Nov. 4, 1969 W. M. ROBERTS ET AL 3,475,999

RACHETING HANDTOOL MECHANISM

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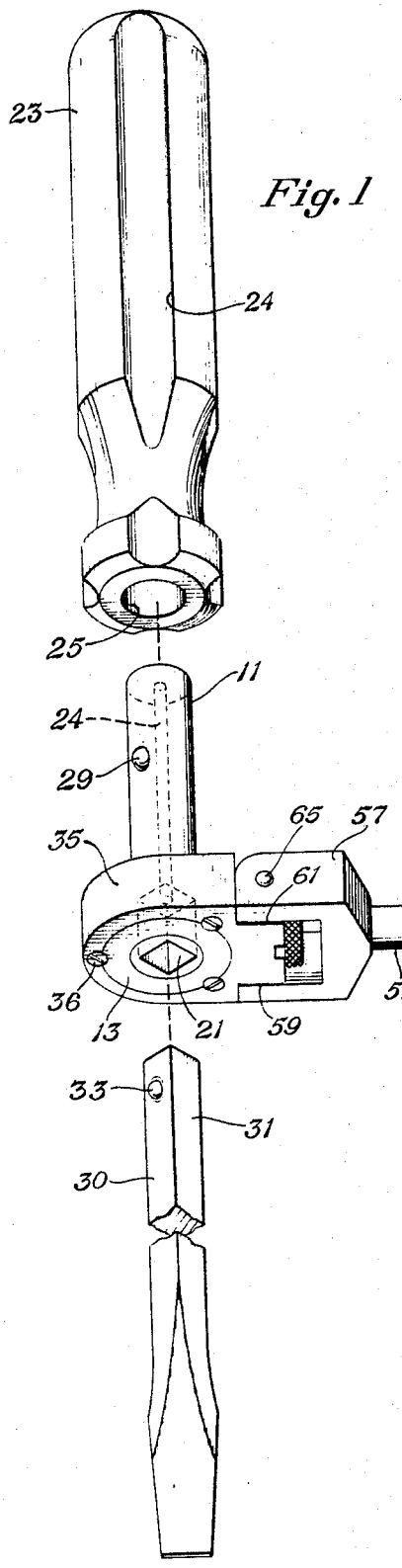

