United States Patent [19]

Lotspeich

[11] **3,801,876**

[45] **Apr. 2, 1974**

[54] **VENDING MACHINE APPARATUS**

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[73] Assignee: **Gross-Given Manufacturing Co.**, St. Paul, Minn.

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[52] **U.S. Cl.** **317/157**, 74/40, 310/23, 221/129

[51] **Int. Cl.** **H01h 47/00**

[58] **Field of Search** 74/40, 42, 75; 310/80, 310/82, 29, 30, 32, 34; 221/110, 125, 129; 194/10; 317/157

[56] **References Cited**

UNITED STATES PATENTS

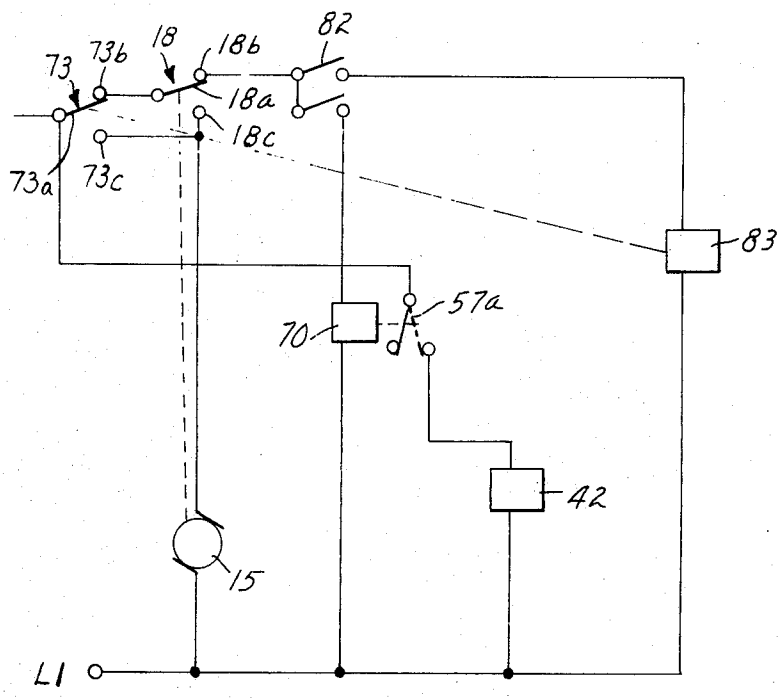
2,908,172	10/1959	Gross	74/40
2,427,898	9/1947	Burrows	310/34

Primary Examiner—J. D. Miller
Assistant Examiner—Harry E. Moose, Jr.
Attorney, Agent, or Firm—Merchant, Gould, Smith & Edell

[57] **ABSTRACT**

A vending machine of the type having a selection carriage movable between front and rear stacks each containing several vertically extending columns of a merchandiseable commodity (e.g. different brands of cigarettes). The shifting mechanism for controlling the movement of the selection carriage is spring biased so that the carriage is normally driven by a single direction motor toward the rear stack. Upon actuation of a selector button for one of the brands of merchandise in a front column, a reversing relay is actuated energizing a solenoid and thereby setting the shifting mechanism so that the selection carriage is driven toward the front stack.

