ALTERNATING LATCH MECHANISM
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Filed Sept. 12, 1968, Ser. No. 759,461
Int. Cl. B65H 3/00; G05g 5/08
U.S. Cl. 74—527

ABSTRACT OF THE DISCLOSURE
Alternate locking of two juxtaposed reciprocable members in a retracted position is achieved by a mechanical latch device. The mechanical latching device is actuated to latch a reciprocable member in the retracted position by the return motion of that member from an actuated position to the retracted position.

BACKGROUND OF THE INVENTION
Field of the invention
This invention generally relates to a latch arrangement for alternately locking two adjacent reciprocable members, and more particularly this invention relates to an alternate latch arrangement to provide alternate dispensing from adjacent reciprocable trays in a vending machine.

Description of the prior art
In many applications, it is desirable to have alternate reciprocation of two movable members. A particular example of such a situation is in a vending machine, such as the one described in an application entitled "Article Vending Apparatus" filed concurrently herewith in the names of A. G. Bodoh; O. J. Schwertfeger; and R. A. Johnson, and assigned to the same assignee as the subject application. In such a vending machine (wherein each horizontal tray slides from a rest position at the front of the machine to a vending area at the back of the machine in order to dispense a package, and then returns to its rest position at the front of the machine), it is frequently desired to provide a greater supply of a particularly popular product or brand than can be placed on a single package tray. In many prior art devices, an additional supply of a popular product is provided merely by filling another tray with the same product, so that a customer can select the product by pushing either of two selector buttons. However, from past experience, it has been found that customers tend to choose one selector button more frequently than another (due to a preferred location of the selection button or some other psychological factor), so that one of the trays becomes empty while the other remains substantially filled. One reason why this arrangement is unsatisfactory is that an empty tray causes one selection button to register "sold out" even though the vending machine still has an ample supply of that product. Although it seems like a petty inconvenience to require that the customer push another selector button to obtain the product, this is an aggravating process to many customers, so it is desirable to minimize the number of "sold out" selector buttons in the vending machine and have all selector buttons for one product remain in operation until all package trays containing that product have been evacuated.

In order to solve this problem, several prior art arrangements utilize electrical switching devices that switch the selector button to a second or reserve tray when the main tray becomes empty, but these switching devices are not satisfactory because they permit the products in the secondary tray to remain in the vending machine for a longer time than the products in the first vending tray, so the products in the secondary tray will tend to become stale before they are selected. In a vending machine that is regularly serviced, the first vending tray might be refilled and emptied several times before the products in the second vending tray are ever chosen. Consequently, this second vending tray becomes little more than a reserve tray of stale products, which the unfortunate customer will receive when the supply of fresh products is exhausted.
The only effective method of keeping fresh packages available in a popular brand of product is to have the machines serviced more regularly and instruct the serviceman to transfer the packages in the lesser used tray to the more popular tray. This procedure, of course, greatly increases costs and is only effective so long as the serviceman conscientiously carries out his task.

In order to obviate these deficiencies of prior art devices, the present invention was evolved.

SUMMARY OF THE INVENTION
Although there are many possible applications of the subject invention, the subject invention is particularly advantageous when employed in a vending operation, so for exemplary purposes the invention will be described in the context of a vending machine.

Since the utilization of more than a single column or a single tray of products in the prior art vending machines described above results in a large number of "sold out" selector buttons and/or a row or column of stale products, the vending system described in the above-cited copending patent application filed simultaneously hereunder employs an inexpensive, effective and fault-free mechanical latching device that effects alternate dispensing of products from two adjacent trays when either of the two selector buttons corresponding to the individual trays are selected. This arrangement insures that no selector button for that product will register "sold out" until all of that product has been dispensed from both trays and that an equal rate of dispensing will occur in each tray, so that the products in the less frequently used tray will not become stale while the products in the other tray are replenished regularly.

