April 29, 1952 G. E. RAYNOR 2,595,213

RATCHET MECHANISM

Filed Jan. 22, 1951

Fig. 1.

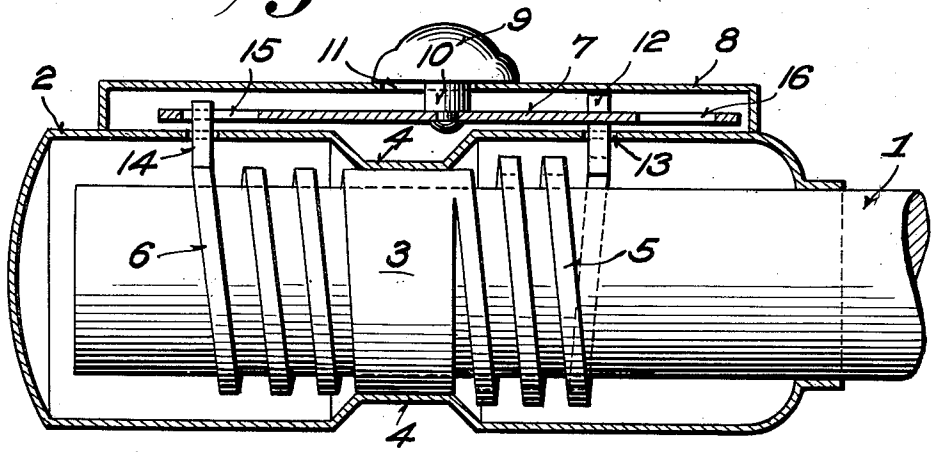


Fig. 2.

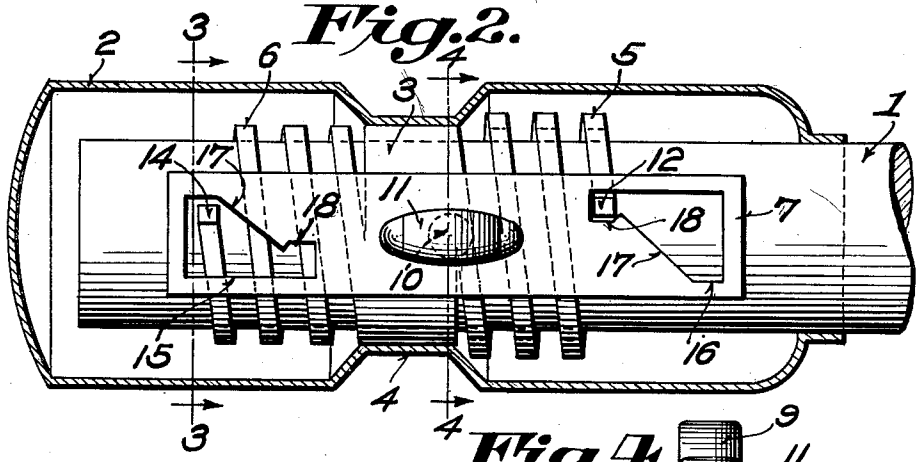


Fig. 3.

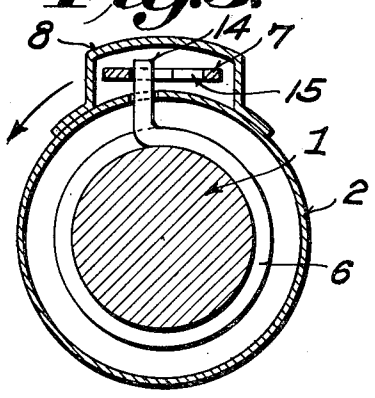
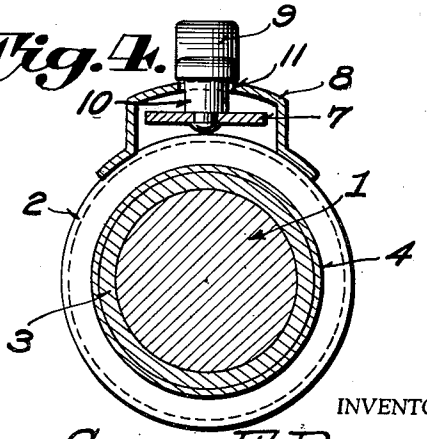


Fig. 4.



