May 26, 1964 W. H. SHANNON 3,134,267

RATCHET MECHANISM

Filed Feb. 5, 1962 2 Sheets-Sheet 1

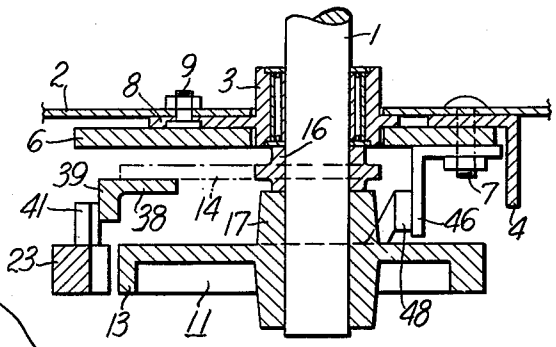


Fig. 6

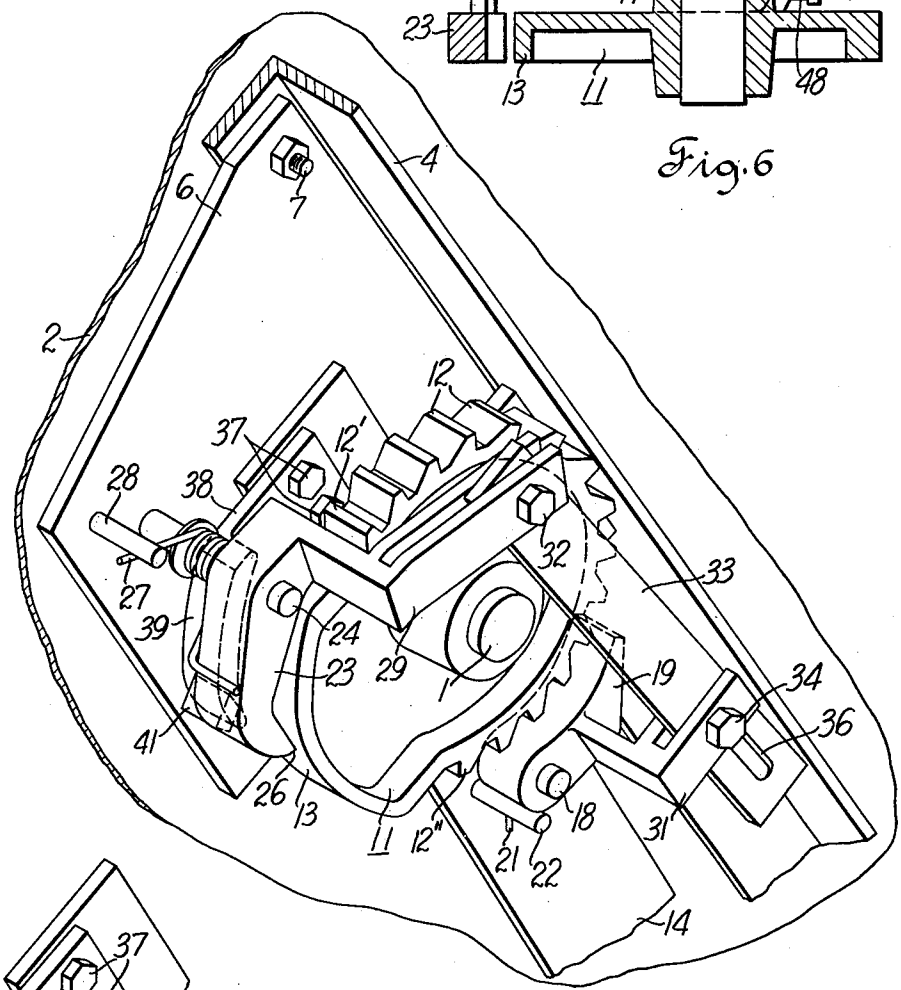


Fig. 1

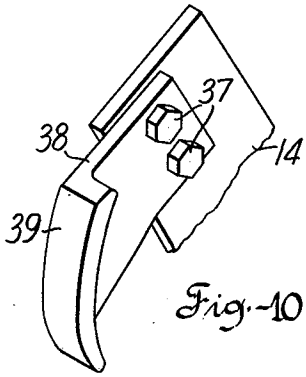


Fig. 10

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RATCHET MECHANISM

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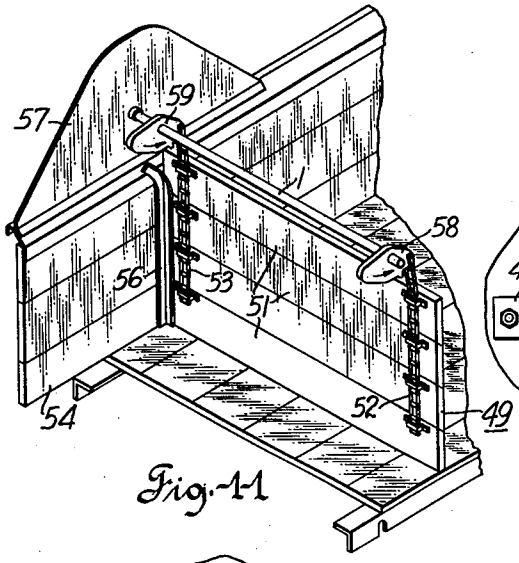


