H. S. CRAVER.

REVERSING RATCHET.

APPLICATION FILED FEB. 13, 1920.

1,365,892.

Patented Jan. 18, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

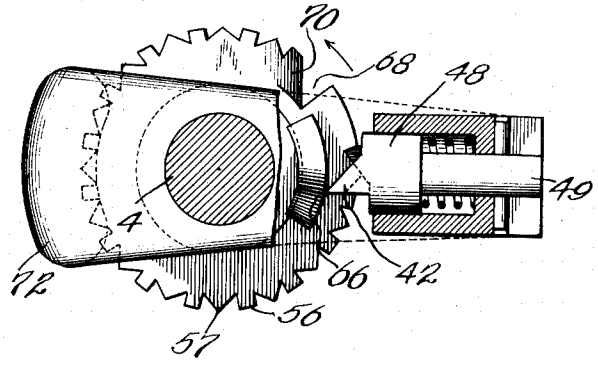


Fig. 4.

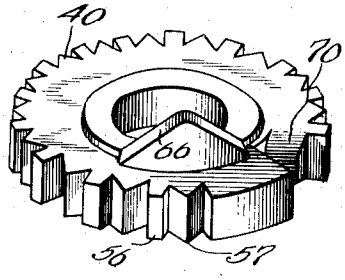


Fig. 2.

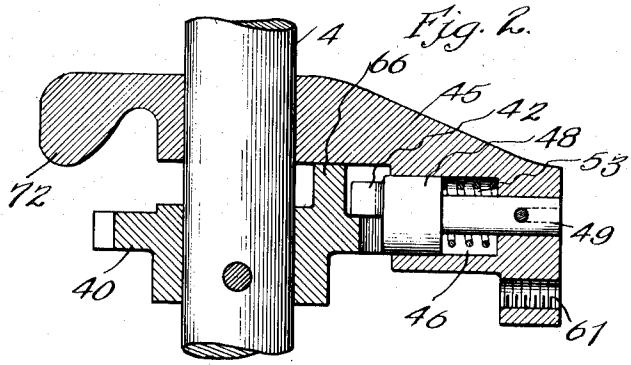


Fig. 3.

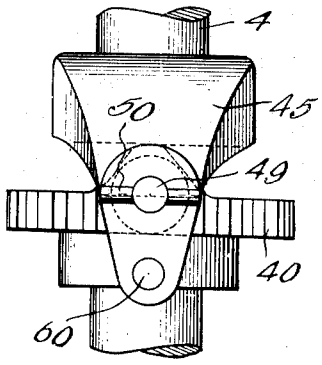


Fig. 5.

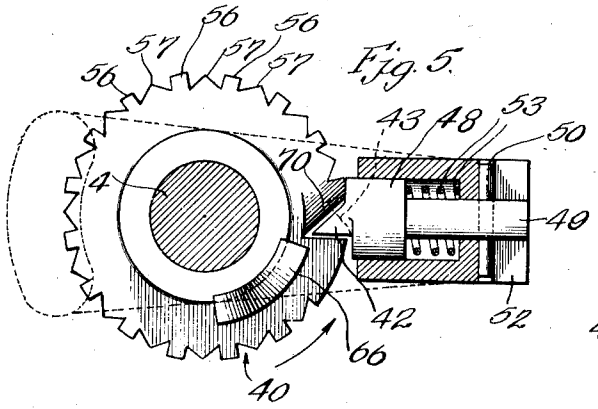
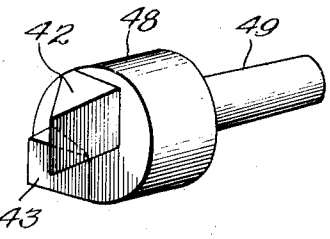


Fig. 6.



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2 SHEETS—SHEET 2.

