United States Patent [19]

Trimble et al.

[11] **3,783,703**

[45] **Jan. 8, 1974**

[54] **RATCHET MECHANISM**

[75] Inventors: **Lester B. Trimble,** Downey; **Zygmunt J. Sopinski,** Pico Rivera, both of Calif.

[73] Assignee: **Jo-Line Tools, Inc.,** Anaheim, Calif.

[22] Filed: **Nov. 17, 1972**

[21] Appl. No.: **307,428**

[52] **U.S. Cl.** **74/157,** 74/142, 81/58.1

[51] **Int. Cl.** **F16h 27/02**

[58] **Field of Search** 74/157, 142, 575; 81/58, 58.1, 58.5

[56] **References Cited**

UNITED STATES PATENTS

3,369,416	2/1968	Kilness	74/157
3,691,876	9/1972	Cassidy, Jr.	81/58.1
3,044,591	7/1962	Kilness	74/157

FOREIGN PATENTS OR APPLICATIONS

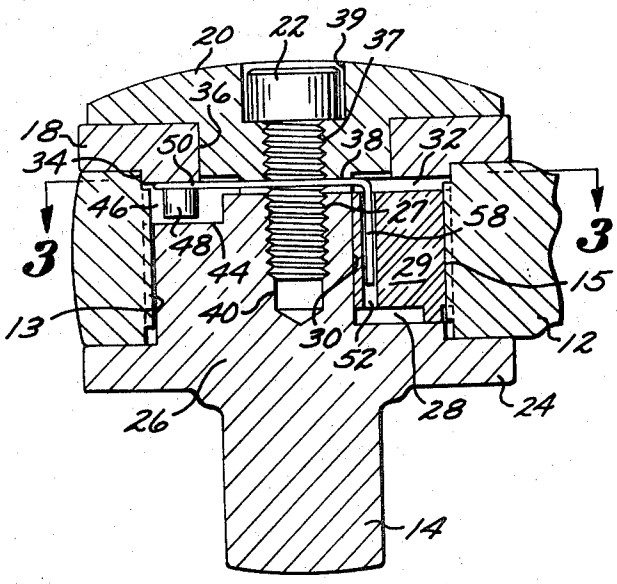
2,026,455	5/1970	Germany	74/142

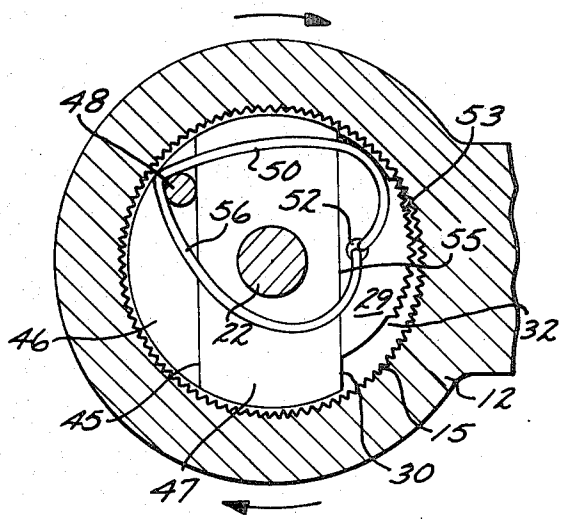
Primary Examiner—Charles J. Myhre
Assistant Examiner—Wesley S. Ratliff, Jr.
Attorney—Francis A. Utecht et al.

[57] **ABSTRACT**

A ratchet tool is described which has a ring for reversal of the ratcheting mechanism. The ratcheting tool comprises a work-receiving member that fits into a cylindrical recess of a ratchet tool housing and which has a segmentally relieved, inner, flat surface to define a segmental recess with a chordal shoulder. A segemental pawl is disposed within the recess and is biased to either side of the segmental recess by resilient means that is biased between the pawl and abutment means, the latter being eccentrically carried on the inside surface of the ring means. In its preferred embodiment, the ratcheting tool has a cap that serves as a force plate and is in force transmitting relationship to the work-receiving means whereby an axial force or pressure can be applied to the tool. Another preferred embodiment employs a circular flange on the work-receiving member to provide a peripheral gripping surface whereby the work-receiving member may be rotated with finger pressure.