Briefer, the subject invention comprises an alternating latch that is movably mounted on a frame or support member adjacent to two reciprocable members (e.g., the sliding package trays in the above-cited article vending machine) which are movably mounted in the same frame. The latch has two positions. In the first position, it latches or locks the first reciprocable member and releases the second reciprocable member so that the second member is free to move in a reciprocal path in response to a force applied to both members by a drive means. At the completion of a single reciprocation of the second member, the second member engages an actuator member on the alternating latch and moves the latch to a second position wherein the first reciprocable member is unlatched and the second reciprocable member becomes latched in its rest position. The next time that the drive means is applied to both members, the second member remains locked in its rest position and the first member reciprocates in its path. At the completion of a single reciprocation, the first member engages the actuator member and moves the alternating latch back to the first position described above, thus freeing the second member again, and locking the first member. When the subject invention is employed in a vending machine, such as the one described in the co-pending application cited above, the above-mentioned deficiencies inherent in the prior art vending machines are obviated. Selector buttons do not register "sold out" when the vending
machine still contains additional quantities of the product and there is no staleness problem resulting from unequal rates of dispensation of products from two trays. Each selector button is adapted to release both trays when the button is pushed, but the alternator switch holds one of the trays in the rest position, so only one tray is free to reciprocate. This unlatched tray (hereinafter first tray) slides to the back of the vending machine and protrudes into a vending area. A dispensing mechanism then moves through the vending area and dislodges the remaining product from the end of the first tray into a package pick-up area in the vending machine. The first tray is then driven back to its rest position where it engages the actuating portion of the alternator latch and moves the latching portion out of engagement with the second tray and into engagement with the returning first tray, thereby locking the first tray in its rest position. The next time that the same selector button is activated, the second tray completes a vend cycle and the first tray is held in its rest position. This system ensures that there are an equal number of articles in each tray at all times, so that one tray will not be utilized to dispense articles more frequently than the other tray, and hence the articles in both trays will be equally fresh. At the same time, the selector button will not register that it is sold out until all of the products in both trays have been dispensed from the vending machine.

Accordingly, it is a primary object of this invention to provide an alternator latch that alternates two reciprocable members to prevent motion thereof.

It is another object of this invention to provide a mechanical latch that permits alternate reciprocation of two reciprocable members when a driving force is applied to both members. It is yet a further object of this invention to provide an inexpensive, automatic, and fault-free device for alternately vending products from each of two adjacent trays in a vending machine.

These and other objects, advantages, and features of the subject invention will hereinafter appear, and for purposes of illustration, but not of limitation, preferred embodiments of the subject invention are described below and illustrated in the appended drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top plan view of a first embodiment of the invention.

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1.

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 1.

FIG. 4 is a top plan view of a second embodiment of the subject invention.

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 4.

FIG. 6 is a cross-sectional view taken along line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, a first alternator latch 10 embodying the subject invention is shown in FIGS. 1–3. For exemplary purposes, the alternator latch 10 is shown mounted in a vending machine 12 of the type described in the above-cited co-pending application filed simultaneously herewith. The machine latch is connected to a vending machine support member 14 between package trays 16 and 18. These trays are adapted to slide from a rest position adjacent to a front wall 20 of the vending machine 12 along supporting member 14 to the back of the machine (i.e., in a downward direction according to the FIG. 1 orientation) in order to dispense a package and then return to its rest position. Trays 16 and 18 are rectangular box-shaped containers having slotted bottoms 26 and 28, respectively, front edges 30 and 32, respectively, opposite side walls 34 and 36, respectively, and outside side walls 38 and 40, respectively.

Column latches 22 and 24 are schematically represented as being pivotally mounted on front wall 20 to hold the trays in their rest positions until the proper amount of money is inserted into the vending machine and a selector button (not shown) corresponding to either tray is pushed. Of course, any appropriate type of latching arrangement could be utilized. Upon actuation, the column latches 22 and 24 pivot in a counterclockwise direction (FIG. 2 orientation) and release both trays simultaneously. A spring (not shown) urges the column latches 22 in a clockwise direction to return the latches to the position shown in FIG. 2 after the trays are released.

