

[54] COMMODITY VENDOR APPARATUS

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[22] Filed: Feb. 27, 1973

[21] Appl. No.: 336,229

Related U.S. Application Data

[63] Continuation of Ser. No. 226,065, Feb. 14, 1972.

[52] U.S. Cl. 221/279, 198/220 BA

[51] Int. Cl. B65g 59/02

[58] Field of Search. 221/279, 197, 270, 221/274; 312/61, 71; 198/220 BA, 227; 46/1

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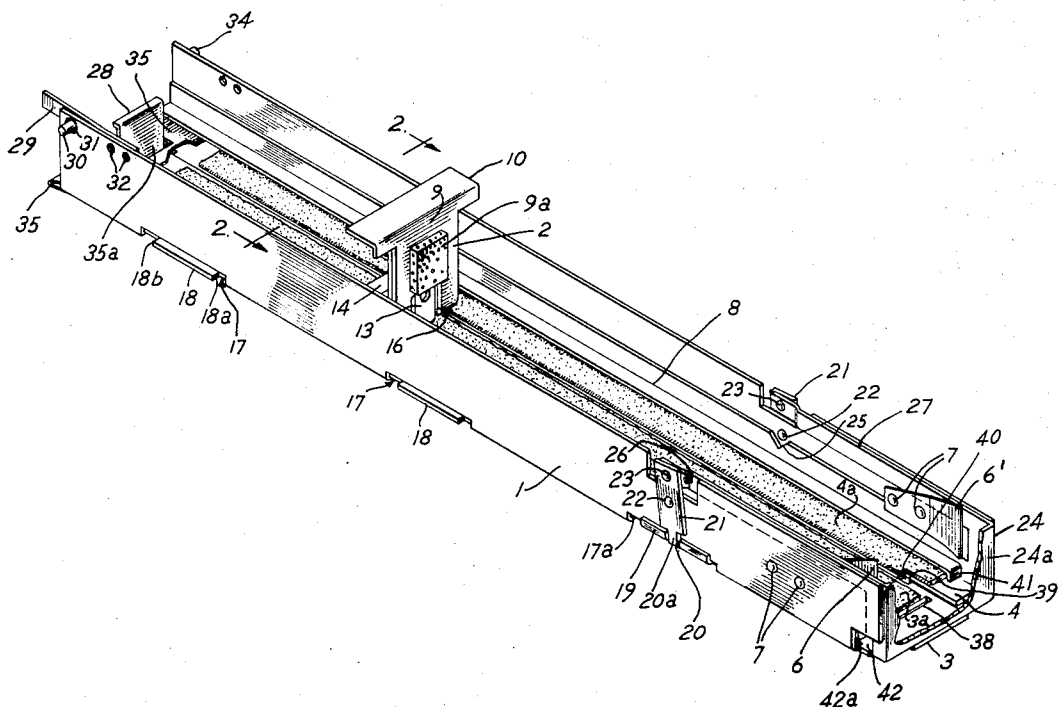
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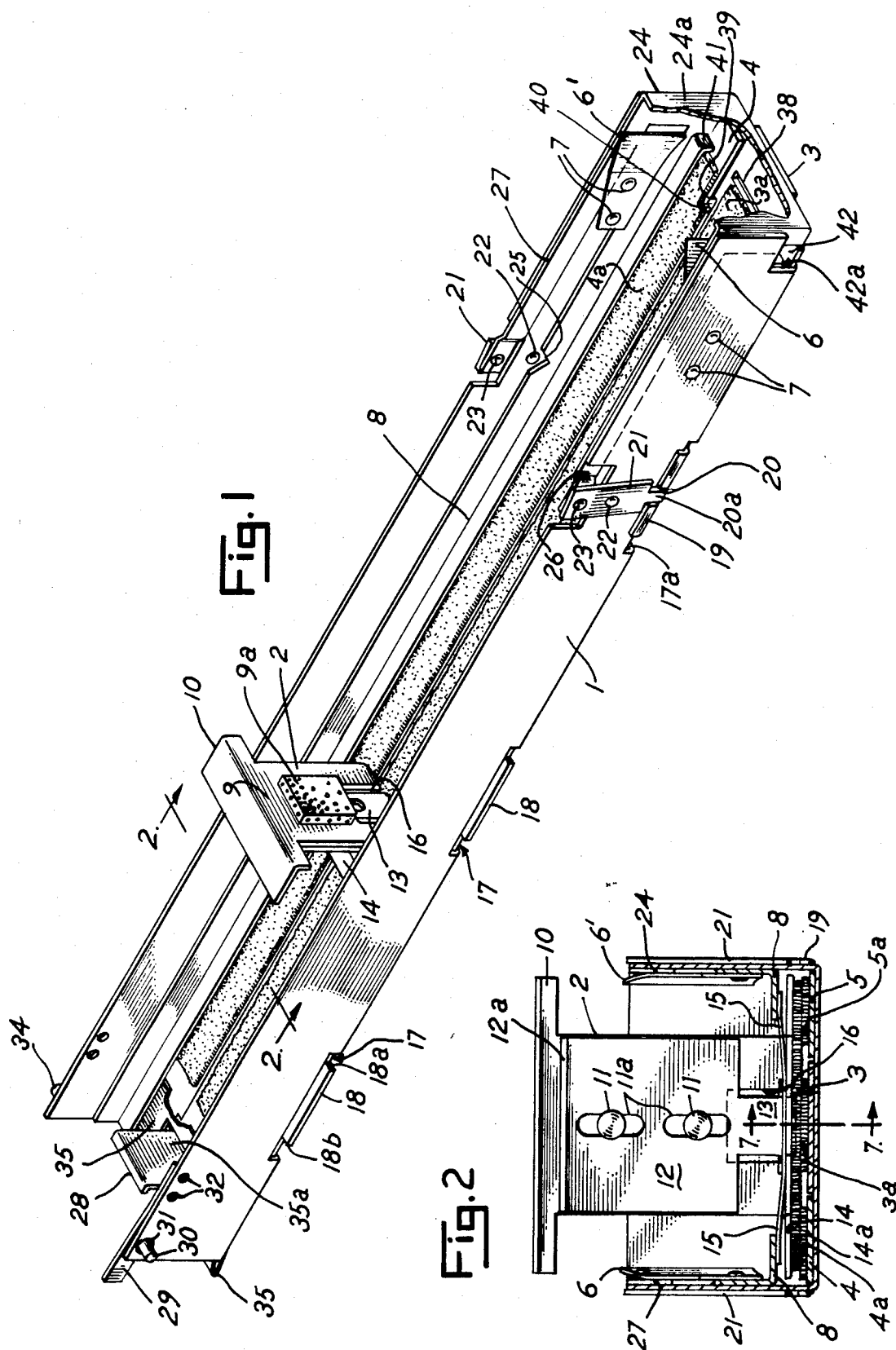
[57] **ABSTRACT**

An anti-theft commodity vendor apparatus for dispensing items from a vending machine which is capa-

ble of dispensing soft as well as hard commodity items without damage or malfunction. The vendor apparatus, which converts reciprocating motion to intermittent uni-directional motion, comprises, in combination: a tray; first and second track members disposed in the tray bottom and adapted to engage each other when the first member moves a predetermined distance forward or backward; a movable driving member in the tray to engage commodity items placed in the tray; first means for selectively engaging the driving member and the first track member; and second means for engaging the driving member and the second track member. The selective engaging means engages the driving member and the first track member only when the first track member moves forward, and the second engaging means engages the driving member and the second track member when the second track member moves backward. By moving the track members back and forth, with the second member moving a smaller distance than the first member, the driving member moves forward to expel items from the tray. Preferably, the selective engaging means comprises a fiber mat containing oriented fibers, slanted in one linear direction.