11 Claims, 5 Drawing Figures





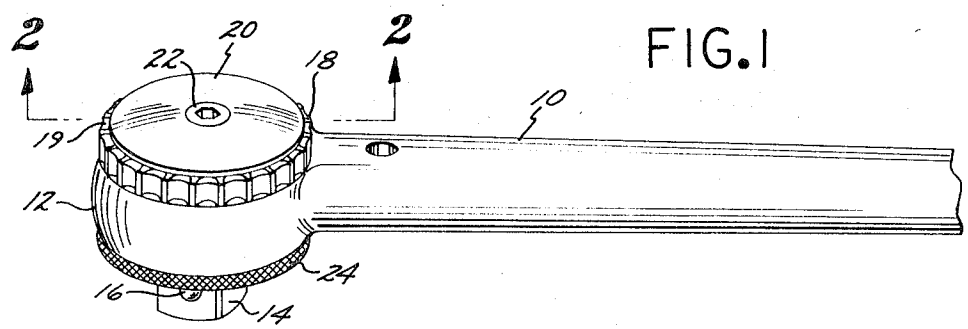


FIG.1

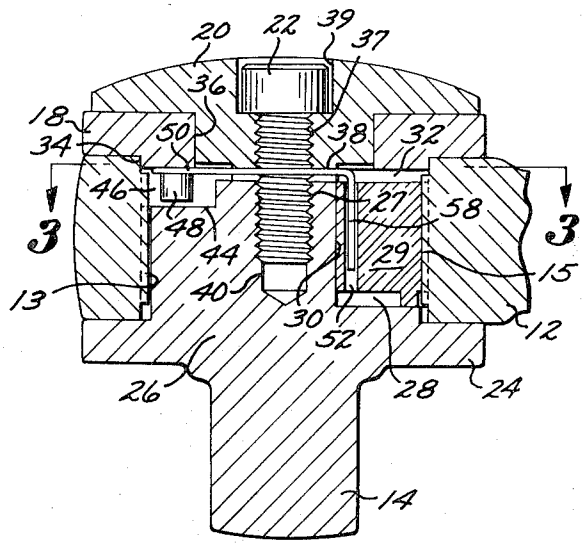


FIG.2

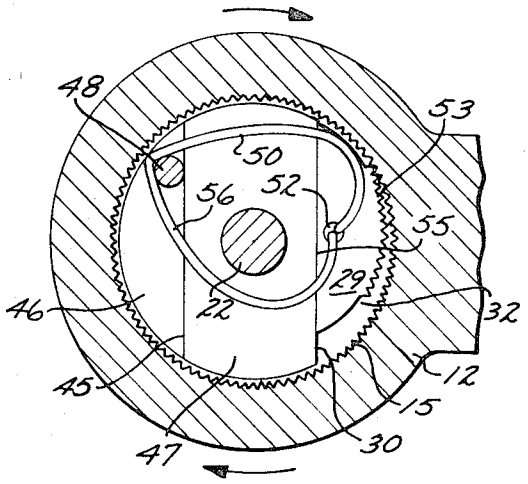


FIG.3

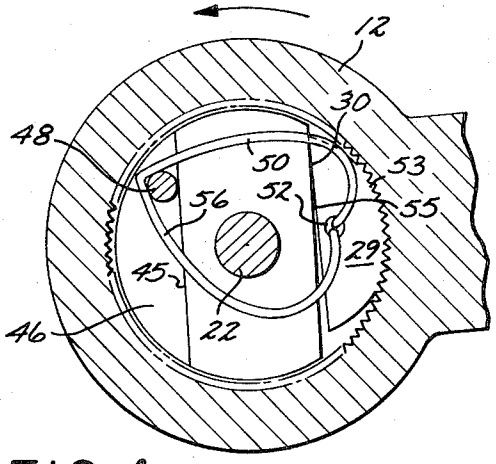


FIG.4

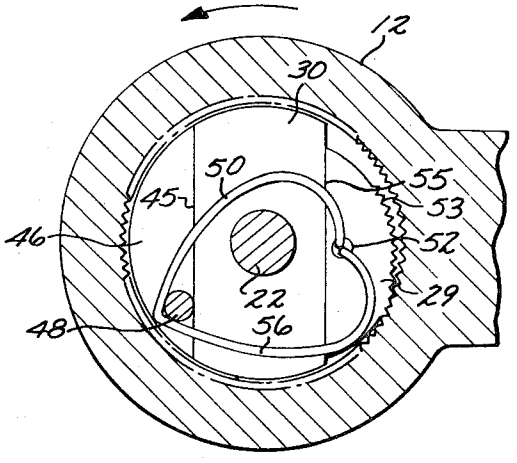


FIG.5

RATCHET MECHANISM

BACKGROUND OF THE INVENTION

This invention relates to a ratcheting tool and, in particular, to an improvement in the ubiquitous ratchet drive tools for use with socket wrenches and the like.

The common ratchet drive tool for socket wrenches employs a rotatable work-receiving member having a square shank having detent means for removably securing interchangeable sockets thereto. On the side opposite the work-receiving member, the tool has a pivotal lever for reversing the ratcheting mechanism. Typical of the ratcheting mechanisms are those which are shown by U.S. Pat. Nos. 2,981,389 and 3,369,416 wherein the pivotal lever is a plate encased within the housing of the ratcheting drive tool with an upstanding abutment for gripping by the operator. The work-receiving member bears a sectored cavity in which a wedge-shaped pawl is mounted with spring means to position the pawl to either side of the sectored cavity. Because the gripping surface for reversal means of the ratcheting mechanism is a raised abutment carried on the upper surface of the tools it is often difficult and cumbersome to reverse the mechanism of the ratchet drive. The reversing means can also be accidentally actuated when the drive is rotated against some fixed obstruction. Another shortcoming of