5 Claims, 4 Drawing Figures



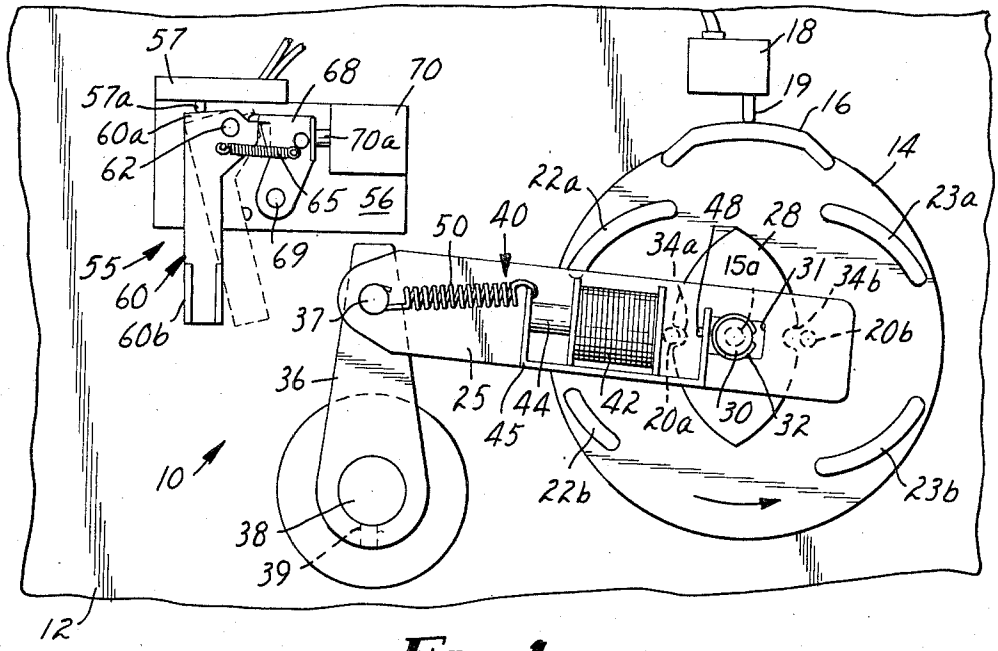

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57a
60a
62
68
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70a
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69
55
60
60b
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19
16
14
23a
22a
48
28
34a
15a
31
34b
50
40
37
20b
36
25
44
45
42
20a
30
32
10
38
39
22b
23b
12

FIG. 1

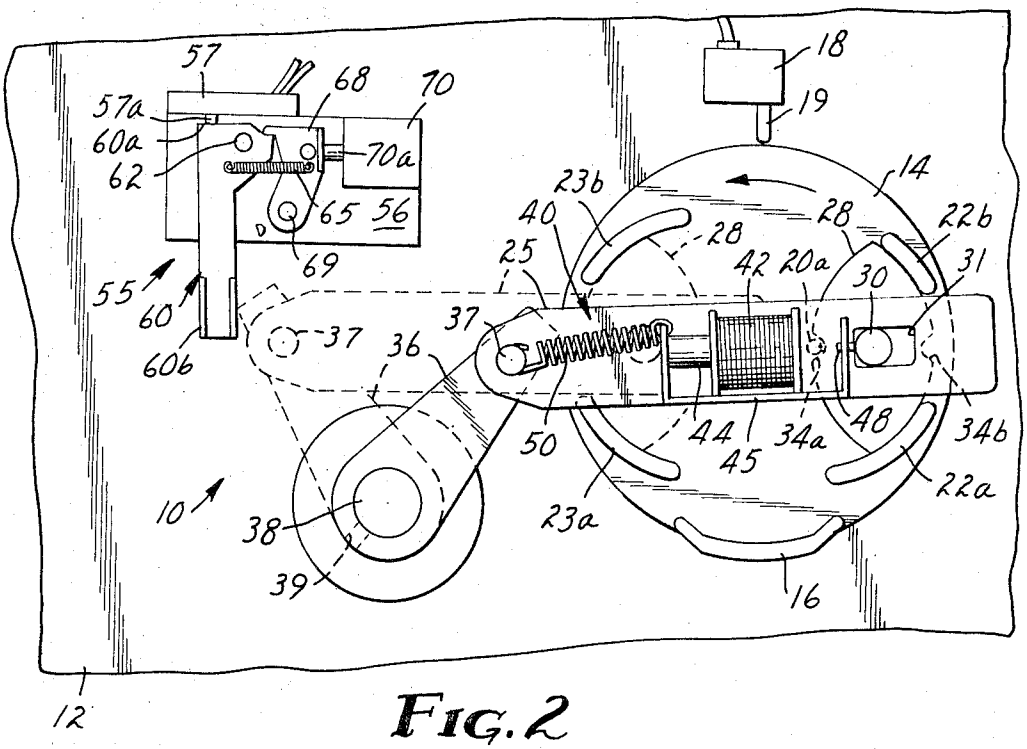

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22b
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20a
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44
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34a
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34b
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38
39
23a
16
12