27 Claims, 10 Drawing Figures





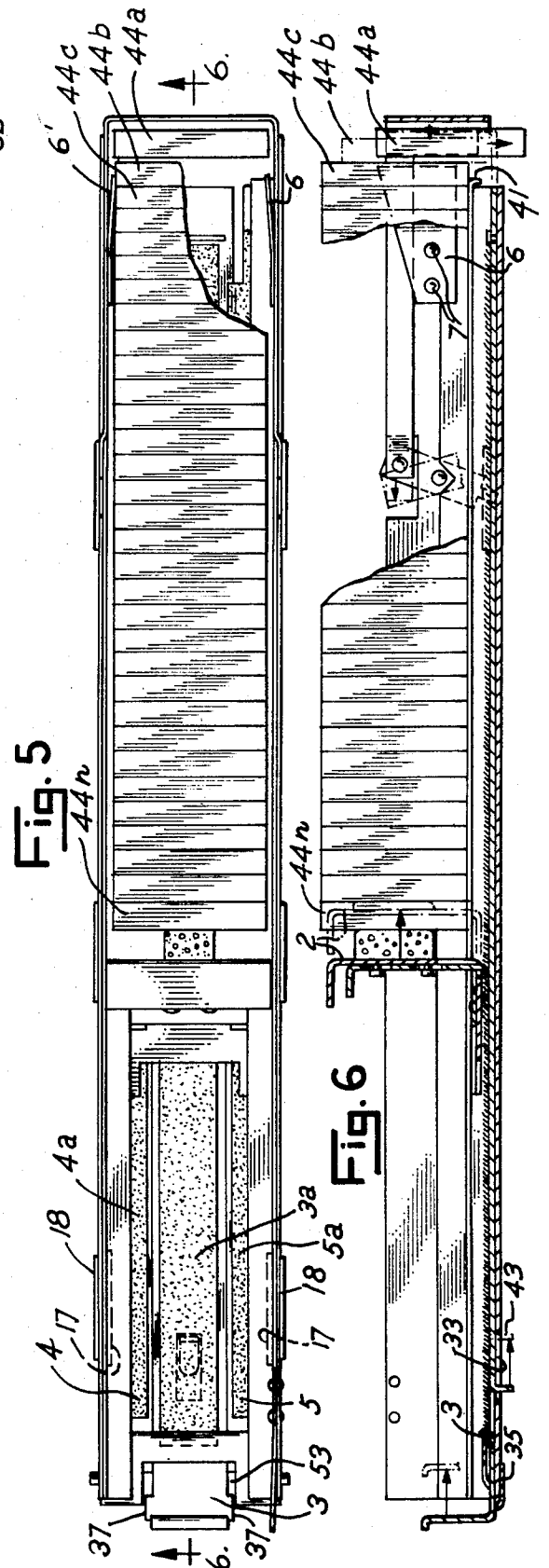
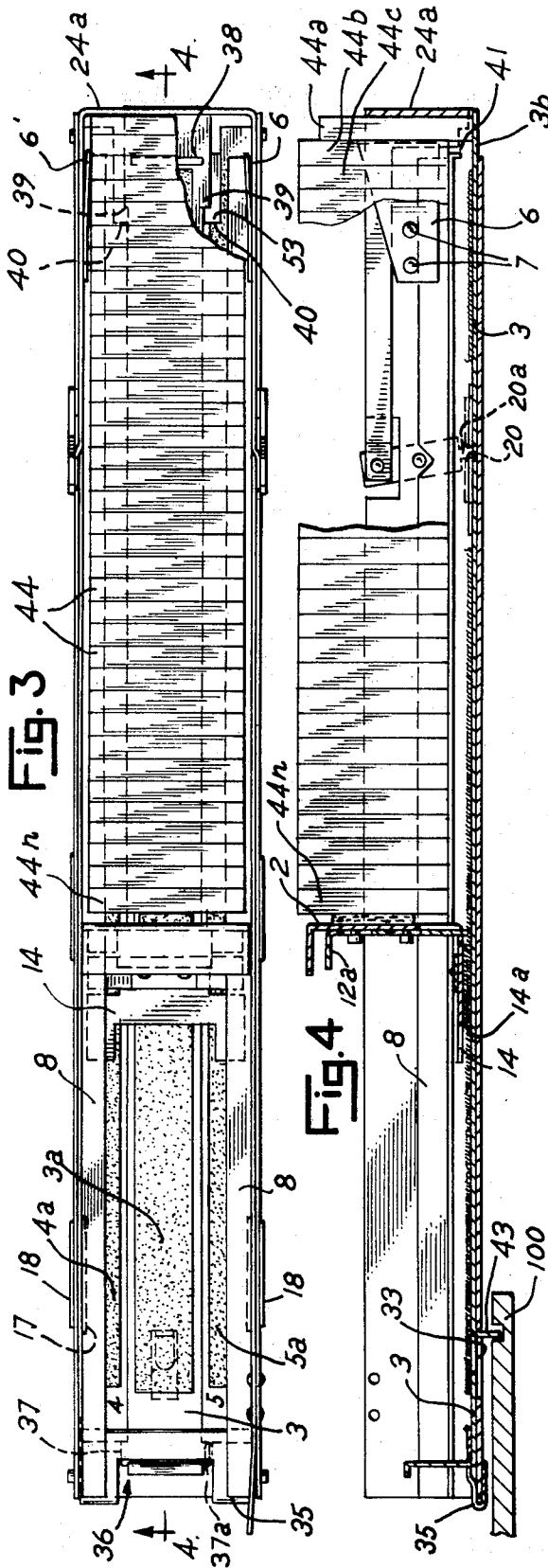


