Sept. 22, 1936. L. J. AUTHIER 2,055,023

TRANSFER MECHANISM

Filed March 17, 1934 2 Sheets-Sheet 1

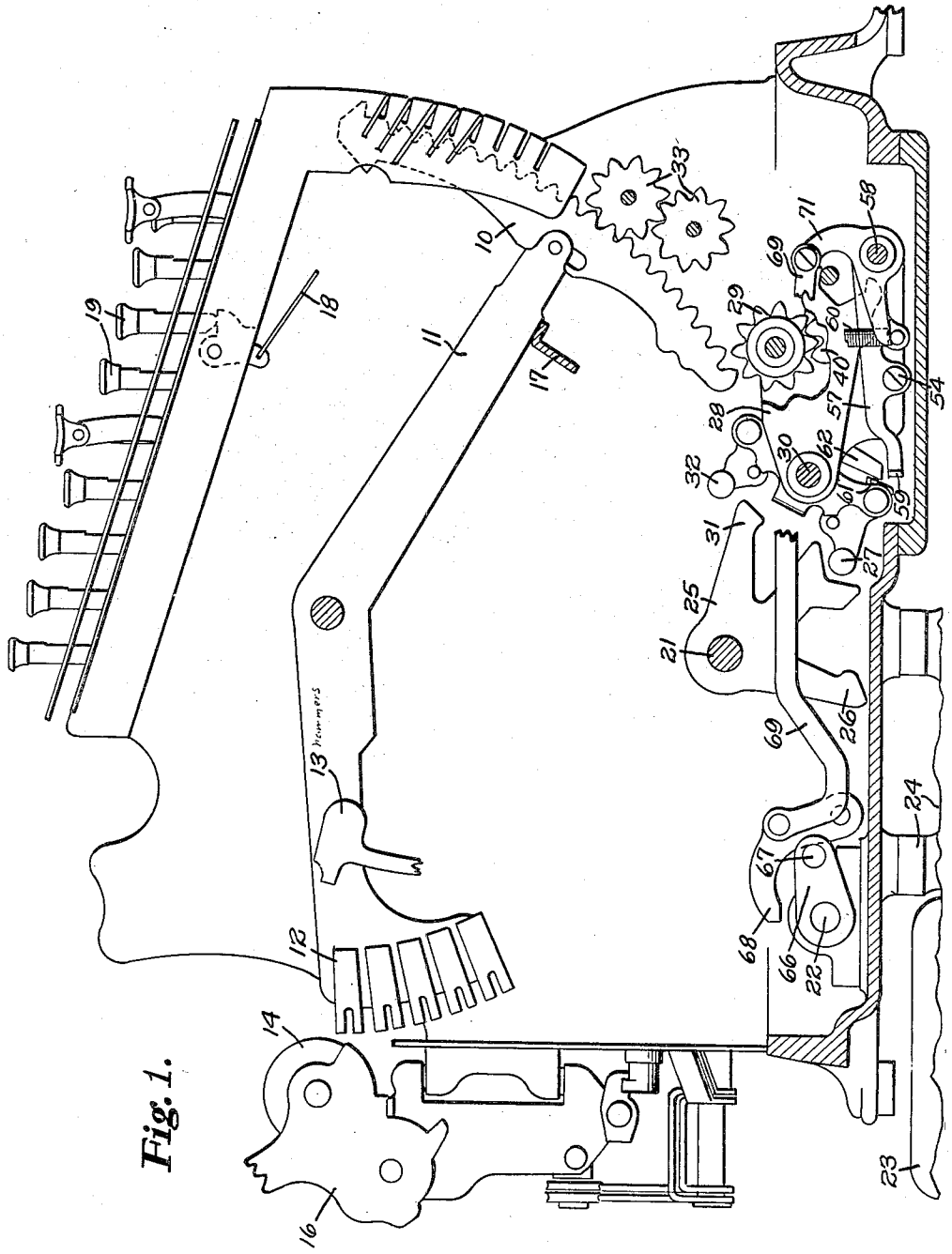


Fig. 1.

