July 21, 1936. M. J. CLABBY 2,048,538

RATCHET DEVICE

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Fig. 1.

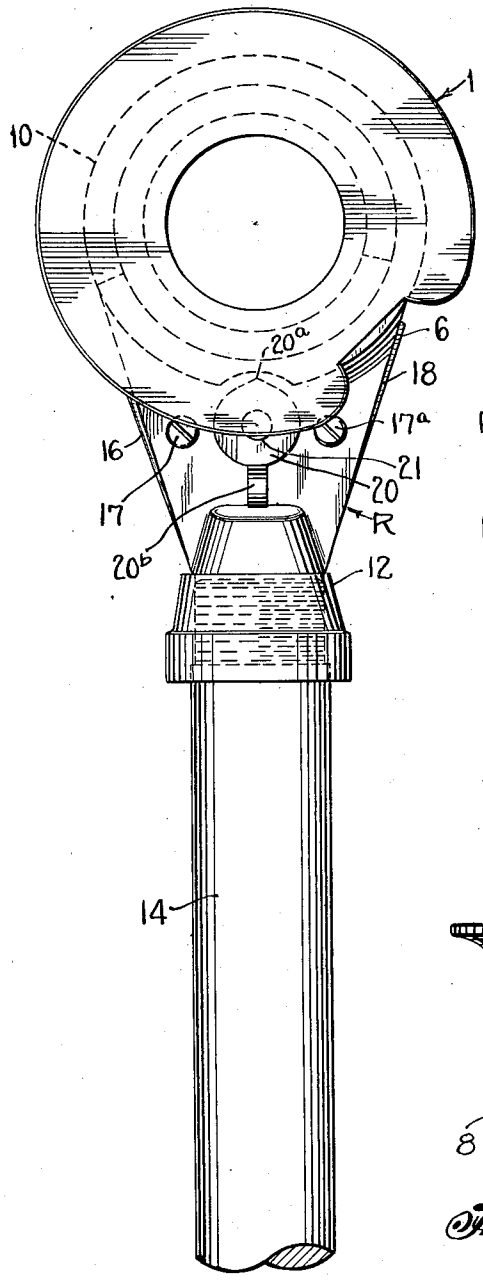
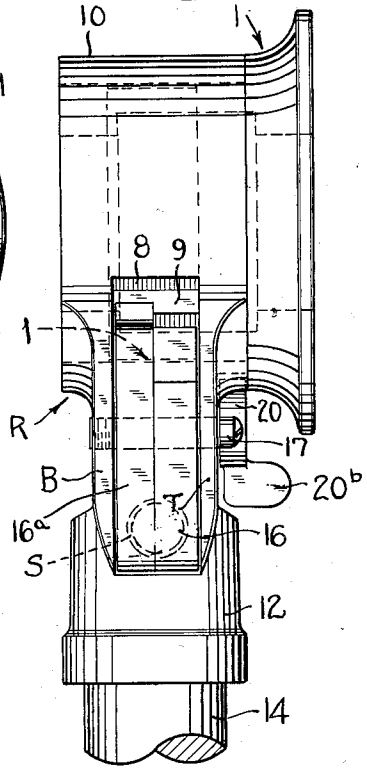


Fig. 2.



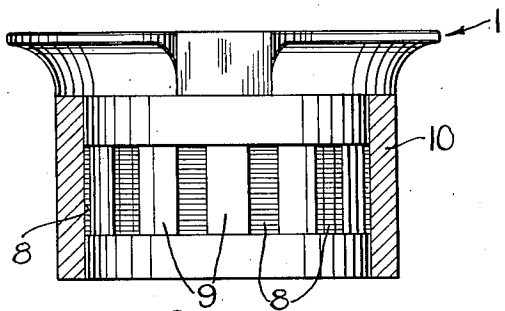


Fig. 3.

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Fig. 4.

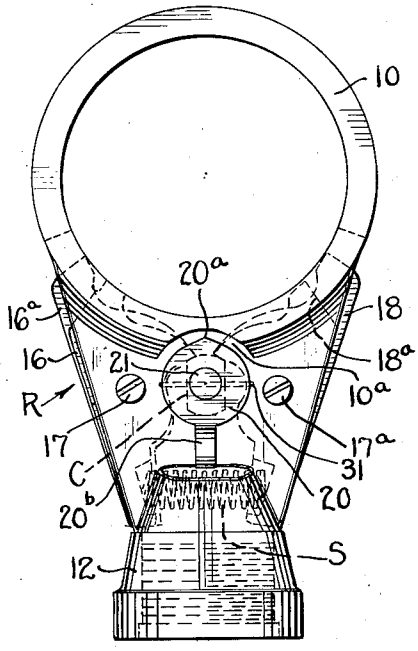


Fig. 5.