Fig. 7

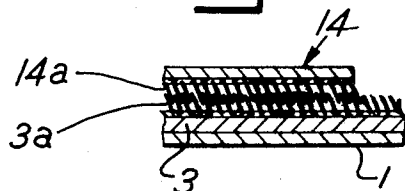


Fig. 8

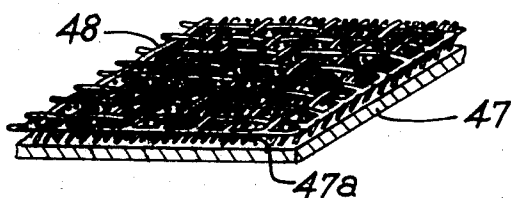
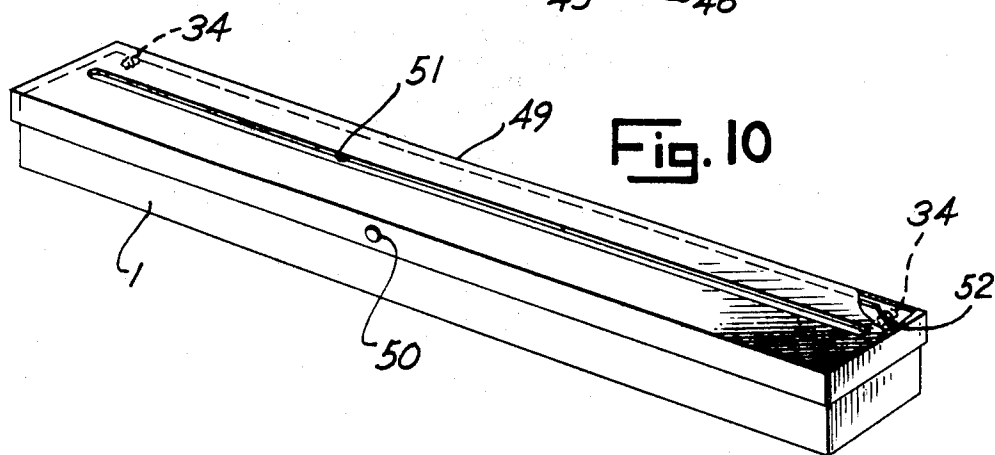
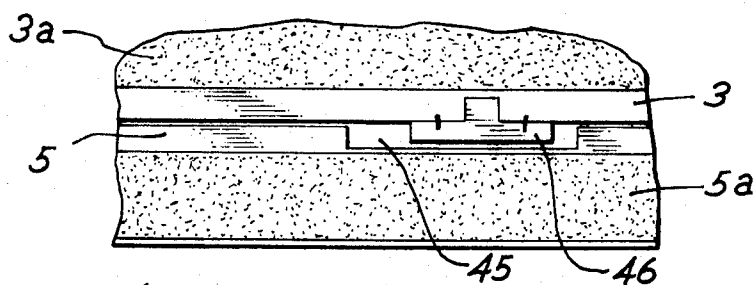


Fig. 9



COMMODITY VENDOR APPARATUS

This is a continuation of my prior, pending application Ser. No. 226,065 filed on Feb. 14, 1972.

BACKGROUND OF THE INVENTION

The invention pertains to an apparatus for dispensing items from a vending machine. More particularly, the invention pertains to an apparatus for dispensing items from a vending machine wherein reciprocating two-way translational motion is converted to intermittent translational one-way motion.

Present day vending machines are ordinarily loaded in the field, and involve opening the machine and hand-filling the racks after taking inventory, collection, and re-setting of actuating mechanisms. This procedure is slow, and due to the high labor costs, is expensive. There is a great need for a means for reducing such vending route costs and reducing commodity loading time.

Another problem with vending machines is the high wear of the mechanical parts which cause frequent breakdowns. Since the machines usually must be repaired in the field, and depend on their trouble-free availability for good financial return, repairs are costly. Thus, there is a need for machine dispensing mechanisms capable of thousands of operations without breakdown, and which are simple and inexpensive to service.

Still another problem in this field is that vending machines are complex and expensive to manufacture and assemble. A related problem is that parts are usually not removable in the field for simple replacement or repair.

Still another problem in the art which is not fully or economically solved, is that of theft of items from the vending machines, or from the supplies in transit prior to placement in the machine. Theft from the vending machine involves damage to the machine, and usually is done in a fairly short time since the machines are placed in a more or less public place. Present vending machines have the commodity items relatively exposed on the interior. Thus, once the machine housing is broken into, theft is easy. Present vending machines do not employ means for separately enclosing the commodity items on the interior of the machine so that theft is discouraged by requiring breaking into the machine housing, extricating the commodity enclosure, and breaking into the enclosure, before the items can be stolen.

Likewise, devices for anti-theft in transit which are compatible with vending machines have not been provided. The problem of transit theft and inventory shrinkage in storage is particularly serious for high priced items and items involving federal and state tax indicia, such as cigarettes.

There are also no vending machines which prevent a more subtle kind of theft, that of substitution. In this type of theft, the machine is opened and items in excess of inventory are placed in the commodity slots. After consumer purchase and vending, the excess money is removed. The machine sales rate appears lower to the authorized owner or distributor. This type of theft occurs most frequently as a means for distributing stolen or bootlegged cigarettes, since the required tax stamps do not show on the exterior of the machine and cannot readily be checked by government authorities.

THE INVENTION**OBJECTS**

It is among the objects of this invention to provide an improved apparatus for dispensing items from a vending machine.

It is another object of this invention to provide an improved vending tray that can be pre-loaded in the factory or distributor's warehouse or office, the parts of which are capable of millions of operations without breakdown, simple to assemble and service, and the parts of which can be removed in the field for repair or replacement.

It is another object of this invention to provide an improved vending apparatus which can, by simple adjustment, provide for vending of different sized objects.

It is another object of this invention to provide a vending apparatus wherein reciprocal motion of a vending machine mechanism is converted to intermittent translational one-way motion in the vending apparatus.

It is another object of the invention to provide a vending apparatus utilizing a relatively silent drive mechanism which is simple of construction and economical to manufacture.

It is another object of this invention to provide a vending apparatus utilizing a drive mechanism which minimizes shock transmitted from the apparatus to the items dispensed.

It is another object of this invention to provide an improved vending apparatus which provides for relief of pressure on the commodity item during the dispensing cycle, thus minimizing crushing of soft commodity items such as cigarettes or candy.

It is another object to provide an improved vending apparatus which includes optional anti-theft means.

It is another object of this invention to provide an improved vending apparatus which includes means for reducing theft of commodity items in transit, in storage, and in the vending machine.

It is another object of this invention to provide an improved vending apparatus which includes an optional housing which permits simple and rapid inventory of the commodity items at any time, yet which is relatively theft-proof.

It is another object of this invention to provide a vending apparatus wherein the dispensing mechanism is automatically locked when all of the items in the apparatus are sold, thus minimizing substitution-type use of the vending machine and theft of proceeds.

It is yet another object of this invention to provide an improved apparatus which is a sub-combination utilized in my vending apparatus and which may be used to selectively advance a member in one direction along a predetermined path as a result of reciprocal motion of another member, such as the vending machine mechanism, along the path.