Fig. 1

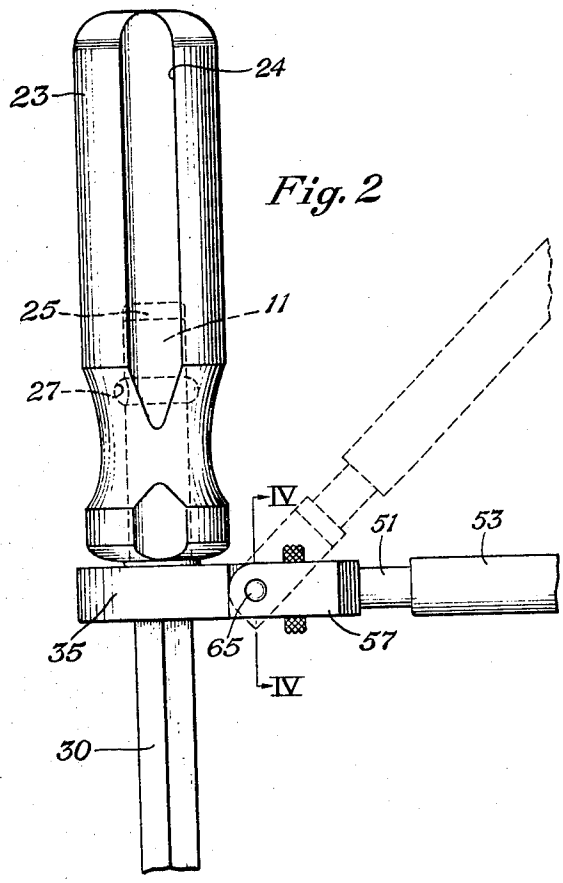

Fig. 2

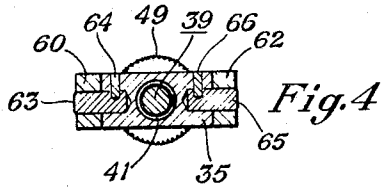

Fig. 4

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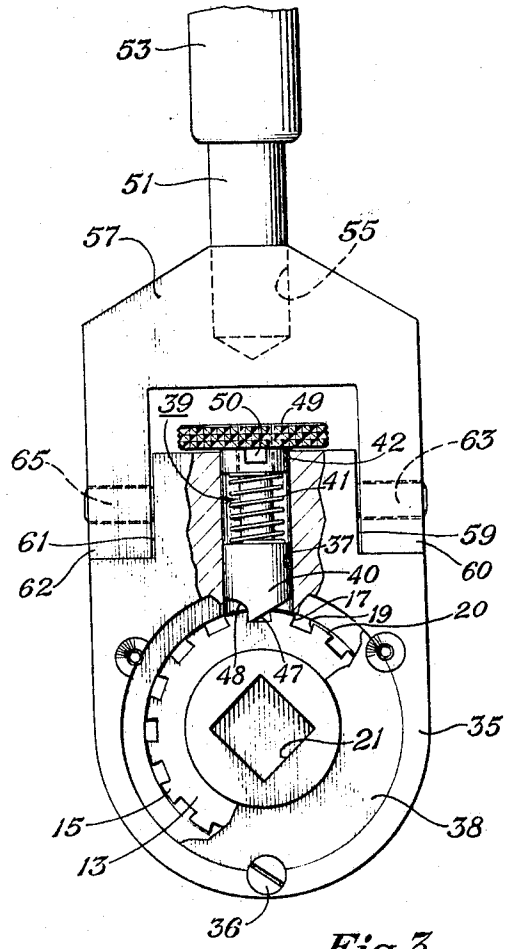

Fig. 3

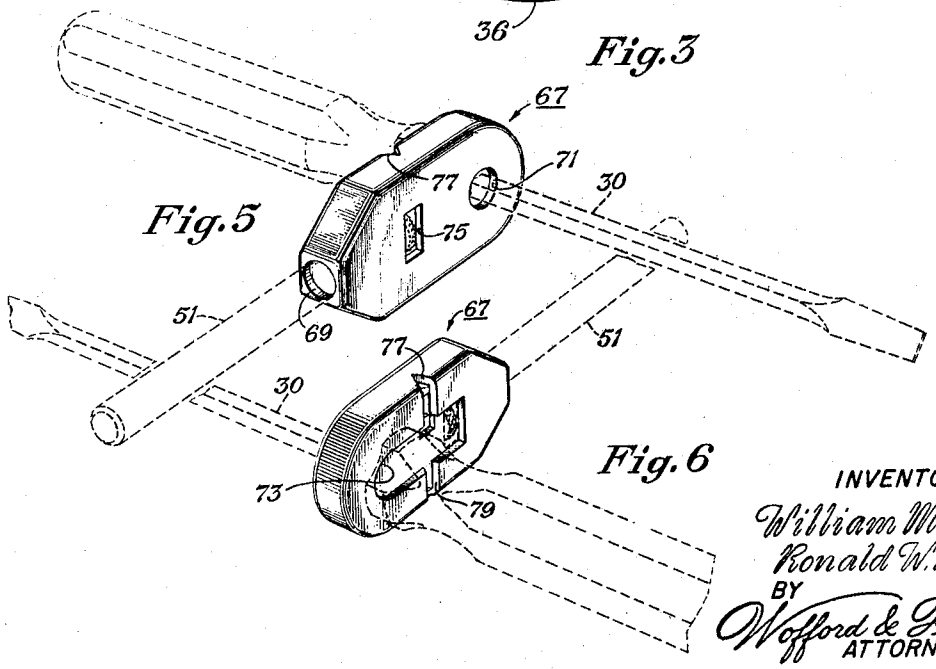

Fig. 5

Fig. 6

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RACHETING HANDTOOL MECHANISM

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ABSTRACT OF THE DISCLOSURE

Following is disclosed a racheting handtool mechanism that includes a shank with an enlarged portion on one end having teeth on its periphery with opposed flanks that are substantially parallel. The enlarged portion has a polygon shaped socket on an interior region and a rotatable handle is secured to the shank and receives a removable tool. A housing having a pivotable arm encloses the enlarged portion, and a reciprocable pin carried by the housing is biased inward to engage the teeth. The end of the pin is beveled to permit rotation of the enlarged portion in one direction, but may be manually retracted and rotated to permit reversed rotation. The pivotable arm has a yoke secured to the housing to partially cover and protect the pin. Insulation is provided to enable use around electrical conductors.

