arcuate slot 40 formed in the upper portion of the ratchet head 30. The ball member 38 may move laterally along the arcuate slot 40, but the ball 38 is restrained with respect to movement normal to the arcuate slot due to the conformance of the surfaces of the arcuate slot 40 and the ball 38. Accordingly, movement of the ball 38 in a generally side-to-side oscillatory path causes the ratchet head 30 to move with the ball 38. Since the ratchet head 30 is constrained to rotate about an axis passing through the openings 26 and 28 through ears 24*a–b*, the ratchet head 30 is oscillated back-and-forth as the ball member 38 is moved by rotation of the shaft 32. The thickness of the ratchet head 30 is sufficiently greater than the diameter of the ball member 38 to allow movement of the ball member 38 in a direction transverse to the plane of the oscillatory movement without striking the interior sides of the ears 24*a–b*.

A circular hole 42 is defined through the ratchet head 30 and registers with the openings 26 and 28 through the ears 24*a–b*. As best shown in FIGS. 3 and 4, the surface of the hole 42 is provided with a plurality of teeth 44. A wrench drive 46 extends through the openings 26 and 28 and through the hole 42 as shown in FIG. 4. The wrench drive 46 includes an enlarged circular midportion 48 which is disposed between the ears 24*a–b*.

A socket wrench engaging stud 50 having a rectangular cross section is rigidly connected to a circular shaft portion 52 of the wrench drive 46. Shaft portion 52 is rotatably journaled in the ear 24*a* within a bearing 54. A cylindrical extension 56 of the wrench drive 46 is also integrally connected with the mid-portion 48 and extends through the opening 28 of the ear 24*b*. A ratchet reversing member 58 is carried by the cylindrical extension 56 in a manner to be subsequently described in greater detail.

As best shown in FIGS. 3 and 4, a recessed portion is formed in the mid-portion 48 to form spaced apart shoulders 60 and 62. A driving ratchet pawl 64 is mounted within the recess between the shoulders 60 and 62. Pawl 64 is pivotally mounted on a shaft 66 which extends through the wrench drive 46. Accordingly, the driving pawl 64 may be rocked between two extreme positions about the shaft 66.

As shown in FIGS. 3 and 7, the ratchet reversing member 58 is integrally connected to a shaft 70 which extends centrally through the wrench drive 46. A plunger or pin 72 is slidably mounted within an aperture 74 extending through the shaft 70. A spring 76 is disposed within the aperture 74 to urge the pin 72 outwardly. Accordingly, the outwardly extending end of the pin 72 pushes against an inner curved portion 78 of the pawl 64.

The shaft 70 may be positioned between two extreme positions by the rotation of the ratchet reversing member 58. The pawl 64 is illustrated in FIG. 3 in one of these extreme positions. By rotation of the shaft 70 counterclockwise, the pin 72 is moved to ride adjacent the opposite end of the inner curved portion 78 in order to position the pawl 64 in the other extreme position. Two sets of teeth 80*a–b* are defined on opposite outer ends of the pawl 64. Either set of these teeth may be engaged as desired with the teeth 44, by proper positioning of the ratchet reversing member 58.

Referring now to FIGS. 5–7, a second friction pawl 82 is disposed in a recess defined in the cylindrical extension 56 of the wrench drive 46 by shoulders 84 and 86. Pawl 82 is pivotal about a shaft 88 disposed through the wrench drive 46 as shown in FIG. 7. Pawl 82 includes a pair of teeth portions 90*a–b* disposed on opposite ends thereof. Pawl 82 also has an inner curved surface 92. A plunger or pin 94 is slidably received within an aperture in the shaft 70. A spring 96 normally biases the pin 94 outwardly against the curved surface 92 of the pawl 82.

A slip ring 98, best shown in FIGS. 4 and 5, is disposed in the opening 28 in ear 24*b*. The slip ring 98 abuts a shoulder in the hole and is held in place by a threaded annular nut 100. Nut 100 threadedly engages a threaded portion in the opening 28 and may be selectively tightened in order to allow a preselected amount of tension to be exerted upon the slip ring 98. Slip ring 98 includes a plurality of teeth 102 about the inner periphery thereof. In the position of the pawl 82 shown in FIG. 5, teeth 90*b* of the pawl 82 engage with the teeth 102 of the slip ring 98.

It will be understood that when the ratchet reversing member 58 is rotated, the shaft 70 will be rotated and the pin 94 will ride around the curved surface 92 of the pawl 82. The pawl 82 is thus racked to a position wherein the teeth 90*a* engage the teeth 102 of the slip ring 98. When the pawl 82 is in the position shown in FIG. 5, if the wrench drive 46 tends to rotate in a clockwise direction, the teeth 90*b* engage with the teeth 102 of the slip ring 98 and tend to place a restrictive force upon rotation of the wrench drive 46 in the clockwise direction. This restrictive force enables ratcheting of the wrench to occur even when a slight or no load is imposed upon the wrench drive.