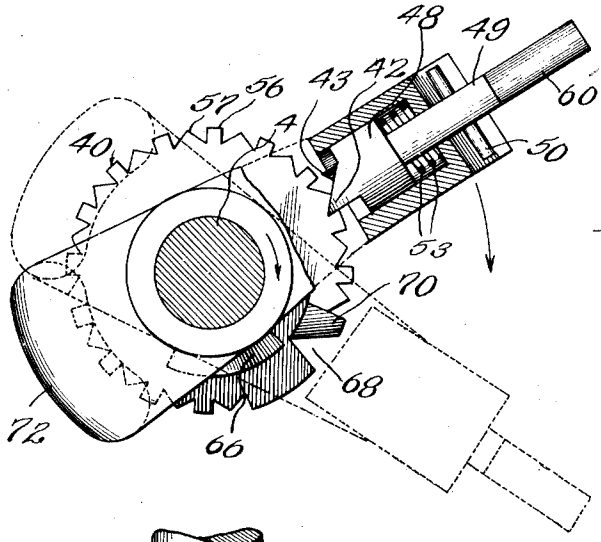


Fig. 7.

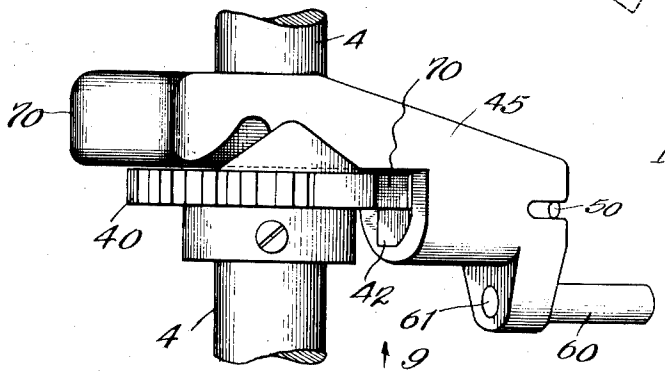


Fig. 8.

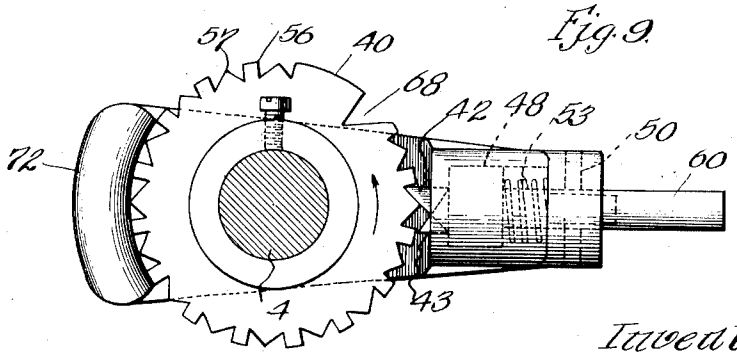


Fig. 9.

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UNITED STATES PATENT OFFICE.

HOWARD S. CRAVER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO HENRY S. JUDD, OF CHICAGO, ILLINOIS.

REVERSING-RATCHET.

1,365,892. Specification of Letters Patent. Patented Jan. 18, 1921.

Application filed February 13, 1920. Serial No. 358,435.

To all whom it may concern:

Be it known that I, HOWARD S. CRAVER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Reversing-Ratchets, of which the following is a specification.

My invention relates to reversing ratchets designed to rotate a driven element intermittently and to periodically reverse its direction of rotation. While this ratchet is applicable to a variety of uses, it is of great utility in washing machines such for example as shown in my divisional application filed Dec. 26, 1919, Serial No. 347,558. The object of my present invention is to provide a simple and efficient mechanism operating in the manner described.

I accomplish my object by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the ratchet wheel, pawl, and associated parts.

Fig. 2 is a central vertical section of the parts shown in Fig. 1.

Fig. 3 is a view looking toward the left in Fig. 2, but showing the entire ratchet wheel and pawl carrier, instead of only a portion thereof as in Fig. 2.

Fig. 4 is a perspective view of the ratchet wheel.

Fig. 5 is similar to Fig. 1, but shows the large part of the double pawl in engagement with the ratchet wheel.