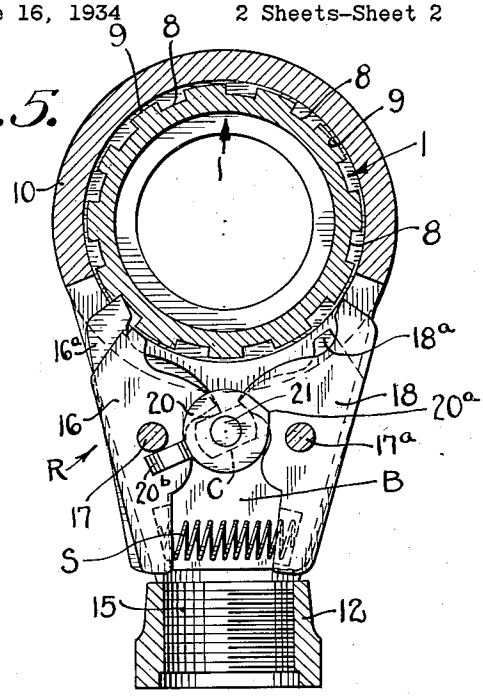


Fig. 6.

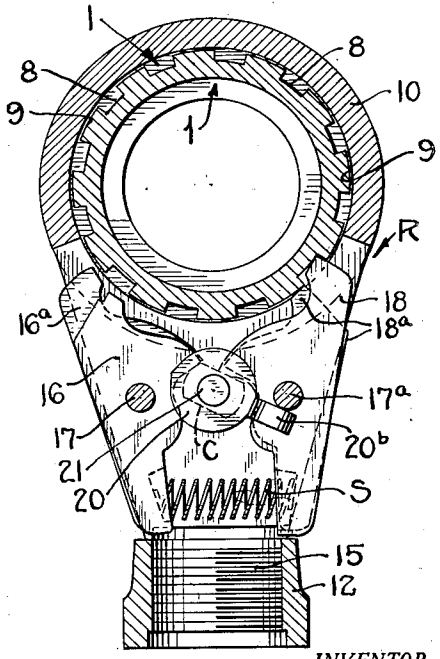
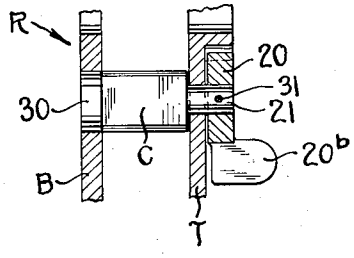


Fig. 7.



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RATCHET DEVICE

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Application June 16, 1934, Serial No. 730,934

5 Claims. (Cl. 192—43.1)

This invention relates to a new and improved ratchet device which can be used for various purposes.

One of the objects of the invention is to provide an improved ratchet device for operating tools of various kinds, such as thread-cutting tools, screw drivers, reamers, taps, drills, etc. This general description of some of the objects of the invention is made without limiting its field of use as the invention is generally applicable for intermittently turning any driven member in either direction, by means of a device which is turned back and forth. Said operating device engages the driven member when said operating device is turned in one direction, and said operating device is released from said driven member, when said device is turned in the opposite or inoperative direction.

Another object of the invention is to provide an operating device of this type, said device having staggered operating pawls, so as to eliminate backlash.

Another object of the invention is to provide at least two pairs of ratchet pawls, one of said pairs being operative to turn the driven member, so as to lengthen the life of the device.

Another object of the invention is to provide a quick release of the improved driving member from the driven member, by locating and arranging the operating pawls, so that they can be directly turned by the hand of the operator, to the inoperative position.

Another object of the invention is to locate the operating pawls in a casing which is provided with a suitable opening or openings, so that the operating pawls can be directly turned to the inoperative position, when it is desired to release the driven member, or for any other purpose.

Another object of the invention is to provide an improved cam control for moving the operating pawls out of operative position.

Another object of the invention is to provide a single spring for actuating all of the pawls to the operative position.

While the device has been heretofore referred to as a "ratchet" device, it is to be understood that the invention is not to be limited to the use of a ratchet or inclined teeth and that the term "ratchet" generally includes any device of the general type described herein.

Fig. 1 is a plan view showing the assembly of the operating device and the driven member.

Fig. 2 is a side elevation of Fig. 1.

Fig. 3 is a detail front elevation of the driven member. This view also includes a section of the collar of the operating device.

Fig. 4 is a plan view of the operating device, the pawls being shown in the neutral or inoperative position.

Fig. 5 is a plan view partially in section showing the operating device assembled with the driven member. In this view the pawls are in a position suitable for positively driving the driven member in the clockwise direction, if the eye of the observer is assumed to be above the plane of Fig. 5.