the conventional ratchet drive tool is the failure to provide means for applying an axial force to the tool. Instead, the application of an axial force to most of the prior ratchet drive tools will result in damage of the delicate internal spring and pawl assembly of the ratcheting mechanism.

BRIEF SUMMARY OF THE INVENTION

The invention comprises a ratchet drive tool having a handle with a ratchet tool body housing having a through cavity and a cylindrival opening bearing internal ratchet teeth, a work-receiving member mounted in one end thereof with a flat, relieved portion on its inside face to form a segmental recess defined by a chordal bearing shoulder and an arcuate portion of the cylindrical opening, a pawl mounted within said recess with an outwardly facing arcuate set of teeth to mesh with the internal ratchet teeth and a bearing surface opposite the chordal bearing shoulder of the work-receiving member, wheel means mounted on the housing with a peripheral gripping surface, abutment means eccentrically carried thereon and projecting into the housing, resilient means within said housing biased between the abutment means and the pawl whereby the pawl is biased to either side of the segmental recess by rotation of the wheel.

In its preferred embodiments, the assembly of wheel, work-receiving member and ratchet body housing is secured by a cap which is mounted above the wheel and which has a boss projecting into removable engagement with the work-receiving member to permit an axial force applied to the cap to be transmitted to the work-receiving member.