FIG. 2

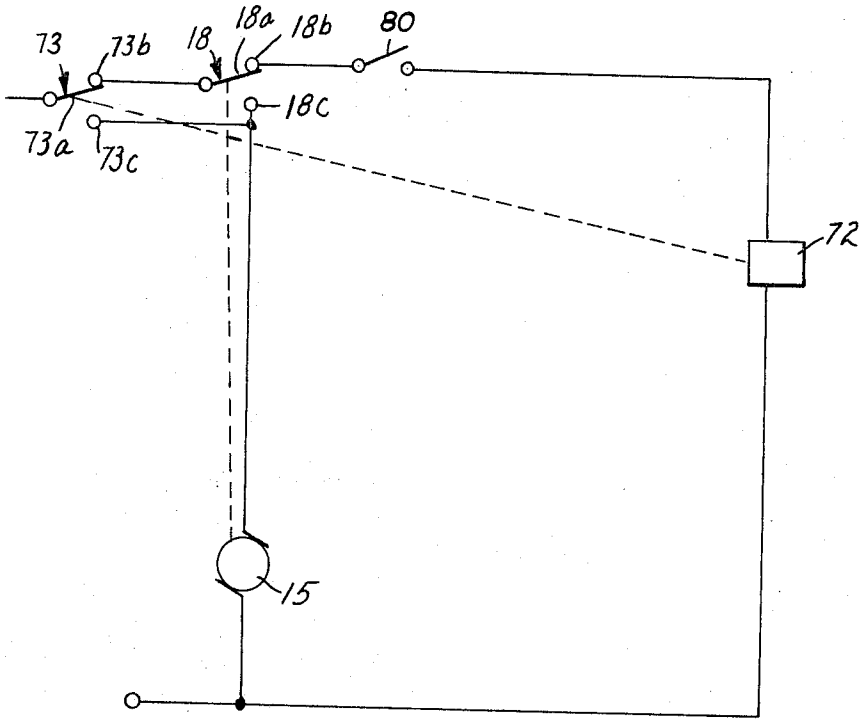

73
73b
18
18a
18b
80
18c
73a
73c
72
15

FIG. 3

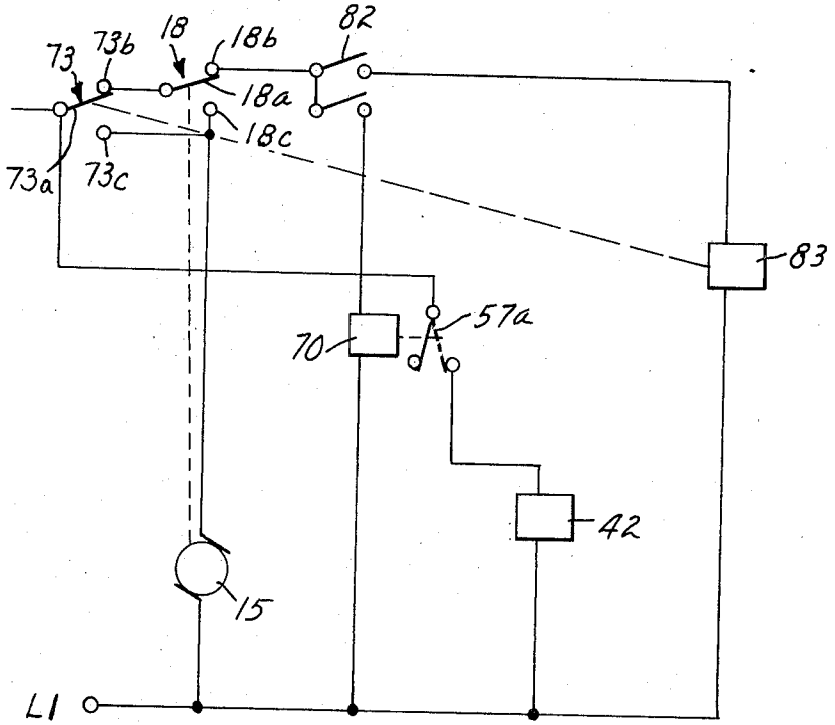

73
73b
18
18b
82
18a
18c
73a
73c
83
57a
70
42
15
L1

FIG. 4

VENDING MACHINE APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to apparatus for selectively determining the directional movement of a reciprocatory element and finds a particularly desirable application in vending machine units of the dual stack type.

2. Cross Reference to Related Patents:

See U.S. Pat. No. 2,908,172, issued Oct. 13, 1959, entitled "Power Transmission Mechanism Having A Reciprocatory Element Selectively Operative In Spaced Operating Zones" and assigned to the same assignee as the present application for letters patent.

Description of the Prior Art

Vending machines for dispensing various brands of packaged goods such as cigarettes, food items (e.g. candy bars), and the like are finding ever increasing usage. In such dispensing units, different brands of a merchandiseable commodity (e.g. different brands of cigarettes) are each stored in a different one of a plurality of vertically extending columns or magazines. These merchandise-containing magazines are positioned in a side-by-side relationship and such a grouping of magazines is commonly referred to as a stack. To allow for the dispensing of a greater number of brands (or different types) of merchandise, the presently available vending machines typically contain two stacks (i.e. a front and a rear stack in terms of their placement within the vending machine). To dispense a chosen item, a selection carriage normally positioned in a neutral position between the front and rear stacks is selectively moveable toward a particular magazine in either the front or rear stack dependent upon the selector button actuated by the user of the machine. The selection carriage then ejects the desired merchandiseable commodity from the proper magazine into a delivery tray which conveys the selected item to the customer through an opening in the front cabinet wall of the vending machine.