BACKGROUND AND GENERAL DISCUSSION

Previously, racheting handtool mechanisms have been developed that utilize removable screwdrivers and other inserts such as adapters for socket wrenches. Such mechanisms with which we are familiar have a number of significant disadvantages. It is common for them to have a rachet mechanism with only one direction of rotation, or alternatively, the means utilized for reversing the racheting direction is lacking in that degree of ruggedness characterized by fail-safe reliability. Moreover, the means for reversing the racheting direction is frequently exposed and thus subject to accidental impact and breakage. Some of them have stationary handles that tend to rotate in one's hand, thereby necessitating periodic changes in grip. Others have a form of construction in which electrical insulation is difficult to achieve. It is our purpose to provide a racheting hand tool mechanism which overcomes many of the above mentioned disadvantages.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWING

FIG. 1 is an exploded, perspective view of a racheting handtool mechanism embodying the principles of our invention; FIG. 2 is a fragmentary side elevational view of the mechanism shown in FIG. 1; FIG. 3 is a fragmentary bottom view, partially in section, showing details of construction of the racheting mechanism; FIG. 4 is a sectional view as seen looking along the line IV—IV of FIG. 2; and FIGS. 5 and 6 are perspective views of insulation means for a portion of the mechanism.

DESCRIPTION OF A PREFERRED EMBODIMENT

The numeral **11** in the drawing designates a shank having an enlarged portion **13** (see especially FIG. 3) integrally formed thereon. A plurality of teeth **15** form a gear on the periphery of enlarged portion **13**, with the opposed flanks **17, 19** of the teeth being substantially parallel. The flanks may be inclined slightly and preferably diverge as shown in FIG. 3. A polygon shaped socket **21** extends axially into an interior region of the enlarged portions **13**.

The upper region of shank **11** has in this instance a

cylindrical exteror and receives a handle **23** with slots **24** preferably constructed of electrically nonconductive material, such handle having an interior cylindrical region **25** which may be inserted over the shank **11**. An air vent **24** extends through the shank **11** to facilitate assembly and disassembly of the handle **23**. An annular groove **27** (see FIG. 2) mates with a depressible but captive ball retainer **29** (see FIG. 1) to secure the the handle **23** to the shank **11**. The handle is therefore rotatable on the shank and, by exerting a relatively large upward axial force against it, may be removed from the shank.

A removable handtool such as the screwdriver **30** may be inserted into the polygon shaped socket **21**, such screwdriver having a polygon-shaped upper end **31** and a depressible but captive ball retainer **33** that engages a sidewall within the socket **21** to secure the screwdriver.

A housing **35** encloses enlarged portion **13**, and as seen in FIG. 3, has an aperture **37** to receive a reciprocable pin **39**. The enlarged portion **13** is covered by a plate **38** releasably secured to the housing **35** by suitable fasteners **36**. The pin **39** is biased toward engagement with the teeth **15** formed on enlarged portion **13** by means of a compression spring **41** which engages an enlarged lower portion **40** of the pin. The spring **41** also engages the shoulder of an insert **42** which in this instance is secured to the housing **35** by suitable means such as epoxy resin, threads, tack weld, interference fit, etc. The enlarged lower portion **40** of the pin **39** is adapted to extend between the space between the opposing flanks **17, 19** of the teeth and is beveled as indicated by the numeral **47** to intersect an arcuate portion **48**. When the housing **35**, as viewed in FIG. 3, is rotated in the clockwise direction, the beveled portion **47** of the pin **39** rides over each tooth crest **20**, with consequent reciprocation of the pin **39**. However, engagement of the arcuate portion **48** with a flank **17** causes rotation of the enlarged portion **13** and a tool inserted in socket **21** when housing **35** is rotated in the counterclockwise direction.

To enable reverse rotation of the housing **35**, the pin **39** is retracted, rotated 180 degrees, and then released. Thus, counterclockwise rotation of the housing **35** causes the beveled portion **47** of the pin **39** to ride over each tooth crest **20**. However, engagement of the arcuate portion **48** with a flank **19** causes rotation of the enlarged portion **13** and tool inserted in socket **21** when housing **35** is rotated in the clockwise direction.