Fig. 11

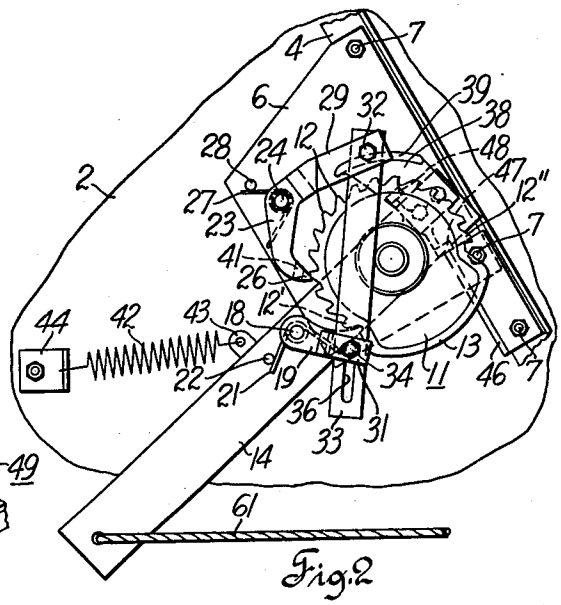


Fig. 2

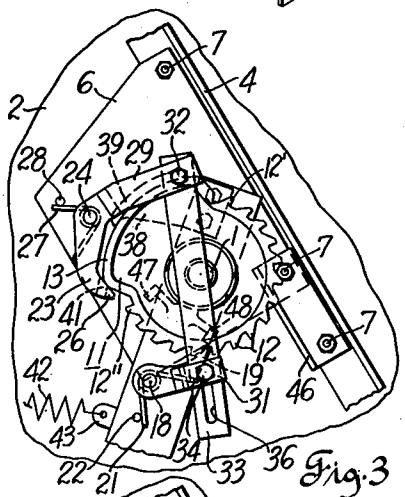


Fig. 3

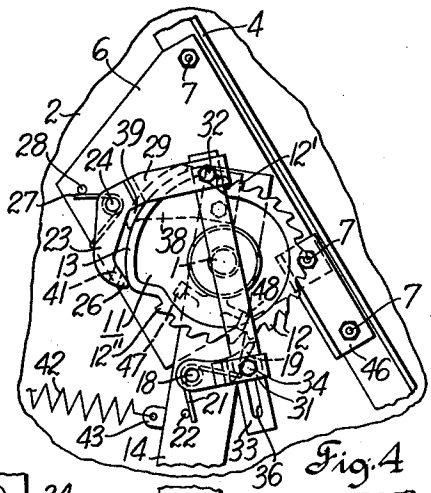


Fig. 4

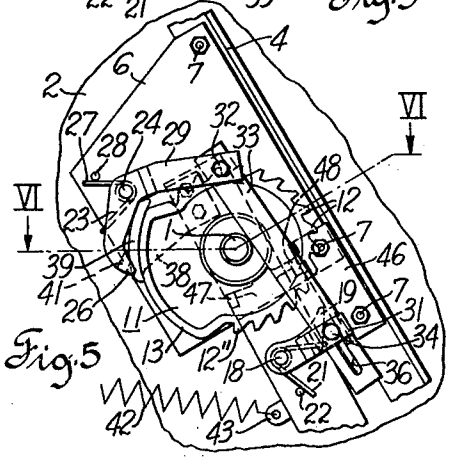


Fig. 5

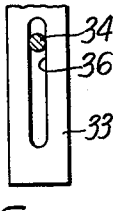


Fig. 7

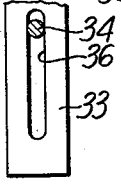


Fig. 8

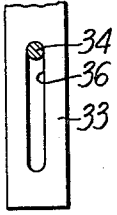


Fig. 9

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3,134,267
RATCHET MECHANISM

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4 Claims. (Cl. 74—142)

The invention relates to intermittent grip devices, and it is concerned more particularly with a ratchet type mechanism for raising and lowering an up and down movable load.

The principal object of the invention is to provide a mechanism of the mentioned character which lends itself for use under conditions where it is desired to lift an up and down movable load, as for instance the end gate of a manure spreader, in successive, relatively short steps, and to let the weight drop by gravity after it has been raised to a predetermined height. The mechanism as contemplated by the invention incorporates a back and forth swingable actuating lever which is spring biased in one direction so that it can be rocked back and forth by alternate tightening and slackening of a control rope which is tied at one end to the lever and the other end of which is within reach of a remotely stationed operator, as for instance the driver of a tractor pulling the manure spreader.

More specifically, it is an object of the invention to provide a ratchet type load lifting mechanism of the mentioned character which will be operable to lift the load to a predetermined height by repeated power strokes of the actuating lever, and which will be operable to release the load by a final stroke of the actuating lever; that is, by swinging the actuating lever once more through its range of movement in opposition to the spring bias after the load has been raised to its predetermined height by one or more preceding power strokes of the actuating lever.