The above-mentioned U.S. Pat. No. 2,908,172 discloses and claims apparatus for selectively moving the merchandise selection carriage between the front and rear stacks of a dual-stack vending machine. The apparatus disclosed in this patent includes an electrical motor which drives a rotary disc element or motor cam for imparting feeding and return movements to the selection carriage. To shift such movement of the selection carriage between the front and rear stacks, a connecting rod or pitman has one end operatively coupled to the motor cam and the opposite end to the selection carriage. A shiftable plate is moveably attached to the connecting rod for engaging either one of a pair of studs projecting outwardly from the motor cam so as to shift the field of movement of the connecting rod and, thus, transfer the feeding and return movemnts of the selection carriage from the front to the rear stack or vice versa. A pair of electrical switches are provided, each energizing a different solenoid for positioning the moveable plate in engagement with the proper one of the two studs and thereby determine the direction of movement of the selection carriage.

While the apparatus described and claimed in U.S. Pat. No. 2,908,172 represented a significant advance within the art in terms of providing simplified and reliable means for dispensing articles from a dual stack vending machine, the apparatus is still more expensive to manufacture and to maintain in proper operating condition than is desirable. This is particularly true with respect to the means (i.e. electrical switches and solenoids) utilized to set the reciprocatory pitman for causing either frontward or rearward movement of the selection carriage.

SUMMARY OF THE INVENTION

The present invention provides apparatus for selectively shifting the movement of a reciprocatory member between a first direction on one side of a neutral position and a second direction on the opposing side of the neutral position. This apparatus finds a highly desirable application in vending machines of the dual stack type for controlling the movement of the merchandise selection carriage between the front and rear stacks.

