

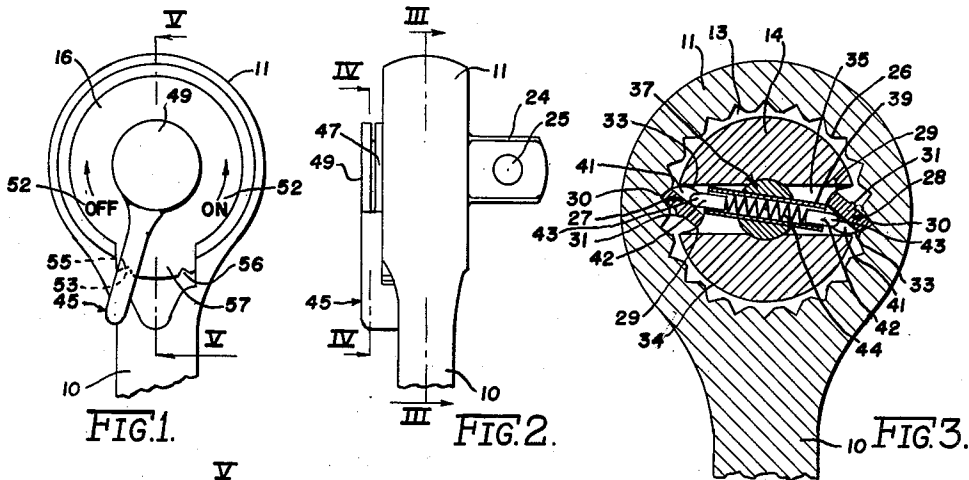
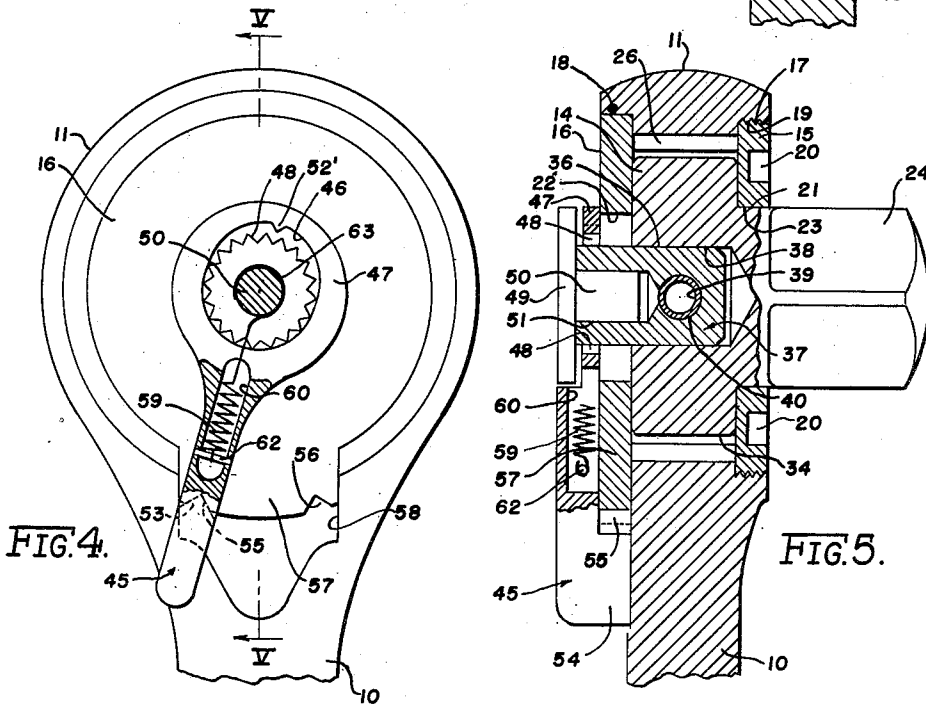
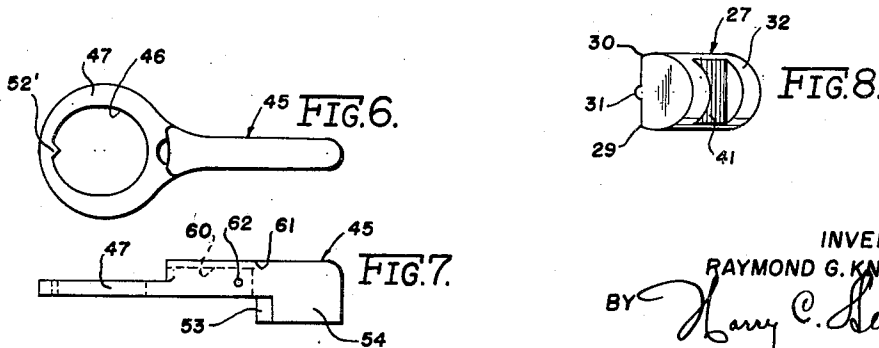
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REVERSIBLE RATCHET MECHANISM

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REVERSIBLE RATCHET MECHANISM

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This invention relates to ratchet mechanisms and more particularly to reversible ratchet pawl controls therefor, although certain features thereof may be employed with equal advantage for other purposes.

It contemplates more especially the provision of an improved pawl control for ratchet devices of the reversible type such as described in United States Letters Patent No. 2,020,883, issued November 12, 1935, which is capable of instantaneous adjustment to enable reversal without withdrawal or change in position of its application for nut turning or other purposes.

It is desirable to preset and retain the pawls of ratchet mechanisms against accidental displacement in that these devices are utilized in restricted and non-accessible nut turning positions. Consequently, any accidental displacement of the pawls necessitates the withdrawal of the tool and the re-adjustment of the pawl or pawls. This entails a great deal of time and labor which can be avoided by providing a positive pawl control lock which precludes any accidental displacement of the pawl mechanism.

The present invention improves the pawl adjusting structure, renders the operation more dependable, and precludes the displacement of the pawl mechanism from its preset position. This is an important factor in ratchet mechanisms owing to the fact that they are often employed in restricted locations where their manipulation is difficult and accessibility is restricted. The instant invention provides a more dependable ratchet mechanism that insures the desired directional operation thereof for which it has been set without any possibility of being self-changing through impact or accidental manipulation.

One object of the present invention is to simplify the construction and improve the operation of ratchet pawl shifting and locking devices of the character mentioned.

Another object is to provide a combined pawl shifting and locking ratchet mechanism that affords presetting of pawl mechanism and the locking thereof against accidental shifting.

Still another object is to provide a compact ratchet mechanism having a unitary adjustment for a plurality of reversible sets of pawls which affords shifting and a self-locking thereof against accidental displacement.

A further object is the provision of a ratchet having a unitary exteriorly accessible adjusting and self-locking pawl shifter to control the ratcheting direction of a plurality of opposite sets of pawls.

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A still further object is to provide a simple and compact reversible ratchet pawl shifting and self-locking mechanism for directional ratcheting control.

5 Still a further object is to provide a pawl shifter that is self-locking when it is in a preset position.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

In the drawing:

Figure 1 is a fragmentary top plan view of a device embodying features of the present invention.

15 Figure 2 is a fragmentary side view in elevation of the device shown in Figure 1.

Figure 3 is a fragmentary sectional view taken substantially along the line III—III of Figure 2.

20 Figure 4 is an enlarged fragmentary sectional view taken substantially along line IV—IV of Figure 2.

Figure 5 is a fragmentary sectional view taken substantially along line V—V of Figures 1 and 4.

25 Figure 6 is an enlarged detail top plan view of the pawl shifting and locking lever.

Figure 7 is a side view in elevation of the pawl shifting and locking lever shown in Figure 6.

Figure 8 is a perspective view of a pawl of the type shown in assembled position in Figure 3.

30 The structure selected for illustration is not intended to serve as a limitation upon the scope or teachings of the invention, but is merely illustrative thereof. There may be considerable variations and adaptations of all or part of the teachings depending upon the dictates of commercial practice. The present embodiment comprises an elongated shank 10, in this instance, of substantially elliptical cross-section, which terminates in a circular or cylindrical head member 11 at one end and a handle member (not shown) at the other end.

35 The head member 11 is suitably recessed to define a circular chamber 13 open on both sides for the reception of a loosely fitting revoluble member 14 therein. The member 14 serves as a pawl carrier and is retained within the chamber 13 of the head 11 by means of a pair of confronting face plates 15 and 16 which conform in contour with shouldered annular peripheries 17 and 18 defining the end openings in the circular head 11 to enable access to the chambered interior 13.

40 While the face plates 15 and 16 substantially conform in contour with the openings 17 and 18 of the head 11, the lower face plate 15 is thread-

ed as at 19 to engage the correspondingly threaded annular periphery 17. The upper face plate 16 is somewhat larger to enable the pressed application for telescopic reception in frictional engagement with the chamber end having a peripheral shoulder 18 to present an obstruction against which the plate 16 is pressed to preclude accidental removal of the revoluble member 14. Diametrically spaced recesses 20 are provided in the outer face of the lower plate 15 for engagement by a spanner wrench of standard construction to tighten and loosen the lower face plate 15. This affords access to the interior of the chamber 13 by removal of the lower face plate 15.

The confronting surfaces of the face plates 15 and 16 are axially apertured to provide aligned bores 21 and 22 in communication with the interior of the chamber 13, the bore 21 rotatively receiving the correspondingly shaped and somewhat smaller sized hub 23 provided on one end of the revoluble member 14 journaled therein. As shown, the revoluble member 14 terminates downwardly in an axially extending socket engaging shank 24 which preferably is provided with a spring impelled detent 25 for frictionally receiving and retaining a standard nut turning socket (not shown) in detachable association therewith.

To enable ratcheting of the revoluble member 14 in opposed directions by selective adjustment, the interior periphery of the circular head 11 is provided with a circumferential series of radially extending ratchet teeth 26 cut or otherwise formed for inward radial extension within the head chamber 13 to present engagement with a plurality of diametrically opposite sets of pawls 27—28, in this instance one set, as will appear more fully hereinafter.

As shown, each of the pawls 27—28 has oppositely directed or diverging teeth 29 and 30 with an intermediate projection 31 of curved contour to confront the extremities of the ratchet teeth 26 and to contact the teeth 26 so as to serve as a fulcrum for pivoting the pawls 27—28 so that the pawl teeth 29 or 30 engage between adjacent ratchet teeth 26 depending upon the desired directional ratcheting for nut turning or other ratcheting operations.

The remaining surface 32 of the pawls 27—28, is circular or cylindrical within a common circumference so as to serve as a complement of a plurality of semicircular grooves or recesses 33, in this instance two, equidistantly spaced along and extending transversely through the peripheral circumference 34 of the revoluble member 14 which serves as a pawl carrier. The circular grooves or recesses 33 communicate with a diametrical bore 35 which extends radially through the axis of the revoluble member 14. The diametrical bore 35 communicates with an axial bore 36 provided in the revoluble member 14. The axial bore 36 in the revoluble member 14 is closed on all sides except one end thereof to receive a pawl adjusting axial member 37 having a shank 38 journaled for rotation therein to effect the directional replacement of the opposite set of pawls 27—28 which, in turn, controls the directional intermittent rotation of the revoluble member or pawl carrier 14 that, in this instance, has an integral shank 27.

The pawl teeth 29 and 30 are sufficiently spaced to enable the desired rotary throw of the head 11 for ratcheting purposes without interference with the inactive pawl tooth, thereby partially

rotating the pawls 27—28 about their curved confronting surface 32 responsive thereto until the next opposite ratchet teeth 26 in registry therewith are engaged by both pawls 27—28. To maintain the pawls 27—28 stationary and in adjusted positions for the desired directional ratcheting, a tubular sleeve 39 projects through a transverse aperture 40 provided in the pawl adjusting shank 37. The sleeve 39 projects from the pawl adjusting shank 37 into the appreciably larger diametrical bore 35 in the revoluble member 14 to extend within the range of and align with cross slots 41 disposed transversely through the center of the pawls 27—28 intermediate the ends thereof (Figure 8).

Pin or other types of detents 42 are reciprocally mounted within the opposite ends of the sleeve 39 so that the tapered extremities 43 thereof will contact with the bottom of the pawl slots 41. The tapered extremities 43 of the detents or pins 42 contact or engage the bottom of the pawl slots 41 on either side of their center line which is in confronting relation with the tooth fulcrum 31 intermediate the pawl teeth 29—30, thereby holding or tending to hold the ratchet engaging pawls 27—28 in an inclined position (Figure 3), this urge being imparted by means of a coiled spring 44 which is confined within the sleeve 39 between the pins 42 so as to normally urge the latter outwardly in the direction of the pawls 27—28. The pawls 27—28 are urged outwardly against the ratchet teeth 26 so that the former fulcrum about their intermediate ridge 31 when rotatively shifted in the circular seats 33 of the pawl carrier 14.

It is to be noted that the pawls 27—28 are freely rotatable in their circular seats 33 of the pawl carrier 14 for controlled operation by the directional actuator such as a finger manipulating lever 45 which has an axial elliptical bore 46 in the enlarged circular head 47 to loosely fit over the toothed outer portion 48 of the pawl adjusting shank 37. The lever 45 is loosely retained in operative association with the toothed outer portion 48 (Figure 4) by an enlarged cap 49 having an axial shank 50 which is press-fitted in an axial recess 51 provided in the pawl adjusting shank 37. In order to guide the adjustment of the pawls 27—28, indicia 52, in this instance directional "on" and "off" indicators, are impressed in the top surface of the face or cover plate 16 (Figure 1).

Movement of the actuator lever 45 in a clockwise direction indicated by the directional indicator "off" (viewed from Figure 1) will cause the pawl teeth 29 of the operative set of pawls 27—28 to engage the ratchet teeth 26 for rotating the revoluble member 14 in an opposite or counter-clockwise direction (viewed from Figure 1) to loosen or turn a nut off of the right handed threaded member. Opposite adjustment indicated by the directional indicator "on" places the pawl teeth 30 in engagement with the ratchet teeth 26 for rotating the revoluble member 14 in a clockwise direction (viewed from Figure 1) to tighten or turn a nut on a right handed threaded member or for other ratcheting purposes.

In other words, the diametrically opposite pawls 27—28 are disposed with their pawl teeth 29 or 30 engaging the ratchet teeth 26 to rotate the socket engaging shank 24 in a clockwise or counter-clockwise direction (viewed from Figure 1) for turning nuts on and off or for other ratcheting purposes depending upon whether or not the pawl teeth 29 or 30 engage the ratchet teeth 26. The position of the pawls 27—28 may be re-

versed by rotating the central pawl actuator lever 45 to its opposite extreme rotary position to reverse their directional position for ratcheting purposes in one or the other of these two directions.

To the end of precluding the accidental shifting of the pawl actuating lever 45 while the ratcheting mechanism is operatively employed in restricted and comparatively non-accessible places, the pawl actuating lever 45 is longitudinally displaceable within the excessive major axis length of the elliptical bore 46 therein relative to the comparatively smaller toothed pawl shifter shank portion 48 (Figure 4). The pawl actuator bore 46 has a tooth 52' formed radially inward from the head 47 in longitudinal alignment with the pawl lever actuator 45 and the major axis of its elliptical bore 46 (Figure 4).

Another tooth 53 is formed on a depending boss 54 constituting the free extremity of the lever actuator 45 to confront the tooth 52' and cooperate with spaced complemental notches 55-56 (Figure 4) provided in an arcuate plate extension 57 of the cover plate 16 to serve as position indexing means. The cover plate extension 57 is disposed in a cut-out 58 provided in the head member 11 (Figure 4) to accommodate the depending boss 54 of the lever actuator 45.

In order to normally maintain the lever actuator 45 out of engagement with the pawl shifting shank 37 and its tooth 53 in a locking position with one or the other of the notches 55-56 constituting its "off" and "on" positions, respectively, a spring 59 is confined in a longitudinal bore 60 provided in the upraised body 61 of the pawl lever actuator handle 45 (Figure 7). The spring 59 is anchored to a cross-pin 62 in the closed end of the bore 60 while its outer extremity 63 encircles the stud 50 of the lever actuator retainer cap 49 (Figures 4 and 5). Thus the pawl actuator lever 45 is locked in one or the other of its notched positions 55-56 unless the attendant pulls the lever 45 against the urge of the spring 59 to engage the other tooth 52' with the toothed pawl carrier shank 37 while simultaneously disengaging the locking tooth 53 from one or the other of the notches 55 or 56, and permitting the pawl carrier shank 37 to be shifted rotarily to reverse the ratcheting directional action.

Consequently, the actuating lever 45 will either be free for pawl positioning within the attendants' control or it will be locked against accidental shifting in one or the other of its extreme operative positions 55-56 to determine the directional ratcheting action, serve as a pawl indexing expedient, and preclude accidental displacement from the indexed position even under conditions of impact and abrasion with any of the moving parts. This simple shifting and self-locking expedient insures the maintenance of the pre-adjusted position for the desired directional ratcheting.

While I have illustrated and described a preferred embodiment of this invention, it must be understood that the invention is capable of considerable variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

I claim:

1. In a ratchet mechanism, the combination with a handle, of a head associated with said handle, cooperating ratchet teeth and pawls in

said head, a revolvable member journaled in said head, a pawl actuator axially journaled within said revolvable member, means including a spring operably disposed radially of said pawl actuator for adjusting the position of said pawls through the medium of said actuator body to regulate the direction of ratcheting, and means for self-locking said pawl actuator in any one of its operative positions of adjustment responsive to said spring means.

2. In a ratchet mechanism, the combination with a handle, of a head associated with said handle, a revolvable member journaled in said head, cooperating pawls and ratchet teeth in said revolvable member and head, a pawl adjusting lever actuator axially journaled relative to said revolvable member, position indexing means on said head for cooperation by said pawl adjusting lever actuator, and means extending radially on said actuator lever opposite to said indexing means for adjusting the angular position of said pawls relative to said ratchet teeth to regulate the direction of ratcheting, and spring means for normally urging said pawl adjusting lever actuator longitudinally to maintain said indexing means operative.

3. In a ratchet mechanism, the combination with a handle, of a head associated with said handle, a revolvable member journaled in said head so that the periphery thereof confronts said ratchet teeth, cooperating pawls and ratchet teeth in said revolvable member and head, a radially shiftable actuator axially journaled in said revolvable member to regulate the position of said pawls relative to said ratchet teeth to control the direction of ratcheting said head responsive to oscillating said handle, and means on said actuator to control the radial position thereof for shifting the angular position of said pawls relative to said teeth to regulate the direction of ratcheting of said revolvable member and to effect self-locking thereof in said adjusted position.

4. In a device of the character described, the combination with pawl and ratchet means, of indexing means for controlling the direction of the ratcheting of said pawl and ratchet means, said indexing means being radially displaceable for shifting said pawl means relative to the ratchet means for controlling the direction of ratcheting and displaceable in its opposite extreme radial position for locking said last named means in its adjusted operative positions.

5. In a device of the character described, the combination with pawl and ratchet means, of positioning means for controlling the direction of the ratcheting of the pawl and ratchet means and including a radially adjustable lever ratcheting control and locking means for shifting said pawl means relative to said ratchet means to control the direction of ratcheting and spring means for radially urging said lever means into locking inoperative position.

6. In a device of the character described, the combination with reversible pawl and ratchet means, of radially displaceable pawl adjusting means detachably associated with said reversible pawl means for engagement therewith in one extreme position of displacement, and means operatively associated with said pawl adjusting means to normally maintain said pawl adjusting means inoperative relative to said reversible pawl means for indexing the operative positions of said pawl adjusting means.

7. In a device of the character described, the

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combination with reversible pawl and ratchet means, of pawl adjusting means detachably associated with said reversible pawl means, means operatively associated with said pawl adjusting means for indexing the operative positions of said pawl adjusting means, and means for normally maintaining said pawl adjusting means inoperative relative to said reversible pawl means and operative relative to said indexing means.

8. In a device of the character described, the combination with reversible pawl and ratchet means, of pawl adjusting means detachably associated with said reversible pawl means, means operatively associated with said pawl adjusting means for indexing the operative positions of said pawl adjusting means, and spring means for normally maintaining said pawl adjusting means inoperative relative to said reversible pawl means and operative relative to said indexing means, said spring means being anchored to said pawl adjusting means to frictionally retain the latter in an inoperative position against displacement when disengaged from said reversible pawl means.

9. In a ratchet mechanism, the combination with reversible pawl and ratchet means, of a pawl carrier, means associated with said pawl carrier for shifting the position of said reversible pawl means to control the direction of ratcheting, a lever movably associated with said pawl shifting means, means on said lever for operative connection with said pawl shifting means in one position to displace said pawl shifting means and in inoperative association therewith in another angular position to index the position of said lever, and position indexing means for maintaining said lever in its adjusted positions to preclude accidental displacement of said pawl carrier.

10. In a ratchet mechanism, the combination with reversible pawl and ratchet means, of a pawl carrier, means associated with said pawl carrier

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for shifting the position of said reversible pawl means to control the direction of ratcheting, said pawl shifting means having a toothed shank, an adjustable lever having means thereon in the path of said toothed shifting shank and capable of meshing engagement with said toothed shifting shank in one position of adjustment, and position indexing means operatively associated with said lever means for maintaining the latter in adjusted extreme positions disengaged from said toothed shank.

11. In a ratchet mechanism, the combination with reversible pawl and ratchet means, of a pawl carrier, means associated with said pawl carrier for shifting the position of said reversible pawl means to control the direction of ratcheting, said pawl shifting means having a toothed shank, an adjustable lever having means thereon in the path of and capable of meshing engagement with said toothed shank in one position of adjustment, indexing means operatively associated with said lever means, and spring means operatively interposed between said shifting means and said lever means for maintaining the latter in adjusted extreme positions disengaged from said toothed shank.

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