Again referring to FIG. 5, when the wrench drive 46 rotates in the counterclockwise position, the pawl 82 becomes disengaged from the teeth 102 of slip ring 98 and thus does not impose a substantial restrictive force upon rotation of the wrench drive. This unidirectional application of restrictive force provides a flywheel effect to the wrench drive, and does not reduce the speed or increase the power consumption of the wrench as did the constant restrictive force of previous wrenches.

Referring to FIGS. 6 and 7, the construction and operation of the ratchet reversing member 58 is illustrated. The shaft 70 extends through a central opening 106 in the wrench drive 46 and carries, in the manner previously described, the spring biased pins 72 and 94. A counterbore portion 108 is defined in the end of the wrench drive 46 to receive a pin 110 which depends from the ratchet reversing member 58. Pin 110 limits the pivot travel of the member 58 due to abutment with the walls of the counterbore portion 108, in order that the pins

72 and 94 are properly positioned. Selective rotation of the member 58 changes the direction of rotation of the wrench drive 46 in the manner previously described.

In operation, with the ratchet reversing member 58 positioned to place the teeth 80*a* of the pawl 64 into the engagement with the teeth 44 of the ratchet head 30, rotation of the shaft 32 causes the stud 36 to carry the ball member 38 in a generally circular path. This results in a rocking, side-to-side oscillatory motion of the ratchet head 30 within the slot provided between the ears 24*a–b*. Accordingly, the teeth 44 on the ratchet head 30 oscillate back-and-forth around the center of the hole 42 about which they are disposed. As the teeth 44 rotate counterclockwise as viewed in FIG. 3, the pawl 64 is carried by the mutual tooth engagement to cause the pawl 64 to follow the counterclockwise rotary path of motion of the ratchet head 30. The wrench drive 46 is thus rotated counterclockwise for an incremental movement.

When the ratchet head 30 is then rotated in the opposite clockwise direction on a return stroke, the teeth 44 push the pawl teeth 80*a* inwardly against the bias of the spring 76 and free of engagement with the teeth 44. Relative motion, or ratchet action, thus occurs between the wrench drive 46 and the ratchet head 30. Due to the rapid turning of the shaft 32, a series of such ratchet actions occur within a relatively short time to produce rapid rotation of the stud 50 in a single direction only.

The operation of the friction pawl 82 is a significant feature when the stud 50 is not substantially loaded, as when a bolt is turned with little resistance by a socket engaged with the stud 50. Inspection of FIG. 5 will illustrate that when the wrench drive 46 tends to rotate in a clockwise direction relative to the fixed wrench frame 22, due to the wrench drive 46 tending to move with the ratchet head 30 on the return stroke, the teeth 90*b* engage with teeth 102 on the slip ring 98 to impose a resistance to such clockwise movement of the wrench drive 46. Pawl 82 thus insures that there is sufficient resistance to the clockwise rotation of the wrench drive 46 to cause the driving pawl teeth 80*a* to be moved out of engagement with teeth 44 during the ratchet portion of the cycle. This insures ratchet action under all conditions, no matter how light the load imposed on stud 50. Without such frictional engagement of the pawl 82, sufficient resistance would not be present to cause the pawl teeth 80*a* to move out of engagement with teeth 44, and the desired ratchet action would not occur, thereby causing the stud 50 to oscillate back-and-forth.

Referring to FIGS. 3 and 5, it will be seen that when the wrench drive 46 is being rotated in a counterclockwise direction due to the alternating driving and ratchet actions, the teeth 90*b* of the friction pawl 82 will be moved out of engagement with the teeth 102 of the slip ring 98. Teeth 90*b* will not then impose a resistance to the movement of the wrench drive 46 in the counterclockwise portion. This unidirectional application of resistive force enables the wrench drive 46 to have a flywheeling action even when the ratchet action is occurring. This increases the drive speed of the wrench drive 46, unlike the prior art, wherein the constant fractional resistance caused a slowdown or stopping of the wrench drive 46 during the ratchet action.

The present tool thus runs much faster than previously developed ratchet wrenches of this type. Particularly advantageous is the fact that the present wrench operates very efficiently and at a relatively fast speed with low air pressure used in many industrial applications. For instance, with a low air pressure of 80 p.s.i., previous ratchet wrenches of this type ran at only about 125 r.p.m., while the present wrench operates at a much faster 250 r.p.m. At higher air pressures, such as 120 p.s.i., previous ratchet wrenches of this type operate at about 300 r.p.m., while the present wrench operates with a speed of at least 450 r.p.m.