Other objects, embodiments, and a more detailed description of the foregoing embodiments will be found in the following description and the drawings, in which like numerals refer to like elements in each of the several figures.

THE DRAWINGS:

FIG. 1 is a perspective view of the apparatus as viewed from the front side.

FIG. 2 is a sectional view of the apparatus along section line 2—2 of FIG. 1.

FIG. 3 is a plan view of the apparatus in the vend or initial storage position.

FIG. 4 is a sectional side view of the apparatus taken along section line 4—4 of FIG. 3.

FIG. 5 is a plan view of the apparatus showing the operation of the unit as items are dispensed from the vendor.

FIG. 6 is a sectional side view of the apparatus taken along section line 6—6 of FIG. 5.

FIG. 7 is a sectional side detail of the slanted fiber mats used as the selective engaging means taken along section line 7—7 of FIG. 2.

FIG. 8 is a perspective detail of another embodiment of the selective engaging means which utilizes a combination of a slanted fiber mat and a mesh screen.

FIG. 9 illustrates an alternative method and embodiment for engaging center track member 3 with side track members 4 or 5.

FIG. 10 illustrates an anti-theft security cover for the vending apparatus of this invention.

SUMMARY OF THE INVENTION

The present invention provides an apparatus for dispensing items from a vending machine having an actuating mechanism. This apparatus comprises in unitary combination a tray having a side portion and bottom portion adapted to receive and store commodity items for vending. This tray is elongated along a longitudinal axis parallel to the side portions of the tray with one end of the tray defining a front portion and the other end of the tray defining a back portion.

Disposed in the bottom of the tray are first and second track members. Also disposed in the tray is a movable driving member adapted to engage items placed in the tray and to push them forward. The track members and driving member are movable parallel to the longitudinal axis of the tray in a forward and backward direction. The first track member is adapted to engage the second track member only after the first track member has moved through a first predetermined distance in either the forward or backward direction. Thereafter, the first and second track members are adapted to move together.

Associated with the driving member and first track member are first means for selectively engaging the driving member and the first track member. Associated with the driving member and the second track member are second means for engaging the driving member and the second track member. Preferably, the first selective engaging means comprises a fiber mat or mats containing slanted fibers oriented in one linear direction with respect to the longitudinal axis of the tray. The fibers in the mat associated with the track members are slanted toward the front of the tray, and the fibers of the mat associated with the driving member are slanted backwards toward the back of the tray. The fiber mats are arranged so that they can selectively engage each other in response to movement of the track and driving members.

The first selective engaging means is adapted to selectively engage the driving member and the first track member only when the first track member moves in a forward direction. The second engaging means is adapted to engage the driving member and the second track member when the second track member moves

in either a forward or backward direction. When the first track member is moved backward the first predetermined distance, the first track member engages the second track member and first and second track members thereafter move backward together a second predetermined distance. While the second track member moves through this second predetermined distance, the second track member and driving member are cooperatively engaged and moved backward, with the driving member moving backward a third predetermined distance. This third distance is less than the second distance and is substantially equal to the first distance the first track moves. Preferably, the first predetermined distance is equal to the thickness of the item vended from the tray. This thickness is the same as the longitudinal dimension of a given item dispensed from the tray as determined when the items are positioned in the tray for dispensing. Alternatively, this first distance can be an integer multiple of the thickness of the item dispensed from the tray so that several items can be dispensed from the tray at once.

By connecting the vending machine actuating mechanism with the first track member, there is imparted motion to this track member in response to the motion of the actuating mechanism whereby the driving member moves forward in response to the back and forth motion of the first track member thereby selectively dispensing items from the tray in response to the actuating mechanism.

In a more limited embodiment, the first track member contains an opening therein disposed near the front end of the track. Disposed on the driving member is a generally vertical sliding lock adapted to move in a general vertical direction and to engage the opening in the first track member. When this embodiment is utilized, the first track member is locked to the driving member when the driving member reaches the front of the dispensing tray thereby preventing further operation of the apparatus when all of the items are dispensed from the tray.

The vendor apparatus of my invention also includes, as a sub-combination, apparatus which has utility separate from my vendor apparatus. This sub-combination apparatus comprises, in addition to supporting structure, such as the tray, the first track member, the first selective engaging means and the driving member. The primary advantage of this apparatus is that it can be used as a variable ratchet mechanism, or in other words, it can be operated to cause the driving member to advance solely in a forward direction as a result of reciprocal movement of the first track member. More specifically, by moving the first track member forward and backward through the first predetermined distance, the driving member will be moved forward a distance equal to the first predetermined distance. In other words, by limiting the forward and backward movement of the first track member to a distance equal to or less than the first predetermined distance, the driving member will only be moved in a forward direction. Of course, if the second engaging means is not utilized with my vendor apparatus or if the sub-combination is used separately from my vendor apparatus, the forward and backward distance through which the first track member is moved, and thus the distance the driving member will be moved forward, can be any desired distance whether greater or less than the first predetermined distance.

It should be understood that the embodiments described are illustrative and not limiting of the broad scope of the present invention. For example, the vendor apparatus illustrated utilizes a three track arrangement, whereas, in certain applications, only two tracks need be used.

DETAILED DESCRIPTION

Referring now to the figures, FIG. 1 shows, in perspective, a tray 1 which has disposed therein a center track 3, and side tracks 4 and 5 that are adapted to engage track 3. Driving member 2 is positioned in the tray and rests on tracks 3, 4 and 5.

Driving member 2 comprises a horizontally oriented tab 10 for manually moving driving member 2, a sponge pad 9a located on the front face 9 of the driving member, and a base 14. Secured to the bottom of driving member base 14 is a fiber mat 14a containing fibers slanted in one direction backward along the longitudinal axis of the tray. Similar fiber mats having the fibers slanted forward are secured to tracks 3, 4 and 5 and are designated as 3a, 4a and 5a, respectively. Secured on the back side of driving member 2 are flanged rivets 11 which project through openings 11a in vertically movable lock member 12. The lock 12 is adapted to slide vertically on rivets 11. Located on the bottom portion of lock 12 is a lock tab 13 which passes through opening 16 in the base 14 of driving member 2. Lock tab 13 is adapted to engage opening 38 located in the front portion of center track 3. When the driving member 2 reaches the front portion of the tray, lock tab 13 descends through opening 38 in center track 3 thereby preventing further motion of the center track 3 and the driving member 2. This serves to signify to the consumer that the tray is empty and to make another selection. Further, in combination with the tray cover 49 (FIG. 10) substitution-type thefts can be prevented. To reset the driving member 2, the lock is lifted by upward pressure on flange 12a and the driving member lifted and moved backwards in the tray.