A further object of the invention is to provide a ratchet type load lifting mechanism of the hereinabove outlined character which will automatically adjust itself for a renewed lifting operation after the load has been released and dropped. In other words, after one operating cycle of the mechanism has been completed and the control rope has been relaxed, a new lifting operation may be started by merely pulling on the control rope.

A further object of the invention is to provide a ratchet type load lifting mechanism of the hereinabove outlined character which will permit holding of the load in a partially or fully lifted position for any desired length of time without need of maintaining the control rope under tension.

A further object of the invention is to provide an improved ratchet type load lifting mechanism which is simple, and compact in construction, efficient and reliable in operation, and which may be manufactured at relatively low costs.

These and other objects and advantages are attained by the present invention, various novel features of which will be apparent from the description herein of an embodiment of the invention, and will be set forth in the appended claims.

In the drawings:

FIG. 1 is a three dimensional view of a ratchet mechanism embodying the invention;

FIGS. 2 through 5 are side views of the mechanism shown in FIG. 1 illustrating various relative positions of its parts;

FIG. 6 is a sectional view on line VI—VI of FIG. 5;

FIGS. 7, 8 and 9 are detail views illustrating relations of parts corresponding to the conditions in which the mechanism is shown in FIGS. 2, 3, and 4, respectively;

FIG. 10 is a detail view of parts shown in FIG. 1; and

FIG. 11 is a three dimensional view of part of a wagon

body on which the mechanism shown in FIG. 1 may be installed.

The reference numeral 1 in FIGS. 1 and 6 designates a shaft which is rotatably mounted on a support of any suitable construction and which may include a wall 2, a bearing 3, an angle iron 4 and a mounting plate 6. The angle iron 4 and the mounting plate 6 are rigidly secured to the wall 2 by bolts 7 (FIG. 2). The bearing 3 has a flange 8 which is secured to the wall 2 by a bolt 9 (FIG. 6) and others not shown.