INVENTOR

GILBERT H. RAYNOR,

BY Shepards Shepard

ATTORNEYS

Patented Apr. 29, 1952

2,595,213

UNITED STATES PATENT OFFICE

2,595,213

RATCHET MECHANISM

Gilbert E. Raynor, United States Air Force

Application January 22, 1951, Serial No. 207,221

12 Claims. (Cl. 74—164)

1

This invention relates to ratchet mechanisms, particularly adapted for use in connection with screw drivers, wrenches and other tools having rotatable shanks, although it is capable of use in other connections.

It is an object of the invention to do away with pawls, ratchet wheels and the like and to provide a noiseless and at the same time effective ratchet mechanism which may be housed and contained within a rotatable handle employed for actuating the ratchet mechanism.

It is a further object of the invention to provide a new and improved ratchet mechanism having no moving parts likely to get out of order.

By housing the mechanism within a handle, the parts of the mechanism are well protected and concealed and will not interfere with the use of the tool.

With these and other objects in view, the present invention consists in the combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and pointed out in the appended claims, it, of course, being understood that changes in the form, proportion, size and minor details may be made, within the scope of the claims, without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings,

Figure 1 is a longitudinal sectional elevation of one embodiment of the present invention.

Figure 2 is a longitudinal sectional view taken at right angles to Figure 1.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 2.

One embodiment of the invention has been shown in Figures 1 to 4, inclusive, to which reference will be made. In these figures, 1 designates a rotatable shank of some hand tool such as a screw driver. For manipulating the clutch part of the ratchet mechanism and for housing and protecting the same there is employed a cylindrical hollow tubular handle 2 embracing the rear end of the shank 1 and rotatable thereon. Within the handle and embracing the shank is a clutch device including a band 3 which is loose upon the shank and is suitably connected as by welding to an inner wall of the handle. Preferably the handle is provided with a reentrant part 4 or reduced part to which the band 3 is secured. From one end of the band there

2

extend similarly wound spring coils 5 and from the other end of the band extend spring coils 6. The band and the coils are formed from a tube and the coils are so constructed that in a normal condition they tend to wind upon and frictionally embrace the shank 1. According to the present invention, when one set of coil springs frictionally engages the shank, the other set of coils is held out of frictional engagement therewith so that they may be turned loosely upon the shank. By turning the band in the proper direction, that set of coils which frictionally engages the shank will be caused to wind upon and more tightly grip the shank and form a driving connection between the shank and the band 3 so as to cause rotation of the shank 1 when the band is turned with the handle.

In order to release either set of coils from frictional engagement with the shank, there is provided a slide 7 suitably mounted upon the exterior of the handle 2 and movable endwise thereon in the longitudinal direction of the handle and the shank. The slide is contained within a suitable housing 8 carried by the handle 2. A button or thumb piece 9 works upon the exterior of the housing 8 and is provided with a shank 10 accommodated in a slot 11 in the housing and suitably connected to the slide whereby the slide may be conveniently moved back and forth upon the handle.

The free end of the outermost coil of the set of coils 5 is provided with a lateral finger or projection 12 disposed at about 90° to the axis of the coil and extends through an opening 13 in the handle and is suitably connected or associated with the slide 7, and a similar finger or projection 14 is provided upon the terminal of the outermost coil of the set of coils 6. The projection 14 is received within a slot 15 in the slide and the projection 12 is received within a similar slot 16 in the slide but disposed reversely to the slot 15. Each slot has a wide end which is disposed remotely from the band and an inner smaller end which is nearer the said band. Each slot is disposed in a general direction longitudinally of the slide. One edge of the slot is inclined transversely to the longitudinal direction of the slide as at 17 or, in other words, oblique thereto. This inclined edge portion terminates adjacent the smaller end of the slot and leads to a notch or seat 18 formed in the slide at the small end of the slot.

As shown in Figure 2, the finger or projection 12 is in the notch or seat 18 which holds the coils of the spring 5 spread or slightly unwound

so as not to frictionally grip the shank 1 while the projection 14 on the other spring 6 is in the wide end of the slot whereby the coils of the spring 6 are free to embrace the shank in frictional engagement therewith. By turning the handle 2 on the shank 1, the band and the springs will be rotated slightly on the shank and the coils of the spring 6 will be caused to grip or bind more tightly upon the shank and effect rotation thereof. Inasmuch as the coils of the spring 5 are held out of engagement with or only slightly in engagement with the shank 1, they will rotate loosely about the shank and not interfere with the drive connection afforded by the coils 6 between the part 3 and the shank.