The ratchet drive tool of this invention has a minimum number of parts. The ratcheting mechanism employs a reversal wheel with peripheral gripping surfaces which permit reversal of the mechanism when the tool is in any position, without need for access to the upper surface of the ratcheting drive tool. The peripheral gripping surface which, preferably, is of the same diameter as the housing, is shielded against obstructions that could cause accidental reversal of the mechanism. In the most preferred embodiment, the work-receiving member is provided with a circular flange having a knurled or similarly roughened peripheral edge to permit finger gripping and rotation of the work-receiving member.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 illustrates the assembled ratchet drive mechanism;

FIG. 2 is a section view along lines 2—2 of FIG. 1; and

FIGS. 3, 4 and 5 are sections views along line 3—3 of FIG. 2 and illustrate the positions of the parts of the reversing mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, the ratchet drive tool is shown with a handle 10 that extends as an integral portion of housing 12. The housing and handle can be a single casting or forging as shown, or separate elements can be employed. The ratchet tool body housing 12 has a central cavity in which is mounted the work-receiving member 26 that has a substantially square shank 14 with a conventional, spring-biased detent 16 mounted therein for receiving interchangeable sockets. The housing also supports a rotatable wheel member 18 in the form of a ring which is covered by a cap 20. The assembly is secured by central cap screw 22 that extends through the cap 20 and into threaded engagement with the work-receiving member.

As shown in FIG. 1, the ring 18 has a fluted or other roughened peripheral surface 19 that provides a gripping surface. The base of the work-receiving member 26 has a circular flange 24 that also has a knurled or other roughened rim.

The internals and construction of the ratchet assembly will be more apparent from FIG. 2. Housing 12 has a through circular opening 13 bearing a circular row of inwardly facing teeth 15 along a substantial portion of its width. The work receiving member 26 is shown as a plug which fits within the circular opening 13 and which has a downwardly dependent shank 14. The base of the plug body of member 26 bears a circular flange 24. The upper end of work-receiving member 26 is circular to fit within the through opening 13 of housing 12. The upper flat surface 27 of this member is provided with a segmental relief 28 to provide chordal shoulder 30 and a segmental cavity 32 between shoulder 30 and the opposite arcuate portion of opening 13.

Pawl 29 is positioned within segmental cavity 32. Pawl 29 is shown as an essentially segmental body having an arcuate row of teeth 53 that mesh with teeth 15 of body 12. Pawl 29 has a bearing surface 55 on its opposite side from arcuate teeth 53 and this bearing surface engages chordal bearing surface 30 of work-receiving member 26. The pawl also has a bore 52 positioned adjacent its inner flat surface 55 and on its mid line.

Disposed above the work-receiving member 26 is wheel member 18 in the form of a circular ring having a raised face or boss 34 with a diameter approximately equal to the internal diameter of opening 13 of the ratchet housing to permit boss 34 to be seated in opening 13. Superimposed on ring 18 is cap 20 which has a first central boss 36 that fits within the central aperture

of ring 18 and a second, smaller diameter, coaxial boss 38 which extends into bearing relationship with the inner flat face of work-receiving member 26. The cap 20 is bored at 37 and counter-bored at 39 to receive cap screw 22 while the work-receiving member has a central bore 40 which is tapped for engagement by the threaded shank of cap screw 22. In this manner, the assembly of the ratchet mechanism in the ratchet drive tool can be secured.

The upper flat face of work-receiving member 26 bears a second segmentally relieved portion 44 which provides a segmental cavity 46. Ring 18 bears abutment means in the form of pin 48 which is eccentrically mounted on the under surface of ring 18. Resilient means in the form of a bifurcated spring 50 extends from abutment 48 to bore 52 on pawl 29.

The construction of the ratcheting mechanism will be more apparent from FIG. 3. In this figure, the ratchet teeth 15 are shown extending entirely around circular opening 13 of housing 12. The inner flat surface of work-receiving member 26 is shown as bounded by two, chordal shoulders 30 and 45 which, together with the circular opening 13, define two segmental cavities 32 and 46.

As previously mentioned, pawl 29 is positioned within segmental cavity 32. The other segmental cavity 42 receives the free end of pin 48. Disposed about the end of pin 48 is the bight of bifurcated spring 50 which has two approximately helical legs 55 and 56 which extend across the upper flat surface 47 of the work-receiving member 26 and into engagement with bore 52 of pawl 29 with downwardly dependent legs 58; shown in FIG. 2.

The operation of the ratcheting mechanism will be apparent from the following description of FIGS. 3 through 5.