Fig. 6 is a view similar to Fig. 5, the pawls being shown in the position suitable for driving the driven member in the counter clockwise direction.

Fig. 7 is a detail view partially in section showing the cam device for shifting the pawls either to the neutral position shown in Fig. 4, or to either one of the positions shown in Fig. 5 and Fig. 6.

The driven member 1 may be of any conventional type and it is partially shown in the drawings herein, since it is to be understood that any suitable drill, reamer, tap, thread-cutting die or other tool member may be either integral with said driven member 1, or to be suitably connected thereto.

The shank of said driven member 1 is provided with vertical grooves 8, which define intermediate vertical teeth 9.

For convenience in describing and defining the invention, it is assumed that the operating device is held in a horizontal plane, but of course said device can operate in any plane.

Said teeth 9 and said grooves 8 have substantially smooth surfaces, and the horizontal lines which are illustrated in connection with the grooves 8 in Fig. 3, are shade lines.

As shown in Figs. 3 and 5, the operating device has a collar 10 which generally conforms to the shape of the shank of the driven member 1.

Said collar 10 has a smooth inner periphery and said collar 10 has an opening between the top and bottom thereof, along a portion of the periphery of said collar 10, so that the operating pawls can enter said collar 10, in order to engage the teeth 9.

The opening in the wall of said collar 10 is preferably less than 180°, although the invention is not to be restricted in this particular.

The operating device also comprises a casing R, which may be of tapered shape, and said casing has a bottom wall B, and a top wall T. Said casing also has a mouth 12, which is provided with an internal thead.

The arm 14 has its end externally threaded at 15 so that said arm 14 can engage the mouth 12 of the tapered casing R, in order to turn the operating device back and forth.

The casing is also provided with two pairs of operating pawls, one of said pairs including the pawls 16 and 16a, the other pair including the pawls 18 and 18a. The pawls 16 and 16a are turnably mounted upon a pivot pin 17, and the pawls 18 and 18a are turnably mounted upon a pivot pin 17a. However, the invention is not to be limited to any particular location or arrangement of the pawls.

As shown in Fig. 2, the pivot pin 17 has a bottom end which is externally threaded, and this engages an internally threaded opening which is provided in the bottom wall B. Said pivot pins 17 and 17a are generally shaped like screws, save that they have smooth shank portions upon which the pawls are turnably mounted.

As shown in Fig. 2, the side walls of the casing R are provided with openings intermediate the top and bottom walls T and B, and these openings are of sufficient height so that the outer ends of the pawls can be pressed by the fingers of the operator in order to directly turn said pawls to the inoperative position, without the use of any cam devices, or the like.

As shown in Fig. 1, said operating pawls may be located wholly within the inclined side walls of the casing R, in all the positions of said pawls, so that said pawls are protected against accidental blows or the like, by said side walls of the casing R.

As shown in Fig. 5, the pawls of each pair are of unequal length. The short pawl 16 of one pair is above the long pawl 16a of the same pair. The long pawl 18 of the second pair is above the short pawl 18a of said second pair. The pawls 16 and 18a are preferably of the same length and they correspond to each other in all respects, and the pawls 18 and 16a likewise correspond to each other.

Likewise, the pivot pin 17a is identical in construction with the pin 17.

The inner surfaces of the pawls have the general contour shown in Fig. 6, each of said inner surfaces being provided with a shoulder which can be engaged by the cam C. Said cam C has the general shape shown in Fig. 6 and Fig. 7 and it is provided with two parallel planar faces and two curved end faces.

The bottom wall B of the casing R is provided with a circular opening through which the cam C can be passed. The bottom end of said cam C is provided with a cylindrical pin 30, which turns in said opening.

The upper end of the cam C is provided with a pin 21 of reduced diameter, and said pin 21 turns in a suitable opening which is provided in the top wall T.

A thumb-operated member 20, having a thumbpiece 20b, is connected to said pin 21, by means of a lateral pin 31. The member 20 is provided with a tip 20a. When this point 20a is in the position shown in Fig. 4, the pawls are in the neutral position, all of the pawls having their inner ends disengaged from the grooves 8 of the driven member.

The heads of the pins 17 and 17a act as stop members to limit the movement of the thumbpiece 20b.

The outer ends of the pawls are provided with aligned partial recesses, and a single compression coil spring S has its ends located in said recesses, so that said spring S tends to force the inner ends of the pawl members, into engagement with the shank of the driven member 1. The shank of the driven member 1 is preferably provided with an odd number of grooves 8, so that none of the grooves 8, and none of the teeth 9, are diametrically aligned with a corresponding groove or tooth.