A drive means for sliding each tray in a reciprocating path comprises a constant spring force (not shown) that urges the tray toward a vending area at the back of the vending machine and a tray return mechanism (not shown) that returns the tray to its rest position. In returning a tray to its rest position, (i.e., the position that tray 16 occupies in FIG. 1) the drive means causes the tray to overshoot its rest position and travel on to the overshoot position occupied by tray 18 in FIG. 1. Then the drive means is deactivated and the spring force slides the tray back to its rest position. At the rest position, column latches 22 and 24 catch the front edges 30 and 32 of their respective trays and hold the trays in their rest position.

The alternator latch 10 provides a second latching means that locks each tray in its rest position on alternative vending cycles, thus allowing only one of the two trays to reciprocate when both column latches are released. The alternator latch 10 comprises a shift lever arm 42 pivotally mounted on a shift lever base 44, which is in turn fixed to support member 14. Shift lever arm 42 has a wedge-shaped end 46 with a tail 48 extending from one of the vertices thereof. The sides of the wedge-shaped end that converge into tail 48 constitute cam surfaces 47 and 49. The shift lever arm 42 is pivotally mounted on the shift lever base 44 at the junction between the tail 48 and the wedge-shaped end 46 by means of shift arm pivot stud 50 that is fixed to the shift lever base and protrudes through an opening in the shift lever arm. The end of the tail that does not join the wedge-shaped head is pivotally connected to a latching member or latch bolt 52 by means of a latch bolt pivot stud 54 that is mounted in the tail and protrudes through the latching member. Latching member 52 rests between two sets of vertical guide posts 56 that are attached to the sides of shift lever base 44. The latching member slides longitudinally between the guide posts in a path that is transverse to the path of the slidable package trays 16 and 18 when the shift lever arm 42 pivots about the shift lever arm pivot stud 50. Slots 58 and 60 are provided in the opposing side walls of trays 16 and 18, respectively, so that latching member 52 may protrude through either (i.e., one, but not both) opposed side walls and thereby prevent that tray from sliding toward the back of the vending machine and dispensing a package.

In FIG. 1, it may be seen that the alternator latch is positioned between the trays 16 and 18 so that the cam surfaces 47 and 49 engage a tray only after the tray has completed a vending cycle and is returned to the overshoot position by the return mechanism. For example, as tray 18 approaches its overshoot position at the completion of a vending cycle, it strikes cam surface 49 and causes shift lever arm 42 to pivot in a clockwise direction (FIG. 1 orientation) about shift arm pivot stud 50. This pivot motion of the shift lever arm causes the tail 48 to drive the latching member 52 into slot 60 in side wall 36 of tray 18. When tray 18 returns to its normal rest position, the latching member catches the end of slot 60 and holds the tray in place. Thus, the next time column latches 22 and 24 are actuated, tray 18 is held in its rest position by the latching member 52, and tray 16 completes a vend cycle. Similarly, when tray 16 completes its vend cycle, as tray 16 approaches its overshoot position, it strikes cam surface 47, causing shift lever arm 42 to pivot in a counterclockwise direction (FIG. 1 orientation). This pivot motion of the shift lever arm 42 drives the latching member 52 out of slot 58 and into slot 60 in side wall 36 of tray 18.
vend cycle, the tray strikes cam surface 47 as the tray moves into its overshoot position and rotates the shift lever arm in a counterclockwise direction. This action drives the latching member 52 to the right (FIG. 1 orientation) out of slot 60 in tray 18 and into slot 58 in tray 16. The latching member remains in this position until the end of the vend cycle. As tray 16 returns to its rest position and holds it in place until tray 18 completes another vend cycle and pivots the shift lever arm back to its former position.

Since the alternator latch releases each tray on an alternative vend cycle, this device insures that packages are dispensed from both trays at the same rate, so there is no problem of package staleness in a less frequently chosen tray. Also, by the actuation of both column latches simultaneously (whether by a single selector button or by two selector buttons, as shown in the above-mentioned co-pending application) no selector button will register as "sold out" until both trays are completely empty.