Side springs 6, 6' are attached to the side walls of the tray by rivets or fasteners 7. Referring to FIGS. 3 and 5, side springs 6, 6' extend forward and are biased inwardly to frictionally retain items 44 in the tray prior to their being dispensed. As illustrated in FIG. 6, when an item 44a descends through the front portion of the tray, the remaining items in the tray are retained in position by means of springs 6, 6' which frictionally engage the sides of the items.

Side support and guide rails 8 are disposed on the interior side walls of tray 1, and are positioned above and parallel to the bottom of the tray. These guide rails serve to support the items placed in the tray and to provide them with a smooth unobstructed path down the length of the tray. Side rails 8 also function to guide driving member 2 down the tray since base 14 of the driving member extends laterally underneath the side rails. Spring 15, attached to base 14 of driving member 2, biases member 2 downwardly, providing an intimate contact between the slanted fiber mates 14a, 3a, 4a, and 5a located on base 14 and tracks 3, 4 and 5, respectively. The front portion of rails 8 extends downwardly to form smooth vertical tab 41 which insures that no items 44 catch on rails 8 as they are dispensed from the tray.

Back clip 35 positioned on the left end portion of the tray (as seen in FIG. 1) serves to prevent tracks 3, 4

and 5 from overlapping one another, maintaining them parallel to each other and to the bottom of the tray. Vertically extending rear tab 28 is positioned on the rear end of center track 3 and extends upward through opening 36 in clip 35 to insure that the center strip will be guided in its operational path. Each side track 4 and 5 is provided with a laterally extending tab 18 which projects through openings 17 in the side wall of tray 1. These tabs assist in maintaining side tracks 4 and 5 in an operational position throughout the entire operation of the unit. Shoulders 18a and 18b may be adapted to butt against the side walls of opening 17, thus limiting the length of stroke of the side tracks 4 and 5.

A front guard 24 having front face portion 24a assists in control of dispensing items 44. Guard 24 is positioned near the front portion of the tray and is reciprocally articulable from a first, backward position (FIGS. 1, 3 and 4) which retains goods in the tray, to a second, forward position (FIGS. 5 and 6) which permits dispensing. As is described in more detail below in conjunction with FIGS. 3 through 6, the front guard 24 operates in response to the sliding action of side tracks 4 and 5 by an interconnection provided by side arms 27 extending rearwardly of guard 24, and pivot arm 21 which engages side tracks 4 and 5. More particularly, the side tracks 4 and 5 are provided with a notched, upturned tab 19 extending through opening 17a in the wall of tray 1. Pivot arm 21 is pivotally connected to side arm 27 by means of pivot 23. Pivot arm 21 is pivotally connected to the wall of the tray by pivot 22. Notch 25 in side rail 8 facilitates the attachment of pivot point 22 through the side wall of tray 1. The actuation of pivot arm 21 by side rail 4 or 5 is provided by means of tab 20a on pivot arm 21, which engages notch 20 in tab 19. Notch 26 in the side of tray 1 provides an opening for movement of side arms 27 and pivot arms 21. Lateral tabs 42 on front guard 24 extends through notches 42a on each side wall of tray 1 to insure that guard 24 moves parallel to the bottom of the tray, and also may limit the rearward travel of guard 24.

The dispensing apparatus may be positioned in a conventional vending machine by movable stud 30 and fixed stud 34 located near the rear end portion of the tray. For example, stud 30 is mounted on a spring 29 affixed to the side of the tray by rivets 32 with stud 30 extending through opening 31. Stud 30 and 34 coast with openings, not shown, in a vending machine. By inserting the studs in openings in the vending machine, the tray can be removably mounted therein. When the tray is in position, the spring 29 is released and stud 30 will pass through opening 31 in the side of the tray into a cooperating opening in the vending machine. The tray 1 may also be supported at the sides or front end by rails in the vending machine, not shown. While this aspect of mounting the tray of this invention is not critical to the invention, it should be understood that the tray may be adapted to fit any type of machine.

As previously indicated, the tracks 3, 4 and 5 are adapted to engage each other when the center track 3 moves reciprocally in a forward or backward direction. Methods for engaging the tracks are illustrated in FIGS. 3 and 9. Referring to FIG. 3, lateral tabs or shoulders 37 located on the left (rear) end portion of center track 3 are adapted to engage shoulder notches 37a in side tracks 4 and 5 as the center track moves forward. When the center track moves backward, lateral tabs or shoulders 39 positioned on the right (front) end por-

tion of center track 3 engage shoulder notches 40 in side tracks 4 and 5. Center track 3 can move either forward or backward a predetermined distance 53 before engaging the side tracks. This distance 53 is substantially equal to the thickness or longitudinal dimension of the items 44 dispensed from the tray, and can be varied to accommodate various sizes of items by appropriate placement of shoulders 39 and 40.

FIG. 9 illustrates an alternative method for engaging the center track member with the side members. More particularly, a T-shaped key or tab 46 is positioned intermediate the end of the center track 4 so that it engages a corresponding notch 45 also positioned intermediate the ends of the side tracks. In a preferred embodiment, tab 46 is detachably connected to the center track, as by staking. Thus, the distance center track 3 moves before engaging side tracks 4 or 5 can be readily changed by placing different size tabs 46 on track 3 to accommodate different sized items to be placed in the dispensing tray.

A preferred configuration of the fiber mats containing oriented fibers is presented in FIG. 7. By oriented fiber mats or selectively slanted fabric, I mean mats having fibers directionally positioned in a predetermined pattern. A typical fiber mat is a linear drive facing manufactured by 3-M under the name "Fibre-Tran." The cross-sectional view in FIG. 7 shows driving member base 14 having selectively slanted fabric 14a, attached thereto, and center strip 3 having selectively slanted fabric 3a attached thereto. It is to be noted that the fibers of the mat or fabric 14a secured to the bottom side of driving member 14 are selectively slanted toward the rear of the tray, and the fibers of the mat or fabric 3a on track 3 are slanted towards the front end of the tray unit. In the embodiment illustrated, the fibers on the mats 4a and 5a on the side tracks 4 and 5 are all oriented in the same direction as the fibers on mat 3a on track 3. When driving member 2 is stationary and center track 3 moves forward, the fibers on mats 3a and 14a selectively engage each other and become intermeshed thereby engaging and moving driving member 2 forward at the same time that the track 3 moves forward. However, when track 3 moves backward, the fibers on mat 3 do not engage with those on mat 14a; i.e., they simply pass over each other, thereby allowing track member 3 to slide beneath driving member 2 without engagement therewith. Similarly, driving member 2 cannot be moved backwards, relative to tracks 3, 4 or 5, since the fibers on mats 3a, 4a, 5a and 14a will become engaged upon the attempted initiation of such movement. In other words, the driving member 2 can move backwards only if the track members also move backwards. In summary, as the tracks move forward, the fiber mats on the tracks selectively engage the fiber mat on the driving member, and when the tracks move backwards, the fiber mats on the tracks do not engage the fiber mat on the driving member. Also, if the driving member 2 moves forward relative to a stationary track, the fibers on mats 3a, 4a, 5a and 14a do not engage and the driving member can be moved forward freely. However, if the driving member 2 is moved backwards, relative to the tracks, the fibers on the mats 3a, 4a, 5a and 14a will become engaged and thus, the driving member can move backwards only in conjunction with backward movement of the tracks.