More specifically, the inventive apparatus is an improvement on the carriage shifting mechanism described in U.S. Pat. No. 2,908,172 and includes spring biasing means (e.g. an extension spring) for normally urging the shiftable member into a position which provides movement of the reciprocatory member (i.e. the pitman or connecting rod) in a first longitudinal direction. A single, electrically energizeable solenoid is preferably mounted on the connecting rod and is connected to the shiftable member for overcoming the bias of the extension spring urging the shiftable member into a position which provides movement of the connecting rod in a second direction opposite from the first direction. In utilizing this apparatus in conjunction with a dual-stack vending machine of the type described in U.S. Pat. No. 2,908,172, a drive arm is pivotably attached to both the connecting arm and selection carriage. Relay means in electrical communication with the solenoid are mounted adjacent the drive arm and include latch means for normally maintaining the relay in an open position preventing energization of the solenoid until actuation of the relay means by depression of a particular merchandise selector button causing release of the latch means. In the course of the movement of the connecting arm in the second direction, the drive arm engages the latch means relatching it and thereby resetting the apparatus in its normal condition.

The present invention represents a considerable simplification of the shifting mechanism described in U.S. Pat. No. 2,908,172. This simplification (i.e. the elimination of a solenoid and a solenoid energizing switch) results, of course, in a considerable reduction in manufacturing costs. Further, the apparatus is considerably more reliable than that heretofore available allowing utilization of a single permanent duty solenoid operating on a pull-basis thereby assuring proper seating of the solenoid with a resultant increase in the magnetic field operating on the solenoid plunger. Thus, vis-a-vis the apparatus presently available, the present invention substantially reduces the manufacturing costs while increasing the reliability of shifting mechanisms for controlling the movement of a reciprocatory element.

Brief Description of the Drawings

Turning now to the drawings wherein like numerals represent like parts of the invention throughout the several views;

FIG. 1 is a front elevational view of the present invention illustrating the shift actuating means of the invention in both its normal position (in solid lines) and in its actuating position (in dotted lines);

FIG. 2 is a front elevational view of the shifting mechanism illustrated in FIG. 1 showing the shifting mechanism at the half-cycle point for both rearward movement of the reciprocatory member (in solid lines) and forward movement of the reciprocatory member (in dotted lines);

FIG. 3 is a schematical view of the electrical circuitry for energizing the shifting mechanism in its normal or non-shift state; and

FIG. 4 is a diagramatical view of the electrical circuitry shown in FIG. 3 in its carriage shift state.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to a description of the preferred embodiment, the numeral **10** generally designates the apparatus provided by the present invention for shifting the field of movement of a reciprocatory element. While this apparatus can find widely divergent applications, it is particularly advantageous when utilized in vending machines of a dual stack type such as disclosed in U.S. Pat. No. 2,908,172. Consequently, the description herein will be limited to this application of the present invention.

Briefly, such vending machines dispense articles of merchandise responsive to insertion of one or more coins in a receptacle therefor and are provided with a moveable selection carriage (not shown in the drawings) which is mounted for reciprocatory feed and return movement in either a forward or rearward direction about a neutral position generally centrally disposed between the front and rear merchandise stacks. This movement allows selective dispensing of the items stored in each of the vertically extending columns or magazines (not shown in the drawings) via an opening in the front cabinet wall of the vending machine. The construction of a highly preferred selection carriage and dispensing system is fully described in the above-mentioned U.S. Pat. No. 2,908,172 and need not be described herein in further detail.

Referring particularly to FIGS. **1** and **2**, a fragmented vending machine chassis **12** is shown on which is mounted the present shift mechanism **10.** The shift mechanism **10** includes a disc-like member **14** which is rotated in a clockwise direction by an electrical motor **15** (situated behind rotatable member **14**) having a drive shaft **15***a* on which rotatable member **14** is rigidly mounted. The member **14** includes an outwardly projecting portion or cam **16** positioned along the peripheral edge thereof. A motor hold switch **18** having an outwardly projecting push button element **19** is engageable with cam portion **16** of rotatable member **14** for de-energizing the electrical motor as subsequently explained. A pair of pin-like elements **20***a* and **20***b* are attached to the motor cam **14** so as to project outwardly therefrom in a diametrically opposed relationship on opposite sides of drive shaft **15***a* (i.e. on opposite sides of the axis of rotation of motor cam **14**). Finally, for the purpose subsequently explained, motor cam **14** includes a pair of spaced arcuate flanges **22***a* and **22***b* concentric with pin element **20***a* and a pair of arcuate flanges **23***a* and **23***b* concentric with pin element **20***b*.