In addition to more efficient operation, the present wrench is advantageous in that it does not tend to overheat when run for long periods, and is additionally not subject to the excessive wear of the previously developed ratchet wrenches. The present wrench will ratchet under no load conditions, and will also ratchet when utilizing long extensions, universal joints, or worn sockets which impose a spring-like action on the wrench drive.

The operation of the present wrench when it is desired to reverse the ultimate direction of rotation imparted to the stud 50 will be clear by reference to the previous description. To reverse the direction of operation, it is ncessary only to rotate the ratchet reversing member 58 to move the shaft 70 to the opposite extreme position.

Rotation of the shaft 70 will cause the pins 72 and 94 to be rotated from the position shown in FIGS. 3 and 5. Pin 72 will move against the curved surface 78 in order to force the teeth 80*b* into engagement with the teeth 44 of the ratchet head 30. Pin 94 will be moved along the curved surface 92 in order to force the teeth 90*a* into engagement with the teeth 102 of the slip ring 98.

Operation of the wrench in this direction is similar to that previously described, but in reverse. The teeth 44 of the ratchet head 30 are oscillated back and forth about the hole 42 on which they are disposed. This causes the teeth 80*b* to provide ratchet and drive action in the opposite sense to that previously described. Additionally, the teeth 90*a* tend to prevent rotation of the wrench drive 46 in a counterclockwise manner, to provide ratcheting action of the wrench even during slight or no load conditions, as previously described.

An important aspect of the present invention is the provision of the slip ring 98. The slip ring 98 allows the use of a relatively small and delicate pawl 82 in the present wrench. When undue force is exerted upon the stud 50 during ratcheting action of the wrench, the slip ring 98 will tend to rotate relative to the ear 24*b* in which it is set, thereby preventing breakage of the friction pawl 82. The slip ring 98 slips until the larger driving pawl 64 engages 44 to take up the force. The annular nut 100 may be selectively tightened within the ear 24*b* in order to provide the desired amount of slip tension on the slip ring 98 for various applications. The slip ring 98 enables the present wrench to be compact and usable in areas with little headroom, but still capable of handling heavy loads.

Another aspect of the invention is provided by the eccentric relationship between the ball member 38 and the stud 36 on shaft 32. This relationship is illustrated in FIGS. 8 and 9, wherein it may be seen that the center of the stud 36 is offset, or eccentric, to the axis A which passes through the center of the shaft 32. Further, the opening in the ball member 38 which receives the stud 36 is offset, or eccentric, with respect to the axis B which passes through the center of the ball member 38. Therefore, the ball member 38 may assume a variety of positions between the extreme positions illustrated in FIGS. 8 and 9.

In FIG. 8, the ball member 38 is illustrated in a position such that the eccentricity of the opening therethrough causes the axis of the ball member to be a maximum distance X from the axis of the shaft 32. FIG. 9 illustrates the ball member 38 when it is pivoted into a position such that its eccentricity causes the distance from the axis of the ball member 38 to the axis of the shaft 32 to be at a minimum value X′.

The load which must be handled by the stud 50 ultimately determines the extent of the placement of the axis of the ball member 38 with respect to the axis of the shaft 32. Thus, in instances where a heavy load is being handled by the stud 50, the comparatively large forces existing between the ratchet head 30, the ball member 38 and the stud 36 will cause the ball member 38 to assume the shortest displacement possible with respect to the center of the axis of the shaft 32. Hence, a short but powerful stroke results where a maximum of force can be transmitted.

Alternatively, where the forces between the ratchet head **30**, the ball member **38** and the stud **36** are relatively low, as when a bolt is quite easily turned down or withdrawn, the maximum displacement X will exist between the center of the ball member **38** and the axis of the shaft **32**. Under such conditions of low force requirements, a long stroke will occur which causes the stud **50** to very quickly withdraw or drive the bolt. Under these conditions, the power transmitted is at a minimum, although the movement is at a maximum. The operation of the eccentric ball member **38** is further described in the previously identified copending patent application Ser. No. 504,670.

Although the present invention has been described in conjunction with a reversible wrench and with a ratchet wrench having an eccentric ball mechanism, it is to be understood that the present invention of the second friction pawl should not be limited to any specific wrench. For instance, the present concept of the second friction pawl could advantageously be utilized on a ratchet wrench having a single direction of rotation, or with a ratchet wrench not having the variable force eccentric ball mechanism described herein.

Thus, although the present invention has been described with respect to specific embodiments, it will be understood that various changes and modifications will be suggested to one skilled in the art, and it is intended to encompass these changes and modifications as fall within the scope of the appended claims.

What is claimed is:

1. A motor operated ratchet wrench comprising:
(a) a wrench frame having an opening in the end thereof,
(b) an oscillatory head reciprocable by said motor within said opening,
(c) a circular wrench drive carried within said osclla-tory head,
(d) a driving pawl connected to said wrench drive and engageable with said oscillatory head to rotate said wrench drive, and
(e) means connected to said wrench drive and engageable with said wrench frame for placing a restrictive force on said wrench drive during one direction of reciprocation of said oscillatory head and substantially no restrictive force on said wrench drive during the other direction of reciprocation of said oscillatory head.