As illustrated, the forwardly slanted selective fiber mats 3a, 4a, and 5a are positioned on tracks 3, 4 and

5, respectively, so that, whenever a track moves forward, the mats thereon engage the mat 14a on the driving member 2. When center track 3 moves backward, it slides freely under driving member 2. However, when side tracks 4 and 5 move backward simultaneously with center track 3 the moving contact area between the driving member and all of the tracks 3, 4 and 5 becomes sufficiently great so that member 2 is frictionally engaged therewith and moves backward with side tracks 4 and 5. In other words, while the respective fiber mats are not selectively engaged, they permit normal frictional forces to move the driving member backward. The contact area between center track 3 and driving member 2 is not sufficient to pull the driving member 2 back by itself. However, when all of the track members move simultaneously, there is sufficient contact area so that the driving member will move backward.

In an alternate embodiment, the fibers on the mats 4a and 5a on side tracks 4 and 5 can be selectively slanted backward instead of forward. This results in center track 3 being the only track selectively engaged with driving member 2 when all of the tracks move forward. However, when the side tracks 4 and 5 move backward, they will be selectively engaged with driving member 2, and, of course, center track 3 will not then be selectively engaged therewith.

A similar type of selective engagement can be accomplished by means of a selectively slanted fiber mat cooperating with a wire mesh screen as illustrated in FIG. 8. Base plate 47, which may be either the bottom of driving member 2 or one of the track members, has mounted thereon an oriented fiber mat 47a containing fibers all slanted in one direction along the longitudinal axis of the tray. Screen 48, which could also be associated with either the driving member or one of the tracks coacts with the fiber mat in the same manner as two fiber mats coact. When the mat moves in the direction of the fiber slant, the fibers engage the wire mesh. When the fibers move in the opposite direction, the fiber mat passed freely across the screen without engagement. Similarly, when the screen moves backward against the slanted fibers, the screen becomes engaged with the fibers, and there is no further movement of the screen relative to the fiber mat.

FIG. 10 shows an anti-theft security cover 49 for the tray so that the tray may be shipped, loaded for installation, in a vending machine. In the embodiment shown in FIG. 10, cover 49 extends over the top, a portion of the sides, and the ends of the tray to substantially enclose the tray. Studs 34 located on the side of the tray engage openings 52 in top 49. Top 49 is detachably affixed to the tray by means of lock 50 which can comprise a conventional or special lock and key. Optionally, an opening 51 may be provided along the longitudinal axis of the top, to permit viewing of the vendor tray contents. This facilitates inventory. In the case of cigarettes, the tax stamp end of the pack is oriented to be viewed through the slot so that the vending tray can be checked for bootleg substitutions. This cover permits shipping and storing a tray previously stacked with the items to be vended without danger of theft from the tray. Further, machines marked with the warning that the items are in separate, locked trays will also discourage breakage and theft from the machine itself.

FIGS. 3 - 6 depict the vending tray apparatus of this invention in operation. FIGS. 3 and 4 show the appara-

tus in its initial or vend position as mounted in a vending machine (not shown) and in contact with vending machine actuating lever 100, such as a coin slot mechanism. Shoulders 37 on the rear of center track 3 engage the ends or shoulders 37a of side tracks 4 and 5. Front guard 24 is in a closed position, wherein the front face 24a of the guard is coextensive with a front edge of the tray. Further, the front portion 3b of center track 3 is positioned to extend under and support the forwardmost item 44a in the tray. Item 44a is a ready-to-vend position as seen in FIG. 4. Item 44b . . . 44n are supported on side support rail 8, while item 44a has been pushed forward past tongue 41 to rest on center track 3, which at that point has no fiber mat or screen on it. As illustrated, items 44 to be dispensed from the tray are tape cassettes, cartridges, or "Cartrettes" adapted for use in portable tape recording and playback instruments. However, the apparatus of this invention is equally suited to dispensing other articles normally dispensed from vending machines such as cigarettes, candy, matches, books and the like.

Extending through opening 33 in the bottom of the tray is an actuating lip or tab 43 which is operatively connected to a vending machine actuating mechanism 100 by conventional means well known to those trained in the art. As illustrated in FIG. 4, all of the items 44a . . . 44n in the tray are compactly positioned against front guard 24.

When actuating lever 100 is pulled backwards it moves tab 43 and track 3 backwards. Because of the selectivity of the mats 3a, 4a, 5a and 14a, the track 3 moves freely without engaging either the driving member 2 or the side tracks 4 and 5 until shoulders 39 on track 3 engage shoulders 40 on tracks 4 and 5. When the shoulders 39 and 40 engage, side tracks 4 and 5 are pulled backward by center track 3. As a result of center tracks 4 and 5 moving backward, the combined effective frictional contact area on the fiber mats on driving member 2 and tracks 3, 4 and 5 become sufficient to engage the driving member 2 with the tracks. As tracks 3, 4 and 5 move backwards, they pull the driving member back a substantially equal distance thus relieving pressure on the items. Preferably, the driving member moves back the same distance as the side members. By "substantially equal" I mean that the distance moved back can be somewhat less than the full movement of the tracks 4 and 5 due to slippage; slipping may occur between the fiber mats on the respective members, since in this embodiment, engagement is provided by normal friction forces. This pressure release feature is particularly useful where the items are crushable, such as cigarette soft packs. Of course, if the pressure release feature is not needed, then it could be omitted by, for example, eliminating the mats 4a and 5a.

When tabs 18 reach the back end of openings 17 (FIGS. 1, 3 and 6), the center track reaches its terminal rear position and will progress backwards no further. As side tracks 4 and 5 have moved backwards, they have simultaneously pivoted arm 21 about pivot 22, thus moving front guard 24 forward. The combination of front guard 24 moving forward and the backward motion of center track 3 and side tracks 4 and 5 creates an opening in the front portion of the tray thereby releasing forwardmost item 44a (see FIG. 6). The items not yet dispensed remain in the tray, first, through the compressive action of side spring 6, and, second, through the release of back pressure on the items in the

tray due to the fact driving member 2 is pulled backward by the rearward motion of side tracks 4 and 5.