A pitman or connecting rod **25** is operatively coupled to the disc-like element **14** and is moveable in opposite first and second longitudinal directions relative to member **14.** The operative coupling of connecting rod **25** and motor cam **14** is effected by a shiftable member **28** moveably attached to an end portion of connecting rod **25** by a central shaft **30** attached to member **28** and extending through an elongated slot **31** in rod **25.** A retainer ring **32** extends about shaft **30** to secure shiftable member **28** to connecting rod **25.** As shown, shiftable member **28** is of a generally elliptical shape having two oppositely disposed semi-circular recesses **34***a* and **34***b* in opposite peripheral edges thereof. Recesses **34***a* and **34***b* are suitable for engaging the pin elements **20***a* and **20***b*, respectively, dependent on the positioning of connecting rod **25** to motor cam **14.**

A second end of connecting rod **25** (opposite from the attachment of shiftable member **28** thereto) is pivotably connected to a first end of a drive arm **36** by a pin **37.** A second end of drive arm **36** is pivotably attached to a shaft **38** by a pin **39.** The drive arm **36** is operatively connected to the merchandise selection carriage (not shown) so as to cause movement of the carriage toward one of the front or rear stacks of the vending machine (e.g. the rear stack) on movement of connecting rod **25** in a direction toward the right in FIGS. **1** and **2.** Likewise, the selection carriage is moved toward the other stack (e.g. the front stack) upon movement of connecting rod **25** toward the left in FIGS. **1** and **2.**

Shift control means, generally designated **40,** are provided for moving the shiftable member **28** into engagement with a selected one of the pin elements **20***a* and **20***b* and thereby control the field of movement of connecting rod **25** (i.e. toward the right or left in FIGS. **1** and **2**) as subsequently described in greater detail. Means **40** include a single, electrically energizable solenoid **42** attached to connecting arm **25** by screws or other suitable means. The solenoid **42** includes a plunger element **44** operable on a pull-basis and having its outer end rigidly attached to a shift arm **45.** The arm **45** is also connected to the shaft **30** (and the attached shiftable member **28**) by a pin **48.** An elongated extension spring **50** has a first end attached to shift arm **45** and a second end attached to the pin **37** so as to urge plunger element **44** outward from solenoid **42.** Additionally, this biases the shiftable member **28** toward the left in FIGS. **1** and **2** causing the recess **34***a* in member **28** to engage the pin element **20***a*. Thus, as a result of the bias provided by extension spring **50,** the shiftable member **28** is normally in engagement with pin **20***a*. However, upon energization of solenoid **42,** plunger element **45** is pulled inwardly into solenoid **42** (i.e. toward the right) and the attached shift arm **45** is also moved in the same direction causing recess **34***b* of shiftable member **28** to engage the pin element **20***b*.

Shift actuating means, generally designated **55,** are mounted on a bracket **56** attached to chassis **12** generally adjacent drive arm **36.** Shift actuating means **55** include an electrical switch **57** mounted on bracket **56** and having a push button element **57***a* extending generally vertically downward therefrom. An inverted, generally L-shaped switch actuating arm **60** is pivotably attached to bracket **56** by a pin **62.** The upper surface of a transverse portion **60***a* of the arm **60** is engageable with push button element **57***a* and an elongated lower arm portion **60***b* extends downwardly so as to be en-