2. The ratchet wrench of claim **1** wherein said means comprises a friction pawl mounted on said wrench drive.

3. The ratchet wrench of claim **2** wherein said friction pawl engages teeth on said wrench frame.

4. The ratchet wrench of claim **2** wherein said driving pawl is larger than said friction pawl and said pawls are engageable with different gear teeth on said wrench drive.

5. The ratchet wrench of claim **2** wherein said driving and friction pawls are each movable between two different positions for selectively reversing the direction of rotation of said wrench drive.

6. The ratchet wrench of claim **2** and further comprising:
an arcuate slot formed in said oscillatory head,
a circular member carried in said arcuate slot, and
a rotatable shaft connected to said motor and having an eccentrically disposed projection received by said circular member.

7. The ratchet wrench of claim **6** in which said circular member eccentrically receives said projection.

8. A motor powered wrench comprising:
(a) a wrench frame having a slot in the end and a circular opening extending therethrough normal to said slot,
(b) an oscillatory head dimensioned to fit within said slot and having a hole therein for registration with said circular opening, said hole having teeth defined about the periphery thereof,

(c) a shaft rotatable by said motor extending through said wrench frame and engaged with said oscillatory head for oscillation thereof,
(d) a wrench drive rotatably mounted within said circular opening and said hole,
(e) a first pawl carried by said wrench drive and engageable with said teeth in said oscillatory head for rotating said wrench drive in a first direction, and
(f) a second pawl carried by said wrench drive for applying only an unidirectional restrictive force on said wrench drive.

9. The wrench of claim **8** and further comprising:
a plurality of teeth disposed about a portion of said circular opening through said wrench frame, said second pawl engageable with said plurality of teeth.

10. The wrench of claim **9** wherein said plurality of teeth are defined in a ring mounted on said wrench frame.

11. The wrench of claim **9** wherein said ring slips relative to said wrench frame upon the application of undue force to said wrench drive.

12. The wrench of claim **8** wherein said first and second pawls are offset from one another along the axis of rotation of said wrench drive.

13. The wrench of claim **8** wherein said first and second pawls are each pivotable about an axis and are spring-loaded.

14. The wrench of claim **13** and further comprising:
a manually operable member for pivoting said pawls about their axes for reversing the direction of rotation of said wrench drive.

15. The wrench of claim **4** wherein said member carries a pair of spring-loaded pins which bear against said pawls.

16. The wrench of claim **8** wherein said first pawl is larger than said second pawl.

17. A motor operated wrench comprising:
a wrench frame having an opening in the end thereof,
a wrench head carried within said opening,
a wrench drive operable by oscillation of said wrench head,
a friction pawl carried by said wrench drive, and
teeth structure carried by said frame and engageable with said friction pawl to place a unidirectional restrictive force on said wrench drive.

18. The combination of claim **17** wherein said teeth are carried by a ring mounted in said wrench.

19. The combination of claim **18** wherein said ring is adapted to slip relative to said wrench when undue force is exerted upon the wrench drive.

20. The combination of claim **18** wherein said ring abuts against a shoulder in said wrench, an adjustable tension means being provided to tension said ring against the shoulder.

21. A powered wrench comprising:
(a) a rotatable shaft having at one end thereof a stud connected parallel to, but eccentric with, the axis of rotation of said shaft,
(b) motor means for rotating said shaft,
(c) an oscillatory head having an arcuate slot therein,
(d) a frame for pivotally carrying said head,
(e) ball means received by said arcuate slot in said oscillatory head and having an opening eccentric with respect to a diameter of said ball means for rotatably receiving said stud, rotation of said shaft causing oscillation of said head with a varying force and length stroke dependent upon the load imposed thereon,
(f) a rotatable wrench drive,
(g) means interconnecting said oscillatory head and said wrench drive for rotating said wrench drive in a selected direction when said head oscillates, and
(h) means carried on said wrench drive for placing a resistive force on said wrench drive during one direction of oscillation of said head but substantially no resisitive force on said wrench drive during the opposite direction of osclation of said head whereby

rotation of said wrench drive will occur when said wrench drive is not carrying a substantial load.

References Cited

UNITED STATES PATENTS

3,019,681	2/1962	Grissom	81—61
2,711,110	6/1955	Brame	81—58.1
2,451,840	10/1948	Lewandowski	74—142 X
3,478,979	11/1969	Henze	192—12 B X
1,222,712	4/1917	Armstrong	192—12 B
1,192,489	7/1916	Anglada	192—12 B

JAMES L. JONES, Jr., Primary Examiner

U.S. Cl. X.R.

74—118, 142