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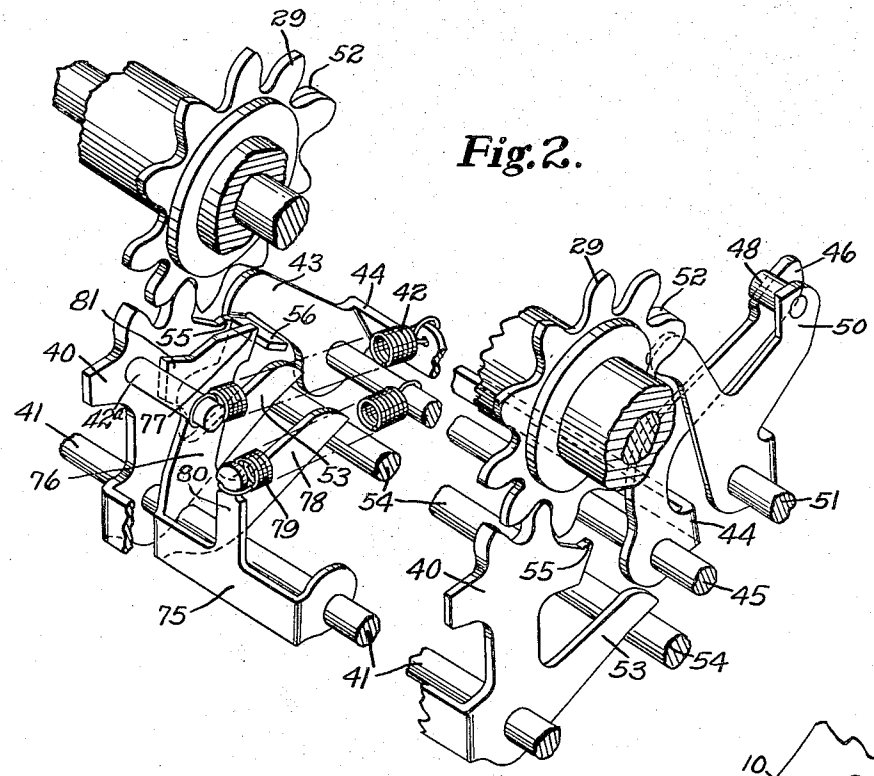


Fig. 2.

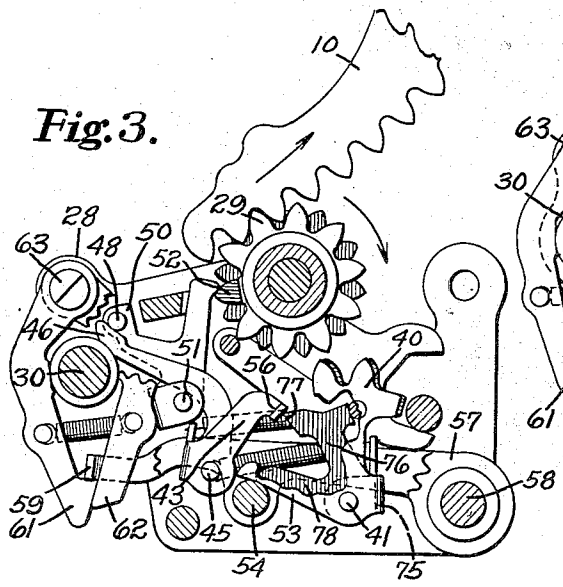


Fig. 3.

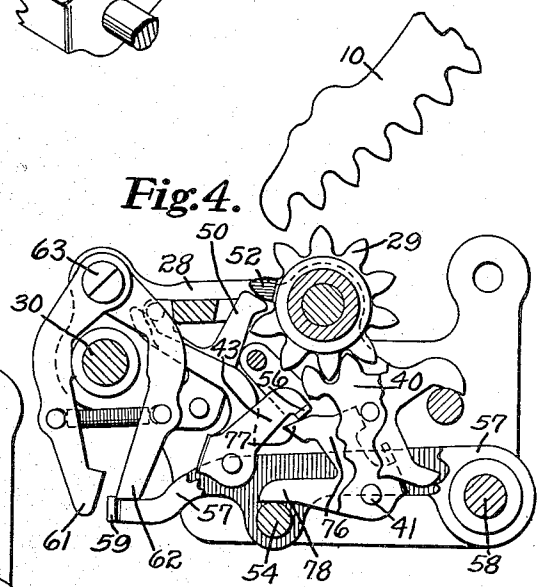


Fig. 4.