gageable with the drive arm **36** upon leftward movement of arm **36.** An extension spring **65** is provided to urge actuating arm **60** away from push button element **57***a* (i.e. so as to be biased for counter clockwise rotation) closing the relay switch **57.** As shown, extension spring **65** has a first end attached to switch actuating arm **60** and a second end attached to a latching member **68** pivotable about a pin **69.** Latching member **68** is operatively connected (i.e. magnetically) to a relay coil **70** via an electromagnet core **70***a* mounted in the center of coil **70.** In its normal or non-shift position shown in FIG. **1,** the latching member **68** engages switch actuating arm **60** retaining the arm **60** in a position depressing push button element **57***a* and thereby maintaining switch **57** in an open position. To close switch **57,** latching member **68** is rotated in a clockwise direction against the bias of spring **65** by the magnet attraction of electro-magnet **70***a* releasing the switch actuating arm **60** from member **68** and allowing arm **60** to rotate in a counter-clockwise direction away from push button element **57***a.*

Turning now to the electrical circuitry used in conjunction with the above-described apparatus, FIG. **3** schematically illustrates the circuitry for operating the shift mechanism through a normal or non-shift cycle. Assume for purposes of this description that a selection switch **80** is closed by depressing a selector button (not shown) for an item stored in the rear stack of the vending machine. Upon the closing of switch **80,** a selection coil **72** is energized moving a switch arm **73***a* of a carriage switch **73** away from a stationary contact **73***b* into contact with a stationary contact **73***c.* This energizes the vend motor **15** causing the disc-like element **14** to rotate in a counterclockwise direction. With extension spring **50** urging shiftable member **28** in engagement with pin element **20***a*, rotation of disc-like member **14** causes member **28** to be guided by arcuate flanges **22***a* and **22***b* resulting in movement of connecting rod **25** toward the right in FIGS. **1** and **2.** This movement of connecting rod **25** causes the selection carriage to move toward the rear stack, selection switch **80** having energized the appropriate pusher element (not shown) on the selection carriage to eject the selected item from the stack as the carriage moves through its delivery stroke. At the end of the delivery stroke, the switch arm **73***a* of carriage switch **73** is returned to contact **73***b* by apparatus not shown and thereby resetting switch **73.** Prior to this point in the dispensing cycle, motor cam **16** disengages push button element **19** of motor hold switch **18** causing switch arm **18***a* to move between stationary contacts **18***b* and **18***c* thereby continuing to maintain motor **14** in an energized state. The energization of vend motor **14** continues through motor hold switch **18** and shiftable member **28** continues to be guided in a circular motion by arcuate flanges **22***a* and **22***b* until a full revolution of member **14** has occurred whereupon the cam portion **16** engages the push button element **19** opening motor hold switch **18** and de-energizing the vend motor **15** terminating the dispensing cycle.

The electrical circuitry shown in FIG. **4** is provided for operating the above-described apparatus through a shift-cycle (i.e. to drive the carriage toward the front stack). To accomplish this, a selection switch **82** is moved to a closed position upon the depression of a selector button (not shown) on the front of the vending machine. The closing of selection switch **82** energizes a selection coil **83** which moves arm **73***a* of carriage switch **73** into engagement with contact **73***c*. This actuates the proper elements on the selection carriage (not shown) for dispensing the desired item and, in addition, energizes the vend motor **15** for rotating the member **14.** The closing of selection switch **82** also energizes reversing relay coil **70** causing latching member **68** to move apart from switch actuating arm **60.** This allows push button element **57***a* to move outward to a position in which relay switch **57** energizes the solenoid **42.** As explained previously, energization of solenoid **42** results in the shiftable member **28** moving toward the right in FIGS. **1** and **2** against the bias of extension spring **50** causing member **28** to engage pin element **20***b*. As disc-like element **14** rotates, the elliptical-shaped member **28** is guided in a circular motion by arcuate flanges **23***a* and **23***b* resulting in the connecting arm **25** moving from its neutral position toward the left in FIGS. **1** and **2.** This movement of connecting arm **25** causes forward movement of the selection carriage. During the dispensing cycle, the carriage switch **73** is reset and the motor hold switch **18** is actuated as described previously. Upon reaching the half-cycle point (shown in dotted lines in FIG. **2**), the drive arm **36** engages the switch actuating arm **60** causing it to pivot in a clockwise direction about pin **62** so as to re-engage the latch member **68** thereby resetting the shift actuating means **55** in its normal or non-shift position. The disc-like member **14** continues to be driven by vend motor **15** through the remaining half cycle whereupon the cam portion **16** engages the push button element **19** of motor hold switch **18** breaking the electrical circuit to the motor and terminating the dispensing cycle.