A ratchet effect may be obtained by reason of the fact that the handle may be turned slightly in a reverse direction and the gripping coils 6 will be turned backward slightly around the shank notwithstanding the frictional engagement therewith because the tendency of the coils will be to loosen the grip upon the shank. At the same time the spring 5 will not interfere with such backward rotation of the handle because the coils are held out of tight frictional engagement with the shank.

By moving the slide 7 to the left from the position in which it is shown in Figure 2, the inclined or cam edge of the slot 17 will wipe across the projection 14 and move the same laterally until the notch or seat 18 of the slot receives the projection. During the wiping of the cam portion of the slot across the finger 14 the coils of the spring will be spread or loosened upon the shank 1 and when the projection is received in the notch 18, the coils will be in their spread condition. At the same time the other notch 18 will travel to the left until it disengages the projection 12 and then the spring is released and tends to tighten its tension to wind upon the shank 1, the projection 12 under the tension of the spring 5 will travel along the cam 17 until it comes into the wide end of the slot when the spring will be free to frictionally grip the shank. Upon turning the handle 2 in the proper direction, the spring coils 5 will wind more tightly upon the shank 1 and form a driving connection between the band 3 and the shank so as to drive the latter. The other coil spring being held in a spread or released condition by reason of the projection 14 being in the seat or notch 18 such coils will rotate loosely upon the shank without tending to interfere with the driving of the latter.

It will be noted that in accordance with the present invention the clutch members include a body in the form of a tube, from each end of which integral coils extend consistuting a tubular continuation of the body. The body is secured or fixed to the rotatable handle 2 and the coils at either end of the member 3 are intended to contract or wind alternately to grip the member 1, so that by turning or rotating the handle 2 the shank will be rotated because the band 3 will rotate with the handle and the coils at one end of the band which are in frictional gripping contact with the member 1 will constitute a driving connection between the rotatable part 3 and the part 1 to be rotated. In effect, the clutch members 5 and 6 are the opposite ends of a volute spring the mid convolutions of which form the band 3.

The inclined wall of each slot acts as a cam to wipe across the lateral projection on the free end of the respective springs to move the projection laterally while the slide is moving from one limit to the other limit. Such movement of the slide may start with the projection in the wide end of the slot so that the cam edge thereof may wipe across the projection and the latter will be moved laterally until it reaches the small end of the slot where it will be held by the notch or seat with the coils spread and out of frictional engagement with the part 1.

When the slide 7 is midway between the limits of its movement, the extension 14 of the spring 6 and the extension 12 of the spring 5 will each be substantially midway of the inclined edge 17 in which position the springs 5 and 6 will be expanded and maintained out of frictional engagement with the shank 1. Under such conditions the shank 1 may readily be removed from the handle and the shank of a different tool inserted.

It will, of course, be understood that the slide is free to move endwise, but is held against lateral movement so as to hold the projections of the springs from lateral movement in opposite directions when the projections are in the notch or seat.

Having thus described the invention, what I claim is:

1. The combination of a driven member to be rotated in opposite directions, a tubular handle rotatably embracing the driven member, and a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member, each set of coils being under tension tending to force said coils into frictional engagement with the driven member, and a slide mounted on the handle and having means in cooperative relation with the respective coils to selectively hold either set of coils out of frictional engagement with said driven member, and permit said other coils to contract and frictionally engage the said driven member.

2. The combination of a driven member to be rotated in opposite directions, a tubular handle rotatably embracing the driven member, a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member, each set of coils being under tension tending to force said coils into frictional engagement with the driven member and provided at its outer free end with a lateral projection, and a slide mounted on the handle and having means in cooperative relation with the respective projections of the coils to hold either set of coils out of frictional engagement with said driven member and permit said other coils to contract and frictionally engage the said driven member.

3. The combination of a driven member to be rotated in opposite directions, a tubular handle rotatably embracing the driven member, and a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member, each set of coils being under tension tending to force said coils into frictional engagement with the driven member, and a slide mounted on the handle and having slots, each slot having one edge provided with an inclined

portion forming a cam, and each set of coils terminating at its free end in a lateral projection received in one of the slots and lying in the path of the cam edge thereof.

4. The combination of a driven member to be rotated in opposite directions, a tubular handle rotatably embracing the driven member, and a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member, each set of coils being under tension tending to force said coils into frictional engagement with said driven member, a slide mounted on the handle and having slots, each slot having one edge provided with an inclined portion forming a cam, and each set of coils terminating at its free end in a lateral projection received in one of the slots and lying in the path of the cam edge thereof, and each slot having a wide end and a narrow end, the slide being provided with a seat at the narrow end of the slot and the inclined edge of the slot leading into the seat.