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UNITED STATES PATENT OFFICE

2,055,023

TRANSFER MECHANISM

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Application March 17, 1934, Serial No. 716,079

6 Claims. (Cl. 235—137)

This invention relates to calculating machines, and more particularly to a transfer or carrying mechanism for calculating machines.

The present demand for increased speed of operation of calculating machines increases the possibilities of errors because of increased vibration, jarring due to sudden starting and stopping of elements operating at high speeds, increased friction, shorter operating periods of moving parts, and other consequences resulting from higher speeds of operation of moving parts. One of the possible points at which errors may occur is in the carry or tens transfer mechanism, a particularly delicate mechanism to adjust and maintain in perfect order.

It is the purpose of this invention to make it possible to increase the speed of operation of a calculating machine and yet insure both positive and complete operation of the carry mechanism.

Other objects and advantages of the invention will appear from the specification and drawings which illustrate one embodiment of the invention, and in which

Figure 1 is a left side elevation of a calculating machine embodying this invention with certain parts removed or cut away to show the general application of the present invention;

Fig. 2 is a perspective view of the transfer mechanism taken from the front of the machine;

Fig. 3 is a left side detail of the transfer mechanism with the parts in the initial carry position after an initial carry movement; and

Fig. 4 is a view similar to Fig. 3 illustrating the parts in position after a full carry has been completed, that is, with the parts in final carry position.

It will be manifest to those skilled in the art as the description of this invention proceeds, that, while the present invention is particularly adaptable to calculating machines of the Burroughs type, such as is disclosed in the Pasinski Patents Nos. 1,774,289, 1,778,506 and 1,911,768, the invention is readily adaptable to other types of calculators.

General calculator mechanism

The invention is shown applied to a Burroughs machine, such as is disclosed in the Pasinski patents heretofore mentioned. These calculators comprise arcuate actuator racks 10 carried by one end of levers 11 which carry printing type 12 upon their other ends. The type are actuated by hammers 13 to print upon paper upon a platen 14 mounted in a traveling carriage 16. The actuator racks are normally upheld by a swinging frame or bail 17 and are individually released and their descent controlled by the stop wires 18 set by depression of the amount keys 19. The calculator mechanism is actuated by a rock shaft 21 which is oscillated by the main driving shaft 22 by mechanism not shown. The main shaft is oscillated by a motor 23 through a clutch mechanism 24. When the motor is operated to give the machine a stroke of operation, shafts 21 and 22 are first rocked counterclockwise as viewed in Fig. 1 during the forward stroke of the machine, and then clockwise during the return stroke of the machine.

Each time the machine is given a stroke of operation, the main driving shaft 22 oscillates shaft 21 and accordingly the three-arm plate 25, the lower arm 26 of which engages a stud 27 carried by a register frame 28 that supports a register 29, the frame being journaled on shaft 30. As the arm 26 engages stud 27, the register frame is moved counterclockwise about the shaft 30 as a pivot until the register wheels 29 engage the actuator racks 10. During the return stroke of the machine, when the actuator racks are returned to normal position from the differential positions assumed upon the forward stroke of the machine as determined by the amount keys depressed, the register wheels are rotated clockwise until at the extreme end of the machine stroke arm 31 of plate 25 engages a pass-by stud 32 and rocks the frame 28 clockwise to disengage the register 29 from the actuator racks.

During the totaling operation, the controls, of course, are reversed to cause the register to engage the actuator racks upon their forward or down stroke to rotate the register wheels in the opposite direction until they reach their zero positions.

During indexing of the actuator racks 10, the register 29 is disengaged from the actuator racks and is in engagement with the carry or transfer racks.