A second alternator latch 110 embodying the subject invention is shown in FIGS. 4-6. As in the first embodiment, this alternator latch is shown for exemplary purposes in conjunction with a vending machine similar to the type used in the above-identified co-pending application filed simultaneously herewith. For clarity, many of the parts of the vending machine are shown in simplified form. In order to facilitate an understanding of the differences between the two embodiments, parts in FIGS. 3-6 that are common to both embodiments are identified by the same numerals used in FIGS. 1-3, except that the numerals are primed to differentiate between the drawings.

Referring now to FIG. 4, it may be seen that the vending machine 12 comprises two slidable package trays 16' and 18', with tray 16' being shown in its rest position and tray 18' being shown in its overshoot position. Column latches 22' and 24' are pivotally mounted on front wall 20', and both are adapted to operate simultaneously to release their respective trays when the proper amount of coins has been deposited in the vending machine and a selector button corresponding to either tray has been pushed.

Two alterations are made in trays 16' and 18' in order to accommodate the second alternator latch 110. Instead of the slots 58 and 60 in the opposed side walls that are employed in the first embodiment to receive latching member 52, notches 112 and 114 are provided at the bottom edge of the opposed side walls 34' and 36' and in the adjoining sections of the bottom 26' and 28' in order to receive a latching member 116 attached to the second alternator latch 110. Another modification is that studs 122 and 124 are mounted in the bottom of the trays and protrude downward therefrom for engagement with the alternator latch 110, as shown in FIGS. 5 and 6.

The second alternator latch 110 includes a flat shift lever arm 126 that is slidable mounted on support member 14' below the trays 16' and 18'. This shift lever arm slides longitudinally in a path that is transverse to the path followed by the trays 16' and 18'. Support member studs 128 and 130 mounted in the support member 14' protrude into slots 132 and 134 in the ends of the shift lever arm in order to limit the movement of the shift lever arm to a fixed longitudinal distance along the above-described transverse path. Stop ears 136 and 138 mounted on the outer edges of the shift lever arm and extending upwards therefrom provide another means for limiting the permissible longitudinal distance that the shift lever arm may travel. When the shift lever arm moves to the right (FIG. 4 orientation), stop ear 138 will hit the outside side wall 40' of tray 18' to limit the distance that the shift lever arm may slide to the right. Likewise, stop ear 136 on the right end of shift lever arm 126 limits the distance that the shift lever arm may slide to the left.

Latching member 116 is fixed to the middle of edge 140 of the shift lever arm 126 and extends upward therefrom. This latching member is adapted to engage either notch 112 in tray 16' or notch 114 in tray 18' (but not both notches at once) and thereby lock one tray in its rest position and release the other tray, thus accomplishing the same function as the latching member 52 employed in the first embodiment. As tray 16 returns to its rest position and holds it in place until tray 18 completes another vend cycle and pivots the shift lever arm back to its former position.

The shift lever arm is moved along its transverse path by cam surfaces 142 and 144 at each end of the shift lever arm that engage the studs 122 and 124, respectively, protruding downward from each tray as the trays move into their overshoot positions at the end of their vend cycles. When a vend cycle is complete, the shift lever arm and moves into its overshoot position, the stud associated therewith engages a cam surface on the shift lever arm and slides the shift lever arm toward the outside of the tray. This moves the latching member into the notch in the side of that tray and locks that tray in its rest position at the completion of the vend cycle.

An example of the operation of this device is shown in FIG. 4, where tray 18' is shown in its overshoot position, and the shift lever arm has been moved to the left (FIG. 4 orientation) by stud 122, and latching member 116 has been moved into the notch 114 in the side of tray 18'. When tray 18' returns to its rest position (i.e., the position occupied by tray 16'), the latching member will catch the end of notch 114 and the tray will be blocked in its rest position. The next time that a customer selects the product contained in trays 16' and 18' and column latches 22' and 24' release both trays simultaneously, only tray 16' will be free to complete a vend cycle because of the position of alternator switch 110. When tray 16' returns from the vend cycle to its rest position, it will pass through its overshoot position and stud 122 will engage cam surface 142 and move the shift lever arm 126 to the right (FIG. 4 orientation). This will move latching member 116 out of notch 114 in tray 18' and into notch 112 in tray 16', thereby locking tray 16' in its rest position for the next succeeding vend cycle.