Rigidly secured to the end of the shaft 1 which extends through the bearing 3 is a rotary member generally designated by the reference character 11 and which has an incomplete circle of ratchet teeth 12 at its periphery and a cam portion 13 which projects radially between the first ratchet tooth 12′ and the last ratchet tooth 12″ in the space therebetween.

An actuating lever 14 has a hub 16 (FIG. 6) which is rockably supported on the shaft 1 between a hub portion 17 of the rotary member 11 and the bearing 3. Pivotally mounted on the actuating lever 14 by means of a pivot pin 18 is a drive pawl 19 for cooperative engagement with the ratchet teeth 12. A wire spring 21 (FIG. 2) is coiled about the pin 18 and reacts between a pin 22 on the actuating lever 14 and the drive pawl 19 so as to yieldingly urge the latter into engagement with the rotary member 11.

A backup pawl 23 is pivotally mounted on the mounting plate 6 by means of a pivot pin 24 and has a tip portion 26 which is engageable with the ratchet teeth 12 and cooperable with the cam portion 13 of the rotary member 11. A wire spring 27 is coiled about the pin 24 and reacts between a pin 28 on the mounting plate 6 and the pawl 23 so as to urge the tip portion 26 of the latter into cooperative engagement with the rotary member 11.

As best shown in FIG. 1, the backup pawl 23 has a bifurcated arm 29 in laterally offset relation to the rotary member 11, and the drive pawl 19 has a similarly offset bifurcated arm 31. Pivotally connected with the arm 29 of the backup pawl 23 by means of a bolt 32 is a link 33, the lower end of which is straddled by the bifurcated arm 31 of the drive pawl 19. A bolt 34 extends through registering holes in the bifurcated arm 31 and through a registering longitudinal slot 36 of the link 33. The link 33 has lateral clearance within the bifurcated arm 31 to permit free back and forth lengthwise movement of the link relative to the arm 31 within the limits determined by the length of the slot 36. In other words, the link 31 and bolt 34 afford a lost motion connection between the backup pawl 23 and the drive pawl 19.

Secured to the upper end of the actuating lever 14 by means of bolts 37, as best shown in FIG. 10, is a lockout member 38 which comprises an arcuate flange portion 39 at the side of the lever 14 which faces toward the backup pawl 23. A lug 41 (FIG. 6) is integral with the backup pawl 23 at the side of the latter facing the mounting plate 6, and the arcuate flange 39 of the lockout member 38 may be brought into and out of radially overlapping relation with the lug 41 by back and forth rocking movement of the actuating lever 14, as will be explained more fully hereinbelow. A coil spring 42 (FIG. 2) is anchored at one end on a lug 43 of the actuating lever 14 and at its other end on a clip 44 which is secured to the wall 2. The spring 42 is initially stressed so that it will subject the lever 14 to a torque in clockwise direction as viewed in FIG. 2 and normally urge the lever to the limit position in which it is shown in FIG. 2. An angle iron clip 46 (FIG. 2) is secured to the mounting plate 6 and angle iron 4 by the bolts 7. The clip 46 has an upstanding flange, as best shown in FIG. 6, and the upper end

face of this flange affords a stop which is engageable edgewise by the upper end of the actuating lever 14 so as to determine the limit position in which the lever 14 is shown in FIG. 2. The rotary member 11 has a lug 47 which is also engageable with the upper end face of the angle iron clip 46 so as to limit clockwise rotation of the rotary member 11 as viewed in FIG. 2. Another lug 48 on the rotary member 11 is engageable with a side face of the upstanding flange portion of the angle iron clip 46 as shown in FIG. 5 so as to limit counterclockwise rotation of the rotary member 11 as illustrated by FIG. 5. The same side face of the upstanding flange of the angle iron clip 46 is also engageable by the actuating lever 14 to limit anticlockwise rocking movement of the latter about the shaft 1, as viewed in FIGS. 2 to 5.