The illustrated machine is also provided with an upper add and subtract register 33 but the invention is shown applied to the lower register 29

Transfer mechanism for lower register

The transfer mechanism for the lower register is best shown in Figs. 2, 3 and 4, and includes a transfer rack 40 for each pinion. The racks are pivoted on a shaft 41 and are normally urged in clockwise direction as seen in Fig. 2 and counterclockwise direction as viewed in Figs. 3 and 4 by a tension spring 42 having one end attached to a

pin 42a projecting laterally from rack 40 and the other end to a yoke 44 later to be described. Each rack is held against movement by a latch 43 which is one arm of a yoke 44 pivoted on a shaft 45. The other arm 46 of the yoke extends upwardly and is engaged by a stud 48 carried by one arm of a trip pawl 50 pivoted on a shaft 51. The other arm of the pawl is engaged by the wide or carry tooth 52 of its register pinion and is tripped as the register pinion moves from 9 to 0. The pawl 50 also serves as a stop for limiting the rotation of its pinion when the register is restored to zero in the taking of a total or subtotal. The pawl 50 for any one pinion controls the latch for the transfer rack of the pinion of the next higher order so that when one pinion moves from 9 to 0, the pinion of the next higher order is advanced one step by the transfer mechanism.

The operation of the transfer mechanism is as follows: The parts normally assume the position illustrated in Fig. 2. When one of the pinions is rotated in the counterclockwise direction from its 9 to its 0 position or beyond, as viewed in Fig. 2, the wide tooth 52 cams the trip pawl 50 clockwise thereby rotating arm 46, yoke 44 and latch 43 clockwise to release the latch to permit spring 42 to rotate rack 40 clockwise to its "initial carry" position. The transfer rack is limited to very slight initial movement to its initial carry position by engagement of its tail 53 with the restoring bail 54. In so moving, each carry rack moves sufficiently to place a projecting nose 55 of the rack under a lateral lug 56 formed on the latch 43 which retains the latch and rack in released position.

The foregoing initial carry movement of the transfer rack to initial carry position takes place during the time the register is in engagement with the actuator racks 10. Near the end of the return stroke of the machine, the register is rocked out of engagement with the actuator racks 10 and the restoring bail 54 is lowered which releases the carry racks. Those carry racks that have been tripped are immediately moved by their springs to their final full carry position shown in Fig. 4. The bail 54 is not lowered until the register pinions are disengaged from the actuator racks and engaged with the carry racks so that the carry does not take place until the pinions are free of the actuator racks and in mesh with the carry racks.

The restoring bail is carried by two side arms 57 fixed to a shaft 58. The left arm is constantly urged clockwise by a spring 60 (Fig. 1) and terminates in an extension having a laterally projecting arm 59 extending between two latches 61 and 62 pivoted at 63 to the register frame. At the beginning of the forward stroke, the register pinions are in engagement with the carry racks, and it is not desirable to move the racks immediately. Accordingly, the lug 59 is blocked against upward movement by engagement with latch 62. As the register frame is rocked to move the pinions into engagement with the actuator racks near the end of the forward stroke of the machine, latch 62 is moved thus permitting the lug 59 to pass upwardly therebetween permitting raising of the restoring bail to restore the tripped carry racks as shown in Fig. 3. This restoring action takes place after the register pinions have been moved out of engagement with the carry racks so that movement of the carry racks will not move the register pinions.

When the initial carry movement takes place, that is, when the actuator racks move to initial carry position, the restoring bail and parts are in positions shown in Fig. 3. As the register frame is rocked from the position shown in Fig. 3 to move the register out of engagement with the actuator racks, the latch 61 moves to release lug 59 so that when the register has been moved out of engagement with the actuator racks and into engagement with the carry racks, the bail 54 may be lowered as shown in Fig. 4 to permit final carry movement of the carry racks to final carry position.

The restoring bail 54 is operated through connections from the main drive shaft 22 (Fig. 1) to which is fixed an arm 66 having a stud 67 projecting therefrom in position to engage the under side of a curved arm 68 pivoted to the machine and to which is attached a link 69, the other end of which is connected to one arm of a bell crank lever 71 journaled on shaft 58. The bell crank 71 is spring connected to arm 57 as described in the Pasinski Patent 1,774,289, whereby it rocks the latter arm to raise the lower bail 54 in the proper timed sequence as previously described.

The foregoing mechanism is substantially the same as that shown in the heretofore mentioned Pasinski patents to which reference is made for further details.