After an item is dispensed from the tray, tab 43 is pushed forward by the actuating mechanism 100 of the vending machine. Initially, center track 3 moves forward in conjunction with driving member 2 since the fiber mats 3a and 14a are engaged. However, the fiber mats 14a on the driving member are not engaged with the mats 4a and 5a on the side members, and side members 4 and 5 do not move forward until shoulders 37 on center track 3 engage shoulders 38 on side tracks 4 and 5. As a consequence, driving member 2 moves forward the same distance as center track 3 moves forward but side tracks 4 and 5 move forward a lesser amount. Since the backward movement of driving member 2 in the first half of the vending cycle has relieved back pressure, the returning forward movement permits the front end portion 36 of track 3 to close the vend opening before, or simultaneously with, the contact of driving member 2 with the items 44b . . . 44n and their being pushed forward. As the forward stroke half of the vend cycle continues, the driving member 2 advances items 44b . . . 44n forward on the support rails 8, while the front guard 24 moves its rearward closing movement and the front end portion 36 of track 3 completes its forward movement. Item 44b is advanced forward off rails 8 into the position formerly occupied by item 44a, as can be seen by comparing the position of item 44b in FIG. 4 with that of FIG. 6, the latter being shown in phantom lines. The vend cycle is now complete, and the machine and tray is ready for insertion of coins to reactivate mechanism 100 for vending item 44b. This continues until the tray is empty, and lock 12 falls into slot 38 thus preventing mechanism 100 from being actuated.

From this description and the drawings, it is seen that the fiber mats 3a, 4a, 5a and 14a engage the driving member 2 and the side track members 4 and 5 when the side track members move in a backward direction. More specifically, after the center track and driving member are moved forward, a first predetermined distance, the side track members are cooperatively engaged with the center track and all thereafter move forward a lesser distance. After the center track member is moved backward through the first predetermined distance, the side track members and center track member are cooperatively engaged and move backward together a second predetermined distance, with the driving member also then moving backwards a third predetermined distance. This third predetermined distance is less than the second predetermined distance moved and is substantially equal to the first predetermined distance, i.e., the distance the center track must move before it engages the side track members. When, as is preferred, the first predetermined distance is equal to the thickness of the items placed in the tray, the driving member moves forward during each cycle an amount substantially equal to the thickness of the items dispensed, thereby, intermittently dispensing articles from the vending machine in response to the actuating mechanism. Thus it is seen the present apparatus effectively translates two dimensional translational motions to unidirectional motion and that the fiber mats accomplish this conversion in a silent manner.

The selective fiber mats used in this invention are reported by its manufacturer to be capable of 200 million operations without breakdown. The tracks and driving

member can be easily removed in the field and replaced if necessary. Likewise the assembly of the tray is simple; the parts are non-complex. Where the trays cannot be repaired in the field, they can be completely removed and replaced as a modular, sub-assembly of the vending machine, which permits the vending machines to be placed back into full service quickly. In addition to the anti-theft feature, the pre-loading capability of the tray makes for greatly reduced vending route stocking and servicing costs.

Furthermore, as noted above, my vendor apparatus includes, as a sub-combination, novel apparatus capable of utility separate from the vendor apparatus such as, for example, use as a variable ratchet mechanism. This sub-combination apparatus comprises the hereinbefore described driving member 2, center track 3, fiber mats 3a and 14a and tray 1 which supports the member 2 and track 3. This sub-combination apparatus can be utilized as a variable ratchet mechanism by reciprocally moving the track 3 forward and backward through a preselected distance, which movement causes the member 2 to be advanced in a forward direction through a distance equal to the preselected distance. When this sub-combination apparatus is used in the environment shown in FIG. 1, the preselected distance must be equal to or less than the first predetermined distance. If, however, the sub-combination apparatus is used separately from my vendor apparatus or if the fiber mats 4a and 5a are removed from the side tracks 4 and 5, the preselected distance may, of course, be greater than the first predetermined distance. Also, the preselected distance can be varied, from one forward and backward movement or cycle of movement of the track 3 to the next, and such variation will, of course, vary the distance through which member 2 is consequently advanced.

Variations may be made in the above-described and illustrated embodiments of and means for carrying out the functions of this invention without departing from the scope or spirit of this invention as defined by the appended claims which are to be interpreted as broadly as the prior art will permit. For example, a variety of grooves, meshes, saw-toothed surfaces and the like can be used as the selective surface to engage the fiber mat in place of another fiber mat or screen wire.

I claim as my invention:

1. An apparatus for dispensing items from a vending machine having an actuating mechanism which comprises, in unitary combination:

- a. a tray having a bottom portion and side portions adapted to receive and store items for vending;
- b. said tray is elongated along a longitudinal axis parallel to said side portions, one end of which defines a front portion and the other end defines a back portion;
- c. first and second track members disposed in the bottom of the tray;
- d. a movable driving member disposed in said tray adapted to engage items placed in the tray;
- e. said track members and driving member are movable parallel to said longitudinal axis in a first, forward direction and a second, backward direction;
- f. said first track member is adapted to engage the second track member when the first member moves in either a forward or backward direction;
- g. said first track member engages the second track member when the first track moves either forward

or backward only after the first track moves a first predetermined distance in either direction;

- h. first means for selectively engaging the driving member and the first track members disposed in association with said driving and track members;
 - i. second means for engaging the driving member and the second track member disposed in association with said driving and track members;
 - j. said first selective engaging means is adapted to selectively engage the driving member and the first track member only when the first track member moves in a forward direction, and said second engaging means is adapted to engage the driving member and the second track member when the second track member moves in a backward direction, so that when the first track and driving member are moved forward the first predetermined distance, the second track member is cooperatively engaged with the first track member and moves forward, so that after the first track member is moved backward the first predetermined distance, the second track is cooperatively engaged with the first track member and the first and second track members move backward a second predetermined distance and so that when said second track member is moved backward the second predetermined distance, the second track member and driving member are engaged and moved backward, said driving member moving backward a third predetermined distance, with said third distance being less than the second predetermined distance and substantially equal to the first predetermined distance; and
 - k. means for operatively connecting said vending machine actuating mechanism to said first track member to impart motion to said first track member in response to motion of said actuating mechanism, whereby the driving member moves forward in response to back and forth motion of the first track member to selectively dispense items from said tray in response to movement of said actuating mechanism.
2. An apparatus as in claim 1 which includes:
1. a front end closure member having a front portion disposed across the front portion of the tray and a rearwardly extending leg portion;
 - m. said front end member is movable from a first open position for discharge of goods to a second closed position for retention of goods in said tray;
 - n. means for pivotally connecting a leg portion of said front end closure to said second track member;
 - o. said leg and second track member pivotally cooperating to move the end closure forward to said first, open position when said second track member moves backward;
 - p. said open position providing an opening disposed between said end closure and said tray bottom for discharge of items and,
 - q. said pivotal connecting means permitting said second track member to pivotally cooperate with said leg portion to move said closure backward to said second, closed position for the retention of items when the second track member moves forward.
3. An apparatus as in claim 2 wherein said front end closure is generally U-shaped in horizontal cross section.

4. An apparatus as in claim 1 wherein said tray is generally U-shaped in vertical cross section.

5. An apparatus as in claim 1 which includes means for frictionally retaining goods within the tray disposed on the interior of the tray.