As shown in FIG. 3, pin 48 is at its maximum clockwise travel and, in this position, spring 50 biases pawl 29 into the upper portion of segment cavity 32. In this position, the tool will provide a ratcheting movement in the clockwise direction as indicated by the solid arrowhead lines of the figure. Movement of body 12 in a clockwise direction will cause the teeth 15 to move across and slip by the arcuate teeth on pawl 29, against the resilient bias of spring 50. Movement of the body 12 in the opposite direction, however, will cause pawl 29 to become tightly secured between chordal shoulder 30 and teeth 15 so that rotational force imposed by body 12 will be transmitted through bearing surface 55 to chordal shoulder 30, imparting a counterclockwise rotational force to work receiving member 26. This action is shown in FIG. 4 where the solid arrowhead lines indicate a counterclockwise rotation of body 12. This action causes the leading portion of surface 55 to be securely engaged against the chordal surface 30 so that member 26 is rotated counterclockwise.

FIG. 5 illustrates the position of the pawl when ring 18 has been rotated to its maximum, counterclockwise position. In this position, pin 48 is at its maximum counterclockwise travel in segmental cavity 46 and spring 50 has caused pawl 29 to move downwardly in segmental cavity 32. The counterclockwise rotation of body 12 as indicated by the solid arrowhead lines will result in the ratcheting movement of teeth 15 past arcuate teeth 53 of pawl 29 since this movement will slide the pawl transversely on chordal surface 30 a sufficient distance against the tension of spring 50 until teeth 15 clear teeth 53. The opposite rotation of body 12, i.e., clockwise rotation, will, however, rock pawl 29 into a secure engagement between teeth 15 and chordal surface 30 and will transmit a clockwise rotational force to work receiving member 26.

The ratcheting mechanism thus described has a number of significant advantages and features. As previously pointed out, the reversing mechanism of the ratcheting mechanism comprises ring 18 which is shown with approximately the same diameter as the outside diameter of housing 12. Wheel 18 can be gripped about its periphery from any position at the side of housing 12 and access to the upper surface of the ratcheting device is not necessary. The circular flange 24 of the work-receiving member 26 also bears a knurled or roughened rim which permits the finger rotation of work-receiving member 26, thereby permitting rapid rotation of this member with finger pressure.

As apparent from the illustration of FIG. 2, cap 20 has a bearing surface engaged with the upper surface 47 of work-receiving member 26. This permits the application of an axial force to the ratcheting assembly without imposing any stress on the more delicate ratcheting mechanism of the assembly.

The invention has been described with reference to the presently preferred embodiment thereof. It is not intended that this description and specific illustration of the preferred embodiment be unduly restricting of the invention. Instead, it is intended that the invention be defined by the elements and their obvious equivalents set forth in the following claims.

We claim:

1. A ratcheting tool comprising:
- a ratchet body housing having a through cavity with a cylindrival opening bearing internal ratchet teeth;
- a work-receiving member mounted in one end thereof and having a relieved portion on its inside flat face to form a recess defined by a bearing shoulder on said member and the cylindrical opening;
- a pawl having an outwardly facing arcuate set of teeth adapted to mesh with said internal ratchet teeth and a bearing surface opposed to said bearing surface of said work-receiving member;
- wheel means having a peripheral gripping surface rotatably mounted on said housing with abutment means eccentrically carried thereon and projecting into said housing; and
- resilient means within said housing and biased between said abutment means and said pawl whereby said pawl is biased to either side of said recess by rotation of said ring.

2. The ratcheting tool of claim 1 wherein:
- said wheel means comprises a ring rotatably mounted on said housing with a circular boss on its inner face that fits within said circular opening.

3. The ratcheting tool of claim 2 wherein:
- said work-receiving member has a circular flange bearing against the side of said housing opposite said ring with assembly means to detachably secure said ring to said work-receiving member.

4. The ratcheting tool of claim 3 wherein:
- said assembly means comprises a circular cap having a central boss projecting through the central aperture of said ring and bearing, in force transmitting relationship, against the inside flat face of said

work-receiving member with means to secure said cap to said work-receiving member.