Positive carry rack lock

The distance moved by the carry rack in moving from normal position to the initial carry position shown in Fig. 3 should be minimized as much as possible, and by the present invention may be minimized or even eliminated so as not to affect the relation between the teeth of the register pinions 29 and the teeth of the carry rack 40. In the illustrated machine some initial movement is permitted in order that the projecting nose 55 of the carry rack may move under the lateral lug 56 of the latch to retain the latch in raised or released position. It can readily be seen that the adjustment to obtain the proper movement of the rack in initial carry movement condition is very delicate and exact because if too much movement of the rack is permitted, movement will be imparted to the register pinion as it engages the carry rack or possibly engagement will be entirely prevented. On the other hand, if insufficient movement is permitted latch 43 either will not ride over nose 55 or will have such a meager engagement therewith as to be readily dislodged to permit relatching of the carry rack to a position where the nose is again in front of lug 56. If the latch is permitted to return or is returned to relatched position the full carry of the transfer will, of course, be prevented when the register is finally meshed with the carry racks during the final transfer movement at the end of the machine operation.

Increasing the speed of the machine to meet the present day demands for high speed operation increases the tendency of an uncertain latching engagement between the latch 43 and rack 40 because of the increased vibration, shortening of the time period, and the increased jar caused by the sudden stopping of rapidly moving parts.

Means have been provided, therefore, for retaining the latch in initial carry position if an initial movement is permitted as is desirable in adapting this invention to present standard machines. This prevents dislodgment of the latch or return of the latch to latched position from initial carry position, and maintains the parts in initial carry position until final carry movement

of the transfer mechanism, thus insuring a positive and final carry after movement to initial carry position.

The provisions so made are independent of the transfer rack and particularly adaptable to present machines without necessitating appreciable modification of existing parts and does not decrease the permissible range of adjustment in the present machine. Furthermore, the mechanism retains the latch in released or tripped condition even though the carry rack be actuated at the wrong time.

The locking mechanism consists of a yoke **75** (Fig. 2) terminating in an arm **76** shaped very much like the transfer rack **40** without the transfer teeth, i. e., it is formed with a projection or nose **77** similar to the nose **55** of the transfer rack except that it projects a trifle higher than projection **55**. Arm **76** is also provided with a tail **78** which engages the bail **54** to limit clockwise movement of the arm and bail **75** by spring **79** having one end attached to an arm **80** projecting upwardly from yoke **75** and the other end to shaft **45**. This also serves as an additional restraint against clockwise movement of the carrier rack because of engagement of a rearwardly projecting shoulder **81** with pin **42a**. In normal position nose **77** engages lug **56** of the latch similarly to nose **55**. When the initial carry movement occurs the carry rack and yoke **75** are released by the raising of lug **56** and their noses **55** and **77**, respectively move under the lug **56** until the rearwardly extending tails **53** and **78**, respectively abut against bail **54**. Slight counter-clockwise movement of the carry rack may occur, however, without dislodging the nose **77** from under lug **56** due to the independence of bail **75** from the carry rack. It will be recalled that bail **54** is restrained in movement to permit only a slight clockwise movement of the carry rack and also yoke **75**. After being released the latch and bail assume the positions shown in Fig. 3 and a full carry is delayed until the register is disengaged from the actuator racks and is moved to engage the carry racks.

Any vibration of the machine or jarring thereof which might cause the latch to jump the nose **55** will not cause it to jump the higher nose **77** and will not cause resetting of the latch member from an initial carry position (Fig. 3) because nose **77** of yoke **75** which is higher than nose **55** is independent of rack **40** and is positioned under lug **56** and positively holds the latch in released or initial carry position against release by any vibration particularly from the transfer rack.