Fig. 6 is a perspective view of the double pawl.

Fig. 7 is similar to Fig. 1, but shows the parts in changed position.

Fig. 8 is a front elevation of the parts shown in Fig. 7.

Fig. 9 is a bottom plan view of the parts shown in Fig. 8.

Like numerals denote like parts throughout the several views.

In the illustrated form of the invention, the driven element is typified by the shaft 4. In the aforesaid pending application this shaft constitutes the vertical reciprocating shaft of a so called "vacuum" washing machine. Fastened to the shaft or other driven element is a ratchet wheel 40 which coöperates with a double pawl provided with two teeth 42 and 43. The pawl is mounted in a carrier 45 and while the design may be varied, said carrier has a cylindrical chamber 46 formed in it which extends radially with respect to the ratchet wheel. It forms a guide for the cylindrical portion 48 of the pawl. A stem 49 extends backward from this cylindrical portion and out through a suitable aperture in the outer end of the carrier. Rotation of the pawl about its longitudinal axis is prevented by a pin 50 which extends transversely through stem 49 and works in a slot 52 formed in the outer end of the carrier. A helical compression spring 53 is interposed between the back of the cylindrical portion 48 and the end of chamber 46, thus constantly urging the pawl toward the ratchet wheel.

The teeth or pawls 42, 43 face in opposite directions and the upper one is longer than the lower one. The purpose of this is to enable the upper and longer one to ride upon the top, blank surface of the ratchet wheel and thus form a support for the pawl and pawl carrier and hold the shorter tooth in the plane of the ratchet wheel when the latter is being driven in one direction. The upper tooth is so long that when the lower tooth is in engagement with the ratchet wheel the upper tooth will project radially inward beyond the root of the ratchet teeth, thus preventing the longer tooth from dropping down into the spaces between the teeth. The pawl carrier makes a loose fit upon shaft 4 and in practice is lubricated so that it will slide freely in a vertical direction upon the shaft and will also freely oscillate about the shaft as an axis.

While the shape of the teeth may be altered somewhat without departing from the spirit of the invention, a good form is shown in the drawings in which the ratchet teeth 56 are in the form of pins, the acting faces whereof extend radially or at least near enough so to justify the statement that the teeth face in both directions, one side of a tooth being adapted to coöperate with one of the pawl teeth and the other with the other. While not essential, it is desirable that the spaces between the teeth contain obtuse angle points 57, the function whereof is chiefly to constitute fillets for reducing the clicking noise which might otherwise be produced, as the pawl teeth slide over them. These fillets also improve the action of the ratchet.

The pawl 45 is supported directly or indirectly by the ratchet wheel and receives an

oscillatory movement about shaft 4 as an axis by suitable means such as the stud 60 which screws into a threaded aperture 61 arranged radially at the outer end of the pawl carrier as best shown in Fig. 2. The stud is moved back and forth in the arc of a circle by any appropriate driving mechanism and this oscillates the pawl carrier about shaft 4 as an axis and causes the pawl teeth to drive the ratchet wheel in one direction or the other, depending upon which of the two pawl teeth are in engagement with the ratchet wheel at the time.