As in the first embodiment, the second alternator latch described herein provides a convenient means for alternately dispensing products from two adjacent package trays upon the actuation of a selector button, thus eliminating the problems of product staleness and "sold out" selector buttons that are associated with the prior art devices discussed above.

It should be understood that the embodiments described herein are merely exemplary of the preferred practices of the present invention and that various changes, modifications, and variations may be made in the arrangements and details of construction of the elements disclosed herein without departing from the spirit and scope of the present invention.

We claim:

1. In an apparatus having first and second reciprocable members and a driving means that urges both members to move simultaneously from a rest position, an alternator latch for producing alternate reciprocations of the two reciprocable members comprising:
   latching means movably mounted in the apparatus and having a first latching position wherein longitudinal movement of the first reciprocable member is prevented and a second latching position wherein longitudinal movement of the second reciprocable member is prevented;
   first actuating means for moving said latch means to said first latching position after a single reciprocation of the first reciprocable member; and
   second actuating means for moving said latch means to said second latching position after a single reciprocation of the second reciprocable member, whereby alternate reciprocation of the reciprocable members is effected.

2. An alternator latch as claimed in claim 1 wherein said latch means comprises first latching means for preventing longitudinal movement of the first reciprocable
member and second latching means for preventing longitudinal movement of the second reciprocable member.

3. An alternator latch as claimed in claim 1 wherein said latch means is a mechanical latching member that slingly traverses a path transverse to the reciprocation paths of the reciprocable members and prevents reciprocation of the reciprocable members by alternately engaging the members.

4. An alternator latch as claimed in claim 3 wherein said latch means is a rectangular stop adapted to enter appropriately formed openings in the reciprocable members.

5. An alternator latch as claimed in claim 1 wherein: said first and second actuating means comprise a mechanical actuator member that engages each reciprocable member when it reciprocates and is moved thereby; and said movement of said actuator member moves said latch means into latching engagement with the reciprocable member that is reciprocating as it is reaching the end of its reciprocation, thereby preventing that reciprocable member from commencing another reciprocation until the other reciprocable member is reciprocated and the latch means is moved to its other latching position wherein the other reciprocable member is prevented from reciprocation.

6. An alternator latch as claimed in claim 5 wherein the mechanical actuator member comprises a shift lever arm pivotally mounted in the apparatus having a first end that effects actuating engagement with said reciprocable members and a second end pivotally connected to said latching means, whereby engagement of a reciprocating member with the first end of the shift lever arm pivots the shift lever arm and drives the latching member into its latching position with respect to that member.

7. An alternator latch as claimed in claim 6 wherein engagement between said first end of said shift lever arm and the first and second reciprocable members is effected through first and second cam surfaces, respectively, on said actuator member.

8. An alternator latch as claimed in claim 7 wherein: said first end of said shift lever arm comprises a wedge-shaped head connected to said second end of said shift lever arm at one of the vertices thereof; and said cam surfaces are formed on the sides of said wedge-shaped head that converge into said vertex.

9. An alternator latch as claimed in claim 8 wherein said latch means comprises a longitudinally reciprocable latching member adapted to engage the reciprocable members.

10. An alternator latch as claimed in claim 5 wherein: said mechanical actuator member comprises a longitudinally reciprocable shift lever arm; and said reciprocable shift lever arm comprises first and second cam means attached to said shift lever arm that engage said first and second reciprocable members, respectively, as they reach the end of a reciprocation.

11. An alternator latch as claimed in claim 10 wherein said latch means is a stop attached to said shift lever arm and adapted to enter appropriately formed openings in the reciprocable members.

12. An alternator switch as claimed in claim 11 wherein said shift lever arm is limited to longitudinal movement in a direction transverse to the reciprocation paths of the reciprocable members by studs mounted in the apparatus that fit into key slots formed in the ends of the shift lever arm.

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U.S. Cl. X.R.

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