The present apparatus having been described solely in reference to a particularly preferred embodiment thereof, numerous modifications to the described apparatus will be readily apparent to the artisan. For example, numerous design modifications to the shift actuating means **55** can be effected which will still provide the function intended of this appartus. This being the case, it is my intent to be limited solely by the spirit and scope of the appended claims.

What is claimed is:

1. Apparatus of the type including a shiftable member movably attached to a reciprocatory element and engageable with either one of a pair of spaced elements on a rotatable member for shifting the field of movement of the reciprocatory element, the improvement comprising:

a. spring biasing means for urging said shiftable member into engagement with a first one of said pair of spaced elements, to provide movement of said reciprocatory element in a first field;

b. an electrically energizable solenoid operatively connected to said shiftable member for overcoming the bias of said spring biasing means and for moving said shiftable member into engagement with a second one of said pair of spaced elements upon energization of said solenoid, to provide movement of the reciprocatory element in a second field; and,

c. shift actuating means for selectively energizing the solenoid, comprising:

i. electrical switch means in circuit with said solenoid; and,

ii. latch means operatively connected with said switch means for normally maintaining said

switch means in a nonconducting mode to prevent energization of said solenoid until release of said latch means.

2. The apparatus of claim 1, wherein said shift actuating means further includes electrical relay means operatively connected to said latch means for releasing said latch means from said switch means to allow electrical closing of said switch means upon activation of said relay means.

3. The apparatus of claim 2, further including a drive arm attached to the reciprocatory element and engageable with said latch means to releaseably re-engage said latch means with said switch means during movement of the reciprocatory element in said second field of movement.

4. Dispensing machine apparatus for controlling the movement of a merchandise selection carriage, comprising:

a. a rotatable member having a pair of elements projecting outwardly therefrom and positioned on opposite sides of an axis of rotation of said member;

b. connecting rod means operatively coupled to said rotatable member and including a drive arm attachable to said selection carriage, for moving in opposite first and second directions relative to said rotatable member;

c. shiftable member movably attached to said connecting rod means and including a pair of recesses for each engaging a different one of said pair of projecting elements on said rotatable member to shift the field of movement of said connecting rod means between said first and second directions;

d. means for moving said shiftable member into engagement with a selected one of said pair of projecting elements, including:

i. spring biasing means normally urging said shiftable member into engagement with a first one of said projecting elements for providing movement of said connecting rod means in said first direction; and,

ii. an electrically energizable solenoid mounted on said connecting rod means and operatively connected with said shiftable member for overcoming the bias of said spring biasing means and for moving said shiftable member into engagement with a second one of said pair of projecting elements upon energization of said solenoid, to provide movement of said connecting rod means in said second direction; and

e. shift actuating means mounted adjacent said drive arm, including electrical switch means in circuit with said solenoid, and latch means operatively connected to said switch means for normally maintaining said switch means in an open position to prevent energization of said solenoid until release of said latch means, wherein said drive arm is engageable with latch means to releasably re-engage said latch means with said switch means during movement of said connecting rod means in said second direction.

5. The vending machine apparatus of claim 4, wherein said shift actuating means further includes electrical relay means operatively connected to said latch means for releasing said latch means upon actuation of said relay means.

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