Furthermore, unintended movement of the carry racks because of vibration, jar or friction or through movement of the register pinions when engaging or engaged therewith, will not cause relatching of the transfer racks because yoke **75** is not engaged at any time by the register mechanism and in fact is not engaged by any train of mechanism which through jarring or vibration might cause its release. Accordingly, there is no possibility of the nose **77** of yoke **75** being repositioned in front of lug **56** of latch **43** because of untimely movement of the carry rack or register pinion. Therefore, yoke **75** provides a positive means for locking the parts either in normal position or initial carry position, even though the carry racks be moved slightly when the register engages them in the extreme end of the machine operation. In this connection it will be seen that in theory at least it is possible for such a movement of the actuator racks because of improper meshing of the register pinions therewith to move projection **55** of the transfer rack from beneath latch **43** permitting resetting of latch **43** were it not for the yoke **75** and its arm **76** formed with nose **77**.

After the register pinion is fully engaged with the carry rack at the end of the machine operation bail **54** is allowed to drop to the Fig. 4 position, whereupon the carry rack **40** and the yoke **75** are allowed to move to the full carry position shown in Fig. 4. Upon the next succeeding operation of the machine the tripped carry racks and yoke member **75** are restored to their normal or Fig. 2 position by return movement of the restoring bail **54**, as disclosed in the Pasinski patents.

From the foregoing description, it will be apparent that a lock has been provided which is independent of the transfer racks; and which supplements the usual retaining mechanism if the invention is applied to a standard machine; retains the latch in tripped condition; and in addition retains the latch in tripped or initial carry position, where an initial movement is permitted, until final carry movement of the transfer mechanism to final carry position.

It will be obvious to those skilled in the art that the locking mechanism heretofore shown and described by way of illustration can be modified to suit particular calculating machine transfer mechanism without departing from the spirit and scope of this invention as defined in the appended claims.

I claim:

1. A transfer mechanism comprising a transfer rack having an initial carry movement and a final carry movement from a normal position, means for moving said transfer rack toward final carry position, means for returning said rack to normal position, and means for preventing said rack from resuming normal position until final carry movement thereof, said rack being movable relatively to said preventing means whereby the latter is not moved by movement of said rack.

2. A transfer mechanism comprising a transfer rack having an initial carry movement and a final carry movement from a normal position, means for imparting said movements to said rack to effect a transfer, a latch for securing said rack against such movements and releasable to permit said rack to move to initial carry position, means for returning said rack to normal position and means for locking said latch against relatching movement following release until final carry movement of said rack, said rack being movable relatively to said locking means whereby the latter is not moved by movement of said rack.

3. A transfer mechanism comprising a transfer rack movable from a normal position to an initial carry position and a final carry position, means for urging said rack toward said final position, a latch for restricting movement of said rack toward initial and final carry positions, means for releasing the latch to permit movement of said rack, means for limiting said movement of said rack to initial carry position, means for returning said rack to normal position, and means for preventing said rack from resuming normal position from initial carry position until further released to move to final carry position, said rack being movable relatively to said preventing means whereby said latter means is not moved by movement of said rack.

4. A transfer mechanism comprising a trans-

fer rack movable from a normal position to an initial carry position and a final carry position, means for urging said rack towards said final carry position, a latch for restricting movement of said rack towards final carry position, means for releasing the latch to permit movement of said rack to initial carry position, means for returning said rack to normal position, and means cooperating with a portion of said latch for restraining said latch against movement in one direction and in released position until final carry movement of said transfer rack, said rack being movable relatively to said restraining means whereby the latter means is not moved upon movement of said rack.

5. A transfer mechanism comprising a transfer rack normally urged from a normal position in a direction to effect a carry for transferring a unit of movement from one pinion to a pinion of another order, a latch for retaining said transfer rack against said movement and movable to release its associated rack for such movement, means for returning said rack to normal position, and means for retaining said latch in released position until the transfer rack completes its movement to effect a transfer, said rack being movable relatively to said retaining means whereby said latter means is not moved by movement of said rack.

6. A transfer mechanism for transferring a unit of movement of one pinion to a pinion of another order comprising a tripping pawl movable by its counter pinion, a latch for holding said transfer device against transferring movement, said latch being releasable by said tripping mechanism, to permit movement of said transfer device from a normal position to an initial carry position, said transfer device having a projection for engaging the latch to retain the latter in released position, means for returning said transfer device to normal position, and means for restricting said latch against return toward normal position until the transfer device moves to effect a transfer, said rack and latch being movable relatively to said restricting means whereby said latter means is not moved by movement of said rack or latch.

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