Oct. 30, 1962 R. V. BROWNING 3,061,061

RATCHET MECHANISM

Filed April 6, 1959

FIG. 1

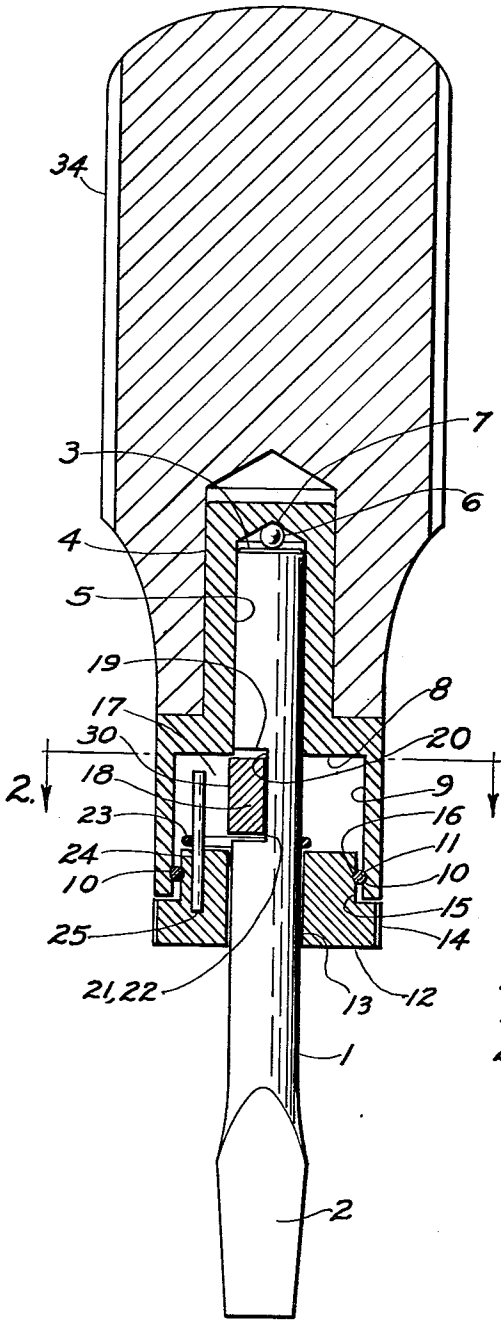


FIG. 2.

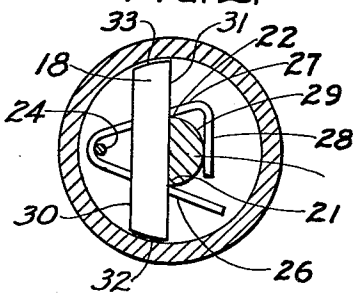


FIG. 3.

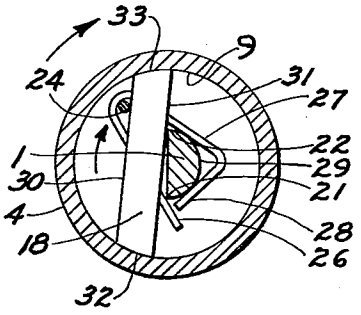
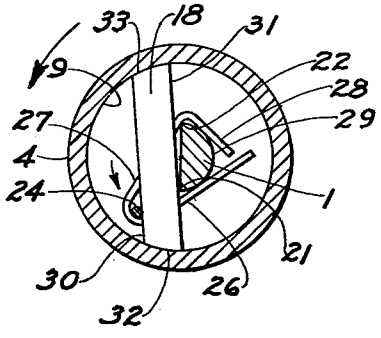


FIG. 4.



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RATCHET MECHANISM

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2 Claims. (Cl. 192—43.2)

My invention relates to a ratchet mechanism for screw drivers, wrench sets and the like tools.

The primary object of this invention is to provide a mechanism of the above mentioned type, smooth operating, without the usual multiplicity of parts, and extremely simple, compact, and sturdy in construction.

A further object is to provide a ratchet mechanism which is positive in gripping action upon the apparatus or tool being turned, and capable of release without appreciable effort, regardless of the force previously applied.

A further object of this invention is to provide a ratchet mechanism capable of a minimum of travel as it is turned from the free direction to the engaged direction.

A further object is to provide a ratchet mechanism free of the sequence of clicks usually heard in ratchets when being turned in the free direction.

A further object is to provide a ratchet mechanism by its construction relatively insensitive to residual accumulations of dust and dirt.

A further object is to provide a ratchet mechanism free of pins, springs, levers, or rollers carrying all or a part of the forces transmitted to the tool being ratcheted as is the case with many types of ratchet mechanisms presently in use.

A still further object of my invention is to provide a ratchet mechanism adjustable to right and left hand turning positions and having no neutral or locked positions.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application, and in which like numerals are employed to designate like parts throughout the same:

FIGURE 1 is a central, vertical, longitudinal, partial half section through a ratchet mechanism, embodying my invention.

FIGURE 2 is a horizontal transverse section taken on line 4—4 of FIGURE 1 the parts shown being in a neutral, and unstable position.

FIGURE 3 is a similar illustration to FIGURE 2 the parts being shown in right turning position and being in stable arrangement.

FIGURE 4 is a similar illustration to FIGURE 3 except the parts being shown in left turning position and being in stable arrangement.

In the drawings where for purposes of illustration are shown preferred embodiments of my invention, attention is directed to FIGURE 1 wherein the numeral 1 designates a straight cylindrical rod which may be flattened and shaped to form a screwdriver blade 2 and which may have an opposite flat end 3.

Mounted on rod 1 enclosing the end 3 is a housing 4 having a bore 5 slightly larger than the diameter of the rod 1, slidably receiving the rod therein, and mounting a conventional handle 34. The rod 1 extends into the bore 5 of housing 4 and terminates against a ball 6 which is constrained to the axis of the bore 5 by the configuration of the conically tapered end 7 of the bore 5 and so is formed an anti-friction axial thrust bearing for rod 1.

The housing 4 is enlarged at the open lower end into a cylindrical recess wherein is provided on the inner circumferential friction surface 9 a semicircular, annular groove 10 wherein restraining ring 11 substantially fills the annular groove and projects radially inward toward cap 12.

Cap 12 is a disc shaped cylindrical plug having a bore 13 somewhat larger than rod 1 and slidably mounted thereon. On the outer circumference of cap 12 is a milled, knurled, or otherwise frictionized surface 14 which serves as a gripping surface with which the mechanism is adjusted to either the right or left turning positions.

A turned step 15 is provided in the cap 12, the diameter being substantially less than the internal dimension of surface 9 and on which an annular groove 16 is formed communicating with and in juxtaposition to annular groove 10 of housing 4 and wherein the restraining ring 11 rotatably positions, and axially restrains cap 12 within the circumferential friction surface 9. Between the cap 12 and the housing 4 totally surrounded by the cylindrical surface 9 now exists an annularly shaped space 17 wherein the rod 1 is axially, and centrally located. A diametral, flat key 18 substantially as thick as the radius of rod 1 and substantially as wide as the axial length of annular space 17, and substantially as long as the internal diameter of circumferential surface 19 is freely constrained in rod 1 by diametral notch 19 having a flat surface 20 slightly shorter than the length of the annular space 17 and having opposite corners 21 and 22 at the transverse extremities of the flat surface, the flat surface being in a diametral plane.

A small clearance exists between top of notch 19 and the adjacent or contiguous side of the key 18 and a slightly wider space exists between the key 18 and the cap 12; sufficient space being allowed for free rotary movement of spring 23 about the rod 1.

Spring 23 circumscribes rod 1 and in cooperation with cap 12 and key 18 in notch 19 prevents the rod 1 from sliding out of bore 5. A pin 24 is tightly fitted into an undersized bore 26 suitably positioned in cap 12 and the pin so oriented into the annular space 17 as to constrain the spring 23 to an appropriate location in relation to the notch 19 of rod 1 as is clearly shown in FIGURES 1 and 2. The position of spring 23 as shown in FIGURE 2 is a position of instability of the elements of the mechanism inasmuch as the spring 23 is freely constrained on pin 24 and contacts the corners 21 and 22 of notch 19 in point contact along the sides 26 and 27 of spring 23, said contacts being under pressure by the constraint of side 28 of spring 23 against the external cylindrical surface 29 of rod 1. Of the three contact points shown and existing between spring 23 and rod 1 obviously none can cause restraint of the spring to the position shown in FIGURE 2, therefore the spring tends to assume either of the positions illustrated in FIGURES 3 and 4. Any slight rotation of cap 12, carrying pin 24 causes spring 23 to assume either a right or left stable position.