The purpose of this is to minimize the wear upon the teeth 9. The casing R is ordinarily turned about 180° at each stroke thereof and by having an odd number of teeth, the pawls are caused to come into contact with different teeth, during each consecutive half revolution. The grooves 8 and the teeth 9 may be made of equal width, measured along the periphery of the shank of the driven member 1. In such case, and assuming that the long pawl 18 abuts one of the teeth 9, as shown in Fig. 6, the short pawl 18a has its inner end substantially aligned with the edge of the consecutive tooth 9.

However, and if desired, the teeth 9 could be made somewhat wider than the grooves 8.

It is clear that the long pawl or the short pawl of either pair of pawls, may be used for turning the driven member 1. The use of a pair of pawls for driving the driven member, minimizes wear and backlash.

The pawls are protected at all times by the tapered casing R and if it is desired to promptly release the driven member, this can be done by inwardly pressing the outer ends of the pawls, irrespective of the position of the cam C.

The use of two separate pivot members 17 and 17a likewise increases the strength and the life of the device. The use of a single spring for controlling all the pawls increases the simplicity and lowers the cost of manufacture of the device.

The effect of using two pairs of pawls having the different lengths and arranged in the manner shown, substantially quadruples the life of the device.

Referring to Figs. 4–6, if one of the pairs of pawls is turned into the operative position, and the casing R is turned in the desired direction, it is impossible for the operator to turn said casing R through a distance which is greater than the width of a groove 8, before one of the operative pawls begins to turn the shank 1. This is due to the use of a pair of operating pawls on each side of the casing, said pawls being arranged in staggered relation.

If only a single pawl were utilized, said pawl could move for a distance which would correspond substantially to the width of two grooves before said pawl would begin to operate. Since these devices are turned with considerable force, it is desirable to minimize the relative free movement between the operating device and the driven member, at each stroke of the operating device.

While it is preferred to have at least two pawls on each side of the operating device, the invention is not limited in certain aspects thereof, to the use of two or more pawls upon each side of the device.

For convenience the member C can be designated as a "selector" because it selects the inoperative or operative positions of the pawls. Likewise, and in order to describe the invention conveniently, the outer ends of the pawls may be designated as being directly accessible, this expression being used in order to indicate that said

outer ends may be directly manipulated by the fingers of the operator.

For example, the selector means can be of any suitable or conventional type.

I have shown a preferred embodiment of my invention, but it is clear that numerous changes and omissions can be made without departing from its spirit.

I claim:

1. An operating device of the ratchet type and having an opening in which the shank of a driven member may be located, said shank having teeth, said device having two pairs of pawls which are mounted upon separate pivot members, the pawls of each pair being of unequal length so that their inner ends are spaced from each other, said inner ends being adapted to contact with different teeth of said shank, and selector means for controlling the positions of said pawls.

2. An operating device of the ratchet type having an opening in which the shank of a driven member may be located, said shank having teeth, said device having two pairs of pawls which are mounted upon separate pivot members, the pawls of each pair being of unequal length so that their inner ends are spaced from each other, said inner ends being adapted to contact with different teeth of said shank, and selector means for controlling the positions of said pawls, the outer ends of said pawls being directly accessible and having compression spring means located between said outer ends.

3. An operating device of the ratchet type and having an opening in which the shank of a driven member may be located, said shank having teeth, said device having two pairs of pawls which are mounted upon separate pivot members, the pawls of each pair being of unequal length so that their inner ends are spaced from each other, said inner ends being adapted to contact with different teeth of said shank, and selector means for controlling the positions of said pawls, the longer pawl of one pair being in the same position as the shorter pawl of the other pair.

4. An operating device of the ratchet type comprising a casing having a collar in which the shank of a driven member may be located, said shank having teeth, said casing having spaced pivot pins, a pair of pawls mounted upon each said pivot pin, the side walls of said casing having openings so that said pawls are directly accessible, each pair of pawls being of unequal length so that the inner ends of said pawls are adapted to engage different teeth of said driven member, a single compression spring located between the outer ends of said pawls, the outer ends of said spring being operatively connected to the outer ends of said pawls, and selector means mounted on said casing and adapted to control the positions of said pawls.

5. An operating device of the ratchet type comprising a casing having a collar in which the shank of a driven member may be located, said shank having teeth, said casing having spaced pivot pins, a pair of pawls mounted upon each said pivot pin, the side walls of said casing having openings so that said pawls are directly accessible, each pair of pawls being of unequal length so that the inner ends of said pawls are adapted to engage different teeth of said driven member, a single compression spring located between the outer ends of said pawls, the outer ends of said spring being operatively connected to the outer ends of said pawls, and selector means mounted on said casing and adapted to control the positions of said pawls, the longer pawl of one pair occupying the same position as the shorter pawl of the other pair.

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