A control element **49** which in this instance is a knurled knob, is secured to the upper end of the pin **39** to enable manual reciprocation and rotation of the pin to reverse the direction of possible rotation of the housing relative to the removable tool. The knob has a rib **50** which extends into a mating formed in the insert **42** to properly orient the knob.

An arm **51**, having in the drawing a covering **53** of electrically nonconductive material, is removably secured by suitable means such as epoxy resin, interference fit, etc., to a yoke portion **57** which extends over slotted portions **59, 61** of the housing **35**. Dowel pins **63, 65** are inserted through respective tines **60, 62** of the yoke **57** and into the housing **35** and secured by retainer pins **64, 66** to pivotally secure the arm **51** for rotation about an axis perpendicular to and adjacent the common axis of the dowel pins **63, 65** such that the yoke **57** partially covers and protects the reciprocable pin and associated racheting mechanism.

In FIGS. 5 and 6 are shown boot insulation means **67** which fits around the housing **35** and yoke **57** in the interest of safety when working around the electrical conductors. An aperture **69** receives arm **51**; aperture **71** receives the tool **30**; and an elongated aperture **73** receives handle **23**, while exposing one side of the knob **49**. A

smaller elongated aperture **75** on the opposite side of the insulation means **67** exposes the opposite side of the knob and thus it may be conveniently retracted and rotated 180 degrees. Notches **77, 79** on the insulation means enable the arm **51** to be folded toward the handle **23**.

It should be apparent from the foregoing that we have provided an invention having significant advantages. The formation of the gear as an integral portion of the shaft **11** and the utilization of the tool receiving socket **21** internally of the gear provides a racheting handtool mechanism of great strength. Moreover, the utilization of a single reciprocable pin or pawl **39** which may be conveniently used to reverse the direction of rotation by withdrawing and rotating it 180 degrees produces a high degree of ruggedness and reliability. The utilization of a mounting system for the reciprocable pin **39** which enables the arm **51** and its yoke **57** to partially cover the pin and rachet mechanism at all times prevents failure through accidental impact. Further, the utilization of the handle **23** construction shown enables shaft **11** to rotate within handle **23** to eliminate necessity for the user changing his grip on the handle. However, when the handle **23** is folded into one of the slots **24** of the handle **23**, rotation of the handle on the shank **11** is prevented and the tool may be used in the manner of a conventional screwdriver. By utilizing an electrically nonconductive material on or for the handle **23**, the arm **51**, and the boot insulation means **67** the tool may be utilized with a higher degree of safety.

While we have shown our invention in only one of its forms it should be apparent to those skilled in the art that it is not so limited but is susceptible to various changes and modifications without departing from the spirit thereof.

We claim:

1. A racheting handtool mechanism comprising:

a shank having an enlarged portion on one end, a gear having teeth with opposed and substantially parallel flanks formed on the periphery of said portion, and a polygon shaped socket formed axially in an interior region of said portion;

a rotatable handle secured to one end of said shank;

a removable tool secured in said socket;

a housing enclosing said enlarged protrusion;

a reciprocable pin carried by said housing and being biased to extend radially into engagement with the teeth of said gear, the end of the pin being beveled to permit rotation of said gear in one direction and consequent reciprocation of said pin;

a control element extending beyond said housing and being secured to said pin to enable manual retraction and rotation of said pin to reverse the direction of possible rotation of said gear; and

an arm having a yoke portion pivotally secured to the housing to rotate about an axis adjacent the axis of said reciprocable pin to partially cover and protect said pin.

2. The mechanism defined by claim **1** wherein the handle has groove means formed on an exterior thereof to receive the folded arm to prevent rotation of the handle relative to the shank.

3. The mechanism defined by claim **1** wherein an insulation boot substantially covers the housing and the yoke of said arm, and insulation means covers the arm and the handle.

4. The mechanism defined by claim **1** wherein the reciprocable pin extends through an insert secured in an aperture in the housing, biasing means extend between the insert and the pin to urge the pin toward the teeth, and a rib on the control element, which is secured to the pin, extends into a mating slot in the insert to orient the pin.

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