FIGURE 3 illustrates a stable position of spring 23 inasmuch as the force at the contact points between corner 21 of the notch and side 26 of spring 23 causes impending motion of spring 23 in a clockwise direction about rod 1. Motion impends due to the low value of frictional restraint between the sides 27 and 28 of spring 23 and the external surface 29 of rod 1. Motion is arrested by the contact of pin 24 with the outer flat surface 30 of key 18 and the communicating contact of the inward flat surface 31 of key 18 with the corner 22 of notch 19. The resultant forces of the corner 22 and the pin 24 continue to produce outward radial motion to the key 18, causing the ends 32 and 33 of the key 18 to engage in intimate contact with the inner circumferential surface 9, and in such relation as to provide a wedging action between the ends 32 and 33 and the inner circumferential surface 9, the wedging action being proportional to the relationship of the length of key 18 to the diameter of the circumferential surface 9, specifically, the more nearly the key is equal to the diameter the tighter the wedging

action for a given outward radial force. The force of rotation of the housing **4** in clockwise rotation in relation to the rod **1** causes an increase in the radially outward force applied between the inward flat surface **31** of key **18** and the corner **22** of the notch **19** of rod **1** so that for any amount of turning force applied to handle **34** in the clockwise direction the full force may be transmitted to the rod **1** by the described combination of contacts. The elements of the mechanism being in stable relationship to each other and being constrained by the force imparted to remain in positions relative to each other, the diametral flat key effectively connects housing **4** and therefore handle **34** to the rod **1** for the single selected direction of drive. As the housing **4** in FIGURE 3 is rotated counterclockwise key **18** attempts to follow the counterclockwise rotation of housing **4**. Pin **24** due to the motion impended by spring **23** constrains key **18** in position relative to rod **1** and thereby releases the wedging contact between the inner circumferential surface **9** and the upper end **33** of key **18**. The frictional force at the bottom of key **18** between the bottom end **32** and the surface **9** tends to return the key to a diametral position wherein the wedging action cannot occur. The housing **4** thereby freely and noiselessly rotates counterclockwise while in a clockwise direction forces are produced by the aforesaid contact points that effectively constrain the elements of mechanism in suitable positions relative to each other to transmit rotary motion from the housing **4** to the rod **1**, undiminished and without slippage.

FIGURE 4 illustrates an identical view to that of FIGURE 3 except that the elements are positioned so that they are constrained in place by the forces produced when housing **4** is rotated in a counterclockwise direction in relation to rod **1**, but freely allow rotation in the clockwise direction.

It being clearly shown above that the mechanism operates to produce the desired objects of invention and the nature and advantages of my invention being clarified in the foregoing description, I claim:

1. In a reversible ratchet mechanism: an inner circumferential surface, a diametrally notched rod rotatably free but axially restrained to dispose the notch within the inner circumferential surface, means to constrain the axis of the rod congruent with the axis of the inner circumferential surface, the notch of the rod having a diametral, plane, flat bottom surface terminated in opposite corners along the external surface of the rod, a single diametral flat key having an inward flat surface cooperating with the corners of the notch and having an outer flat surface against which

selective directional controlling means are applied to position the flat key in either the right or left turning positions, the ends of the key juxtaposed with the inner circumferential surface and configured to conform to the shape thereof, the key of such length that any substantial displacement of the key from a diametral position causes the ends of the key to engage the inner circumferential surface with a wedging action and the key thereby to form single driving means to connect frictionally the diametrally notched rod to the inner circumferential surface for the selected direction of rotation; said selective directional controlling means comprising a single pin member rotatably mounted about the notched rod and a spring member encompassing the pin member and the notched portion of the rod, the three sides of the spring member cooperating respectively with the opposite corners of the notch and with the external surface of the rod to impart rotary motion to the spring from a medial position, the rotary motion limited in either direction by the cooperating contact of the pin member with the outer flat face of the key and the combination of contacts of the pin member and the corner of the notch on the key operating to displace the key from a diametral position to cause the ends of the key to engage the inner circumferential surface with a wedging action when the mechanism is rotated in the selected direction; means provided to release the wedging action of the key for the opposite direction of rotation.

2. In a reversible ratchet mechanism, the subject matter of claim 1 wherein means provided to release the wedging action of the key comprise a single pin member rotatably mounted about the notched rod and a spring member encompassing the pin member and the notched portion of the rod, the spring member restraining the pin in relation to the notch and in cooperating contact with the outer flat surface of the key to release the wedging contact of one end of the key and therefore the wedging action of the entire key with the inner circumferential surface when the mechanism is rotated in a direction opposite the selected direction.

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