5. The ratcheting tool of claim **4** wherein:

said work-receiving member has a centrally positioned and tapped bore;

said cap has a central bore; and

a cap screw extending through said central bore into threaded engagement with said centrally positioned and tapped bore.

6. The ratcheting tool of claim **5** wherein:

said cap has a central boss bearing against the inner flat face of said work-receiving member.

7. The ratcheting tool of claim **6** wherein:

said resilient means comprises a bifurcated spring, said abutment projects into the bight of said spring and the free ends of said spring are secured to said pawl.

8. The ratcheting tool of claim **4** wherein:

the circular flange of said work-receiving member has a peripheral gripping surface to permit direct rotational movement of said work-receiving member.

9. The ratcheting tool of claim **1** wherein:

said recess is segmental and said work-receiving member has a chordal shoulder for bearing engagement with said bearing surface of said pawl.

10. The ratcheting tool of claim **9** wherein:

said pawl is segmental with a shorter chord than said chordal shoulder.

11. The ratcheting tool of claim **10** wherein:

the inner flat surface of said work-receiving member has a second, segmentally relieved portion to form a second, segmental recess and said abutment means projects into said second, segmental recess.

* * * * *

REEXAMINATION CERTIFICATE (1126th)

United States Patent [19]

Trimble et al.

[11] **B1 3,783,703**

[45] Certificate Issued **Sep. 26, 1989**

[54] **RATCHET MECHANISM**

[75] Inventors: **Lester B. Trimble**, Downey; **Zygmunt J. Sopinski**, Pico Rivera, both of Calif.

[73] Assignee: **Jo-Line Tools, Inc.**, Anaheim, Calif.

Reexamination Request:
No. 90/001,699, Jan. 26, 1989

Reexamination Certificate for:

Patent No.:	3,783,703
Issued:	Jan. 8, 1974
Appl. No.:	307,428
Filed:	Nov. 17, 1972

[51] **Int. Cl.**[4] F16H 27/02; F16D 41/18; B25B 13/46

[52] **U.S. Cl.** 74/157; 74/142; 81/58.1; 81/63.2; 192/43.2

[58] **Field of Search** 74/157, 142, 575; 81/58, 58.1, 58.5, 63.1, 63.2; 192/43, 43.1, 43.2; 188/82.2

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,283,382	5/1942	Mandl	192/43.2
3,044,591	7/1962	Kilness	74/157 X
3,222,943	12/1965	McDonald	192/43.2 X
3,290,969	12/1966	Bergquist et al.	81/63.1
3,369,416	2/1968	Kilness	74/157
3,691,876	9/1972	Cassidy, Jr.	81/58.1

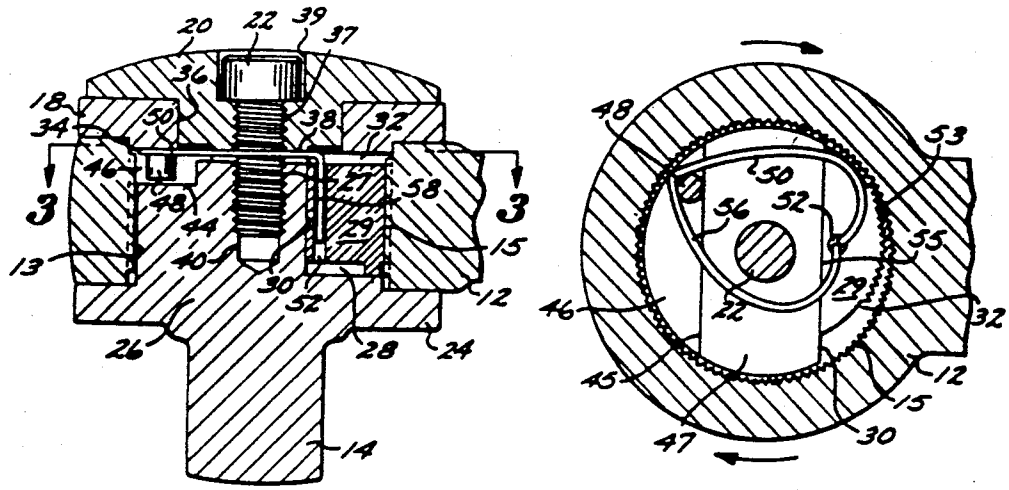
FOREIGN PATENT DOCUMENTS

2026455	12/1970	Fed. Rep. of Germany	74/142
1340335	9/1963	France .	