5. The combination of a driven member to be rotated, a tubular handle rotatably embracing the driven member, and a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to the handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member and normally tending to engage the same frictionally, and a slide mounted on the handle and having cams in cooperative relation with the respective coils to hold either set of coils out of frictional engagement with the driven member and permit said other coils to contract and frictionally engage the said driven member.

6. The combination of a driven member to be rotated in opposite directions, a tubular handle rotatably embracing the driven member, and a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to the handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member, each set of coils being under tension tending to force said coils into frictional engagement wth the driven member, and a slide mounted on the handle and provided with slots, each slot having a wide end and a narrow end and provided with an edge portion inclined transversely of the driven member, each set of coils terminating at its free end in a lateral projection received in one of the slots and lying in the path of the cam edge of said slot, the slide having a notch at the narrow end of each slot, and the inclined edge of each slot leading into the notch thereof.

7. In combination with a driven member to be rotated in opposite directions, a tubular handle rotatably embracing the driven member, and a clutch member within the handle comprising a centrally disposed band surrounding the driven member and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the driven member and under tension to normally frictionally engage the same, and a slide mounted on the handle and having cams in cooperative relation with the respective coils to hold either set of coils out of frictional engagement with said driven member and permit said other coils to contract and frictionally engage said driven member, a housing for the slide carried by the handle, and an operating button slidable on the outside of the handle and having a stem connected to the slide for operating the same, the housing having a slot through which the stem passes.

8. A ratchet screw driver comprising a screw driver shank to be rotated in opposite directions, a tubular handle rotatably embracing the shank, and a clutch member within the handle comprising a centrally disposed band surrounding the shank and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the shank, each set of coils being under tension tending to force said coils into frictional engagement with said shank, and a slide mounted on the handle and having cams in cooperative relation with the respective coils to selectively hold either set of coils out of frictional engagement with said shank and permit said other coils to contract and frictionally engage said shank.

9. A ratchet screw driver comprising a screw driver shank to be rotated in opposite directions, a tubular handle rotatably embracing the shank, and a clutch member within the handle comprising a centrally disposed band surrounding the shank and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the shank and under tension to normally frictionally engage the shank, and a slide mounted on the handle and having cams in cooperative relation with the respective coils to hold either set of coils out of frictional engagement with said shank and permit said other coils to contract and frictionally engage said shank, a housing for the slide carried by the handle, and an operating button slidable on the outside of the handle and having a stem connected to the slide for operating the same, the housing having a slot through which said stem passes.

10. A ratchet screw driver comprising a screw driver shank, a tubular handle rotatably embracing the shank, and a clutch member within the handle comprising a centrally disposed band surrounding the shank and fixed to said handle, said band being provided at opposite ends with integral similarly wound spring coils surrounding the shank and under tension to normally frictionally engage the shank, and a slide mounted on the handle and having cams in cooperative relation with the respective coils to hold either set of coils out of frictional engagement with the shank and permit said other coils to contract and frictionally engage said shank.

11. In a device adapted for use in rotating a shaft in opposite directions, the combination of a tubular handle, a clutch member within the handle comprising a centrally disposed band fixed to said handle and provided at opposite ends with integral spring coils, said coils constructed and arranged to receive and frictionally embrace a shaft to be driven, and a slide mounted on the handle and having means in cooperative relation with the respective coils to selectively hold either set of coils out of frictional engagement with the shaft to be driven and permit the other of said coils to frictionally engage the said shaft when embraced by said other coils.

12. In a device adapted for use in rotating a shaft in opposite directions, the combination of a tubular handle, a tubular clutch member within the handle adapted for receiving and frictionally embracing a shaft to be rotated comprising a pair of similarly wound volute spring coils disposed in longitudinal alignment with their inner

ends connected to the handle and their outer ends free for movement to permit expansion and contraction of said portions of said spring coils, and a slide mounted on the handle and having means in cooperative relation with the respective coils to selectively hold either set of coils against contraction and permitting contraction of the other set of coils to frictionally engage said shaft when embraced by said other coils.

GILBERT E. RAYNOR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
78,183	Burch	May 26, 1868
1,704,062	Starkey	Mar. 5, 1929