It will be evident that as the pawl carrier is freely slidable upon shaft 4 its weight will always urge it to descend as far as possible. When in lowered position the long tooth 42 will engage the ratchet teeth 56 as shown in Fig. 9 and will drive the ratchet wheel in an anticlockwise direction when viewed from the bottom as in Fig. 9, or in a clockwise direction when viewed from the top; but a cam 66 is formed upon the top of the ratchet wheel and this is so shaped that when the wheel has been rotated by the longer pawl tooth a certain amount, the cam will slip under the pawl carrier and force it upward to the position shown in Figs. 2 and 3. This causes the long tooth to be shifted up out of the plane of the ratchet wheel, whereupon spring 53 forces its radially inward so far that the point of the tooth extends to a point inside of the root circle of the ratchet wheel and thus prevents the long tooth from descending again even after the cam has been rotated out from under the pawl carrier. This upward shifting of the long tooth brings the short tooth up into the plane of the ratchet wheel, with the result that the oscillatory movement of the pawl carrier causes the ratchet wheel to be driven in the reverse direction. This reverse rotation of the ratchet wheel under the action of the short tooth 43 continues until the long tooth, which is now riding upon the upper surface of the ratchet wheel, comes to the large notch 68 formed in the periphery of the ratchet wheel. This is larger than the long tooth, and hence permits it to drop down into it, as illustrated in Fig. 5. The result is that the long tooth is once more in the plane of the ratchet wheel. The sides of notch 68 are so formed as to produce a ratchet tooth faced in such direction as to be actuated by the long tooth of the pawl, consequently the oscillatory movement of the pawl carrier now causes the long tooth to drive the ratchet wheel in the reverse direction. This completes the cycle of operation, the long tooth driving the ratchet wheel when the pawl carrier is lowered and the short tooth driving it when the pawl carrier is raised. In order to render the device smooth acting and assure the descent of the long tooth when it arrives at the notch 68, it is desirable to bevel the upper surface of the ratchet wheel at the point 70 adjacent to the entering side of the notch. This permits the long tooth and supported parts to descend gradually and certainly. This construction also avoids the production of noise incident upon the descent of the parts.

The long pawl tooth 42 is so long that when it is seated in engagement with the ratchet teeth, the point of the short tooth will be outside of the point circle of the ratchet teeth—that is, will be prevented from reaching the ratchet teeth, and hence will be maintained nonactive while the long tooth is acting, this characteristic being clearly illustrated in Fig. 9.

Although a matter chiefly of design, it is desirable that the pawl carrier be provided with a counterweight 72 located on the opposite side of the shaft from the pawl, thus tending to balance the carrier and promote the ease and certainty with which it will slide along the main shaft.

In operation, the pawl carrier is oscillated back and forth through the agency of the stud 60 or otherwise. Assuming that the carrier is in down position with the long tooth 42 in engagement with the ratchet wheel; the ratchet wheel and shaft will be rotated intermittently in a direction in which the long tooth faces. Finally, however, the lifting cam 66 comes into action, raises the pawl carrier to the position shown in Figs. 1 and 2, brings the short tooth into the plane of the ratchet wheel, and causes the spring 53 to project the long tooth over the blank surface of the ratchet wheel. The short tooth now commences to act and intermittently rotates the ratchet wheel in the opposite direction.

Thus it will be evident that the long tooth intermittently rotates the ratchet wheel in one direction while the short tooth intermittently rotates it in the opposite direction. The action of the short tooth is continued until the notch 68 is reached, whereupon the pawl carrier drops down to the lower position and the long tooth comes into action once more.

It will be understood, of course, that the positioning of the notch 68 with reference to the pawl 66 is optional with the designer and the angular distance between them may be increased or decreased, depending upon how far it is desired to have the vacuum cups rotate in one direction before the direction of rotation is reversed. Ordinarily, however, it is desirable to place the notch as far from the cam, angularly, as possible, thus causing the vacuum cups to make practically one complete revolution before the direction of rotation is reversed.

In the foregoing description I have used the term "up" and "down" for the sake of

clearness and because the device will frequently if not usually be used in the position illustrated, but it will be understood that the ratchet is applicable to many types of mechanism and its general principles are operative whether the main shaft is vertical, horizontal, or inclined.

In the illustrated construction, gravity is relied upon to cause the pawl carrier to drop when the long tooth reaches the notch 68, but it will be evident that the action of gravity may be supplemented by a spring and also that in cases where the shaft is not vertical the action of a spring may be substituted for the action of gravity. I wish to be understood, therefore, in the following claims as applied to the ratchet, to use the terms "up" and "down" in their relative rather than in their absolute sense.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. A reversing ratchet having a ratchet wheel with teeth formed in its periphery, a double pawl having two teeth, one facing in one direction and the other in the opposite direction, said pawl teeth being located in parallel planes and being shiftable in a direction normal to the plane of the ratchet wheel, means for thus shifting said pawl, one of said pawl teeth being longer than the other whereby it will, when in engagement with the ratchet teeth, hold the shorter tooth out of engagement with the ratchet teeth, and when the shorter tooth is in engagement with the ratchet teeth, will project radially inward beyond the root circle of the ratchet teeth.