Primary Examiner—Allan D. Herrmann

[57] **ABSTRACT**

A rachet tool is described which has a ring for reversal of the ratcheting mechanism. The ratcheting tool comprises a work-receiving member that fits into a cylindrical recess of a ratchet tool housing and which has a segmentally relieved, inner, flat surface to define a segmental recess with a chordal shoulder. A segmental pawl is disposed within the recess and is biased to either side of the segmental recess by resilient means that is biased between the pawl and abutment means the latter being eccentrically carried on the inside surface of the ring means. In its preferred embodiment, the ratcheting tool has a cap that serves as a force plate and is in force transmitting relationship to the work-receiving means whereby an axial force or pressure can be applied to the tool. Another preferred embodiment employs a circular flange on the work-receiving member to provide a peripheral gripping surface whereby the work-receiving member may be rotated with finger pressure.



REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims 9–11 are cancelled.

Claim 1 is determined to be patentable as amended.

Claims 2–8, dependent on an amended claim, are determined to be patentable.

New claim 12 is added and determined to be patentable.

1. A ratcheting tool comprising:

a ratchet body housing having a through cavity with a cylindrical opening bearing internal ratchet teeth;

a work-receiving member mounted in one end thereof and having a *first segmentally* relieved portion on its inside flat face to form a *first segmental* recess defined by a bearing shoulder on said member and the cylindrical opening;

a pawl having an outwardly facing arcuate set of teeth adapted to mesh with said internal ratchet teeth and a bearing surface opposed to said bearing [surface] *shoulder* of said work-receiving member;

wheel means having a peripheral gripping surface rotatably mounted on said housing with abutment means eccentrically carried thereon and projecting into said housing; [and]

resilient means within said housing and biased between said abutment means and said pawl whereby said pawl is biased to either side of said recess by rotation of said [ring] *wheel;*

wherein said recess is segmental and said work-receiving member has a chordal shoulder for bearing engagement with said bearing surface of said pawl;

wherein said pawl is segmental with a shorter chord than said chordal shoulder; and

wherein the inside flat surface of said work-receiving member has a second, segmentally relieved portion to form a second, segmental recess and said abutment means project into said second, segmental recess.

12. A ratchet tool comprising:

a ratchet body housing having a through cavity with a cylindrical opening bearing internal ratchet teeth;

a work-receiving member mounted in one end thereof and having a first segmentally relieved portion on its inside flat face to form a first segmental recess defined by a bearing shoulder on said member and the cylindrical opening;

a pawl having an outwardly facing arcuate set of teeth adapted to mesh with said internal ratchet teeth and a bearing surface opposed to said bearing shoulder of said work-receiving member;

wheel means having a peripheral gripping surface rotatably mounted on said housing with abutment means eccentrically carried thereon and projecting into said housing;

resilient means within said housing and biased between said abutment means and said pawl whereby said pawl is biased to either side of said recess by rotation of said wheel;

wherein said wheel means is rotatably mounted on said housing with a circular boss on its inner face that fits within said cylindrical opening;

wherein said recess is segmental and said work-receiving member has a chordal shoulder for bearing engagement with said bearing surface of said pawl;

wherein said pawl is segmental with a shorter chord than said chordal shoulder; and

wherein the inside flat surface of said work-receiving member has a second, segmentally relieved portion to form a second, segmental recess and said abutment means projects into said second, segmental recess.

* * * * *