For purposes of explanation it may be assumed that the shaft 1 shown in FIGS. 1 and 6 is an operating shaft for a tail gate 49 of a manure spreader as indicated in FIG. 11. The tail gate 49 comprises a number of boards 51 which are flexibly jointed by means of a pair of chains 52 and 53. The boards 51 are guided on one side wall 54 of the manure spreader by means of an angle iron 56 which is rearwardly curved at its upper end, and the boards 51 are similarly guided on the opposite side wall of the manure spreader, not shown. The shaft 1 is rotatably mounted on an upward extension 57 of the side wall 54, and its other end, not shown in FIG. 11, is journaled on a similar upward extension of the other side wall of the manure spreader in the manner illustrated by FIG. 6. The chains 52, 53 are connected at their upper ends to cam members 58 and 59 which are fixedly secured to the shaft 1 for rotation therewith. Anticlockwise rotation of the shaft 1 as indicated by the arrows in FIG. 11 will raise the tail gate 49 from the lowered position in which it is shown in FIG. 11. The weight of the gate imposes a torque upon the shaft 1 in clockwise direction which is taken up either by engagement of the lug 47 with the upper end of the angle iron clip 46 as shown in FIG. 2, or when the tail gate is adjusted to a raised position, the clockwise torque acting upon the shaft 1 is taken up by the backup pawl 23 in cooperation with one of the ratchet teeth 12.

The condition in which the ratchet mechanism is shown in FIG. 2 corresponds to the lowered condition of the gate 49 as shown in FIG. 11. In order to raise the gate an operator, who might be stationed on a tractor pulling the manure spreader, may swing the actuating lever 14 anticlockwise from the position in which it is shown in FIG. 2 by pulling on a rope 61 which is connected at its rear end to the lever 14 and at its forward end to any convenient stationary part of the tractor in proximity to the operator's seat. Anticlockwise swinging movement of the lever 14 from the position shown in FIG. 2 will be transmitted to the rotary member 11 through the drive pawl 19 which remains in engagement with the rotary member throughout the lifting stroke of the lever 14 while the backup pawl 23 rides over the ratchet teeth 12. Upon completion of the lifting stroke the backup pawl 23 falls into the space between two ratchet teeth 12 and thus prevents return rotation of the shaft 1 under the weight of the gate 49 while the lever 14 is permitted to return to its starting position under the tension of the spring 42 after the rope 61 has been slackened.

Repeated back and forth movement of the lever 14 by alternate pull and release of the rope 61 will raise the gate 49 step by step until the condition of the mechanism shown in FIG. 3 is obtained. Movement of the cam portion 13 against the tip of the backup pawl 23 as shown in FIG. 3 causes swinging movement of the latter in clockwise direction and corresponding downward movement of the link 33 relative to the arm 31

of the drive pawl 19. Such downward movement of the link 33 will be initially accommodated by the slotted connection of the link 33 with the bolt 34 as illustrated by FIGS. 7 and 8. Continued rotation of the rotary member 11 in anticlockwise direction from the position shown in FIG. 3 to the position shown in FIG. 4 will bring the tip of the backup pawl upon the arcuate periphery of the cam portion 13 and cause further downward movement of the link 33 from the position in which it is shown in FIG. 3. Such further downward movement of the link 33 will bring the upper end of the slot 36 against the shank of bolt 34 as shown in FIG. 9, and cause the drive pawl 19 to swing out of engagement with the toothed portion of the rotary member 11. As a result, the rotary member 11 and shaft 1 will no longer be restrained from rotating clockwise under the weight of the gate 49.

In order to enable the gate 49 to return from its fully raised position to the lowered position in which it is shown in FIG. 11, it is necessary that the backup pawl 23 be maintained out of engagement with the ratchet teeth of the rotary member 11 during the corresponding clockwise rotation of the latter. This result is accomplished by the provision of the lockout member 38 on the upper end of the actuating lever 14.