6. An apparatus as in claim 1 wherein:

r. said first track member contains an opening therein disposed near the front end of the track member, and

s. a lock member is disposed on said driving member and is adapted to move in a generally vertical direction and engage the opening in the first track member; whereby the first track member is locked to the driving member when the driving member reaches the front end of the tray thereby preventing further operation of the apparatus when all of the items are dispensed from the tray.

7. An apparatus as in claim 1 which includes:

t. a horizontally extending side rail having a bottom face and a top face disposed on the side portion of the tray, parallel to and spaced above the bottom portion of the tray, and

u. said side rail is adapted to carry goods placed in the tray for vending on the top portion of the rail.

8. An apparatus as in claim 7 wherein said driving member has a bottom portion containing said selective engaging means, said bottom portion is positioned between the bottom face of the side rail and the selective engaging means associated with the first track member; and wherein means for biasing the bottom portion of the driving member against said track members is disposed between said driving member and said rail member.

9. An apparatus as in claim 1 wherein said selective engaging means comprises oriented fiber mats associated with said track members and associated with said driving means.

10. An apparatus as in claim 9 wherein the fibers in the mat associated with the first track member are slanted forward towards the front of the tray, and said fibers in the mat associated with the driving member are slanted backward towards the back of the tray; and wherein the mats are arranged so that they can selectively engage each other.

11. An apparatus as in claim 1 wherein said selective engaging means comprises an oriented fiber mat member and a mesh screen member which are arranged so that the fiber mat selectively engages the mesh screen.

12. An apparatus as in claim 1 wherein said first predetermined distance is substantially equal to the thickness of an item to be dispensed from the tray.

13. An apparatus as in claim 1 which includes anti-theft means comprising an elongated cover having a top detachably connected to the tray, and said cover is adapted to be locked to said tray.

14. An apparatus as in claim 13 wherein said top of the cover contains a narrow slot running along the longitudinal axis of the top from one end to the other, whereby said tray contents can be viewed for inventory.

15. An apparatus as in claim 1 wherein said second means for engaging the driving member and the second track member is adapted to selectively engage the driving member when the second track member moves forward and frictionally engage the driving member when the second track member moves backward.

16. An apparatus as in claim 1 wherein said second means for engaging the driving member and the second track member is adapted to selectively engage the driving member only when the second track member moves backward.

17. An apparatus for dispensing items from a vending machine having an actuating mechanism which comprises, in unitary combination:

a. a tray having a bottom portion and side portions adapted to receive and store items for vending;

b. said tray elongated along a longitudinal axis parallel to said side portions, one end of which defines a front portion and the other end defines a back portion;

c. first and second track members disposed in the bottom of the tray;

d. a movable driving member disposed in said tray adapted to engage items placed in the tray;

e. said track members and driving member are movable parallel to said longitudinal axis in a first, forward direction and a second, backward direction;

f. said first track member is adapted to engage the second track member when the first member moves in either a forward or backward direction;

g. said first track member engages the second track member when the first track moves either forward or backward only after the first track moves a first predetermined distance in either direction;

h. first means for selectively engaging the driving member and the first track members disposed in association with said driving and track members;

i. said first selective engaging means is adapted to selectively engage the driving member and the first track member only when the first track member moves in a forward direction so that when the first track and driving member are moved forward the first predetermined distance, the second track member is cooperatively engaged with the first track member and moves forward together with the first track member and the driving member; and

j. means for operatively connecting said vending machine actuating mechanism to said first track member to impart motion to said first track member in response to motion of said actuating mechanism, whereby the driving member moves forward in response to back and forth motion of the first track member to selectively dispense items from said tray in response to movement of said actuating mechanism.

18. An apparatus as in claim 17 which includes:

k. a front end closure member having a front portion disposed across the front portion of the tray and a rearwardly extending leg portion;

l. said front end member is movable from a first open position for discharge of goods to a second closed position for retention of goods in said tray;

m. means for pivotally connecting a leg portion of said front end closure to said second track member;

n. said leg and second track member pivotally cooperating to move the end closure forward to said first, open position when said second track member moves backward;

o. said open position providing an opening disposed between said end closure and said tray bottom for discharge of items, and,

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p. said pivotal connecting means permitting said second track member to pivotally cooperate with said leg portion to move said closure backward to said second, close position for the retention of items when the second track member moves forward. 5

19. An improved apparatus for selectively advancing a member in one direction along a predetermined path as a result of reciprocatory motion of another member along the path, comprising:

a. a track member including an elongated body which defines a predetermined path having a first end and a second end;

b. first member supported by the track member for relative movement therebetween and for reciprocatory, back and forth movement along the path, the first member having an elongated body which has a mat receiving surface thereon, with the longitudinal axis of the body of the first member being substantially parallel to the path; 15

c. first fiber mat means mounted on the mat receiving surface of the body of the first member, the first fiber mat means containing fibers which are selectively oriented or slanted in a direction toward the second end of the path; 20

d. second member supported by the track member for relative movement therebetween and having a mat receiving surface thereon, with the mat receiving surface of the second member being disposed adjacent to the mat receiving surface of the first member; 25

e. second fiber mat means mounted on the mat receiving surface of the second member, the second fiber mat means containing fibers which are selectively oriented or slanted in a direction toward the first end of the path; 30

f. means for maintaining the fibers of the first fiber mat means and the fibers of the second fiber mat means in contact with each other; and

g. means for causing selective, reciprocatory movement of the first member back and forth along the path, in a direction parallel to the path, whereby when the first member moves toward the second 40

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end of the path, the slanted fibers of the first and second fiber mat means engage and the second member moves with the first member so as to be moved along the path in a direction from the first end of the path to the second end of the path and whereby when the first member moves toward the first end of the path, the second member remains stationary relative to the first member.

20. The improved apparatus described in claim 19 wherein the distance that the first member can be moved in either direction along the path at any one time can be varied.

21. The improved apparatus described in claim 19 wherein the path is horizontally disposed; and wherein the second member is disposed above the first member.

22. The improved apparatus described in claim 19 wherein the predetermined path is straight.

23. The improved apparatus described in claim 19 wherein the elongated body of the first member extends substantially from the first end of the path to the second end of the path; and wherein the first fiber mat means extends between the ends of the body of the first means.

24. The improved apparatus described in claim 19 wherein the second member is biased toward the first member so that the second fiber mat means is maintained in contact with the first fiber mat means.

25. The improved apparatus described in claim 20 wherein the elongated body of the first member extends substantially from the first end of the path to the second end of the path; and wherein the first fiber mat means extends between the ends of the body of the first means. 35

26. The improved apparatus described in claim 25 wherein the predetermined path is straight; wherein the second member is biased toward the first member so that the second fiber mat means is maintained in contact with the first fiber mat means;

27. The improved apparatus described in claim 26 wherein the path is horizontally disposed; and wherein the second member is disposed above the first member. 40

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