2. A reversing ratchet having a ratchet wheel with teeth formed in its periphery, a double pawl having two teeth, one facing in one direction and the other in the opposite direction, said pawl teeth being located in parallel planes and being shiftable in a direction normal to the plane of the ratchet wheel, one of said pawl teeth projecting a greater distance beyond the other than the height of the ratchet teeth, a cam on the ratchet wheel for shifting the longer pawl tooth out of the plane of the ratchet wheel, said pawl being biased in a direction to shift the shorter tooth into the plane of the gear, and the ratchet wheel having a notch large enough to admit the longer tooth and to permit it to be shifted into the plane of the ratchet wheel.

3. A double pawl ratchet having a ratchet wheel provided with teeth, a double pawl adapted to shift relatively to the plane of the wheel to bring one or the other of the pawl teeth into engagement, and means operating in synchronism with the wheel for thus shifting the pawl.

4. In a ratchet, a toothed wheel, a pawl having two teeth facing in opposite directions and adapted to engage the teeth of the wheel said pawl teeth being fastened together to act as a single unit and being shiftable relatively to the plane of the wheel to bring one or the other into engagement, the pawl being biased to shift in one direction to bring one pawl into engagement, and a cam acting in synchronism with the wheel for shifting the pawl in the other direction, against its bias.

5. In combination, a ratchet wheel provided with teeth having acting surfaces facing in opposite directions, two pawl teeth forming a unit and facing in opposite directions, the pawls being shiftable relatively to the plane of the wheel for bringing one or the other into engagement with it, the pawls being biased to shift in one direction, a cam on the wheel for causing the pawl to shift in a direction against its bias, and means for reciprocating one of the parts about the axis of the wheel for causing intermittent movement of the other part about the axis of the wheel, first in one direction and then the other.

6. A reversing ratchet having a ratchet wheel and a double pawl having one tooth facing one way and another tooth facing the opposite way, the ratchet wheel having teeth facing both ways for engagement with the different pawl teeth and having fillets between the ratchet teeth, the sides of said fillets sloping toward the roots of the ratchet teeth.

7. A reversing rachet having a ratchet wheel and a double pawl having one tooth facing one way and another tooth facing the opposite way, the ratchet wheel having teeth facing both ways for engagement with the different pawl teeth and having fillets between the ratchet teeth, the fillets being pointed and the points extending approximately to the point circle of the ratchet teeth.

8. A reversing ratchet having a ratchet wheel with teeth facing in both directions, a double ratchet having a long tooth and a short tooth facing in opposite directions and arranged in parallel planes whereby one or the other may be brought into engagement with the ratchet wheel by shifting the pawl in a direction normal to the plane of the ratchet wheel, and means for thus shifting the pawl, the long tooth resting upon the blank surface of the wheel when the short tooth is acting, and the ratchet wheel having a notch at one point in its circumference large enough to pass the long tooth for permitting it to drop down to the plane of the wheel.

9. A reversing ratchet having a ratchet wheel with teeth facing in both directions, a double ratchet having a long tooth and a short tooth facing in opposite directions and arranged in parallel planes whereby one or

the other may be brought into engagement with the ratchet wheel by shifting the pawl in a direction normal to the plane of the ratchet wheel, and means for thus shifting the pawl, the long tooth resting upon the blank surface of the wheel when the short tooth is acting, and the ratchet wheel having a notch at one point in its circumference large enough to pass the long tooth for permitting it to drop down to the plane of the wheel, the surface of the wheel at the approach side of the notch being beveled downward to let the long tooth be lowered gradually.

In witness whereof, I have hereunto subscribed my name.

HOWARD S. CRAVER.