The last part of a full lifting stroke of the lever 14 from the position in which it is shown in FIG. 2 brings the arcuate flange 39 of the lockout member 38 into radially overlapping relation with the lug 41 of the backup pawl 23. The radial spacing of the inside surface of the arcuate flange 39 from the center of the shaft 1 is slightly greater than the radial distance to which the radially outer surface of the lug 41 moves away from the center of shaft 1 when the tip 26 of the backup pawl 23 rides up to the crest of any one of the teeth 12. However, when the arcuate peripheral surface of the cam portion 13 has been moved under the tip 26 of the backup pawl 23 as shown in FIG. 4, the last part of a full lifting stroke of the lever 14 will bring the arcuate flange 39 of the lockout member 38 into a radially inward overlapping relation with the lug 41 of the backup pawl 23. Such positioning of the arcuate flange 39 of the lockout member at the radially inner side of the lug 41 will positively keep the backup pawl 23 in an idle position as shown in FIG. 5 in which its tip 26 is out of the range of the ratchet teeth 12. At the same time, the drive pawl 19 is kept out of engagement with the ratchet teeth by the link 33 as shown in FIG. 4, and the gate 49 will therefore be free to drop to its lowered position while the actuating lever 14 is held in its clockwise limit position by pull on the rope 61. Such return movement of the gate to its lowered position brings the rotary member 11 from a gate raised position, such as illustrated by FIGS. 4 and 5, back to the starting position in which it is shown in FIG. 2. Slackening of the rope 61 after gate lowering rotation of the member 11 causes return movement of the lever 14 under the action of the spring 42 to the position shown in FIG. 2, and the mechanism is then ready for a new lifting and lowering cycle by continued back and forth swinging movement of the actuating lever 14.

FIGS. 5 and 6 show the lug 48 of the rotary member 11 in engagement with the upstanding flange of the angle iron clip 46. This is a momentary condition which may be brought about by inertia forces developed during the lifting of the gate 49. Engagement of the lug 48 with the angle iron clip 46 prevents the rolled up gate 49 from turning over about the axis of shaft 1.

While in the foregoing a preferred embodiment of the invention has been shown and described, it should be understood that it is not intended to limit the invention to the exact details of construction, but that it includes such other forms and modifications as are embraced by the scope of the appended claims.

What is claimed is:

1. A ratchet mechanism comprising:

a support;

a rotary member journaled on said support and presenting a series of ratchet teeth and a cam portion;

an actuating lever rockably mounted on said support and having a drive pawl in cooperative relation to said ratchet teeth;

a backup pawl movably mounted on said support for cooperative engagement with and actuation by said ratchet teeth and cam portion; and

lost motion connecting means between said drive and backup pawls, whereby said drive pawl will be disengaged from said ratchet teeth upon actuation of said backup pawl by said cam portion.

2. A ratchet mechanism as set forth in claim 1 and further comprising a lockout member connected with said actuating lever for movement thereby into and out of cooperative relation with said backup pawl.

3. A ratchet mechanism comprising:

a support;

a rotary member journaled on said support and having an incomplete circle of ratchet teeth at its periphery and a cam portion projecting radially beyond the first and the last of said ratchet teeth in the space therebetween;

an actuating lever rockably mounted on said support and having a drive pawl in cooperative relation to said ratchet teeth;

a backup pawl movably mounted on said support and having a tip portion engageable with said ratchet teeth and cooperable with said cam portion so that engagement of said cam portion with said tip portion of said backup pawl upon rotation of said rotary member in one direction will move said backup pawl to an idle position out of range of said ratchet teeth;

lost motion connecting means between said drive and backup pawls whereby said drive pawl will be disengaged from said ratchet teeth by movement of said backup pawl to said idle position;

and lockout means for temporarily retaining said backup pawl in said idle position independently of said cam portion.

4. A ratchet mechanism as set forth in claim 3 wherein said lockout means comprise a flange member secured to said actuating lever and a lug on said backup pawl, said flange member and lug being arranged to that said flange member will be brought into and out of radially overlapping relation with said lug by back and forth rocking movement of said actuating lever.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,134,267 May 26, 1964

William H. Shannon

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 19, for "arranged to" read -- arranged so --.

Signed and sealed this 22nd day of September 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents