

[54] **APPARATUS FOR DISPENSING ITEMS FROM SHELVES**

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[22] Filed: **Apr. 2, 1973**

[21] Appl. No.: **347,249**

[52] U.S. Cl. **221/123**

[51] Int. Cl. **B65g 47/10**

[58] Field of Search 221/13, 92, 123, 258, 279; 214/16.4 R, 16 B, 16.1 CF; 198/106

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Primary Examiner—Robert B. Reeves

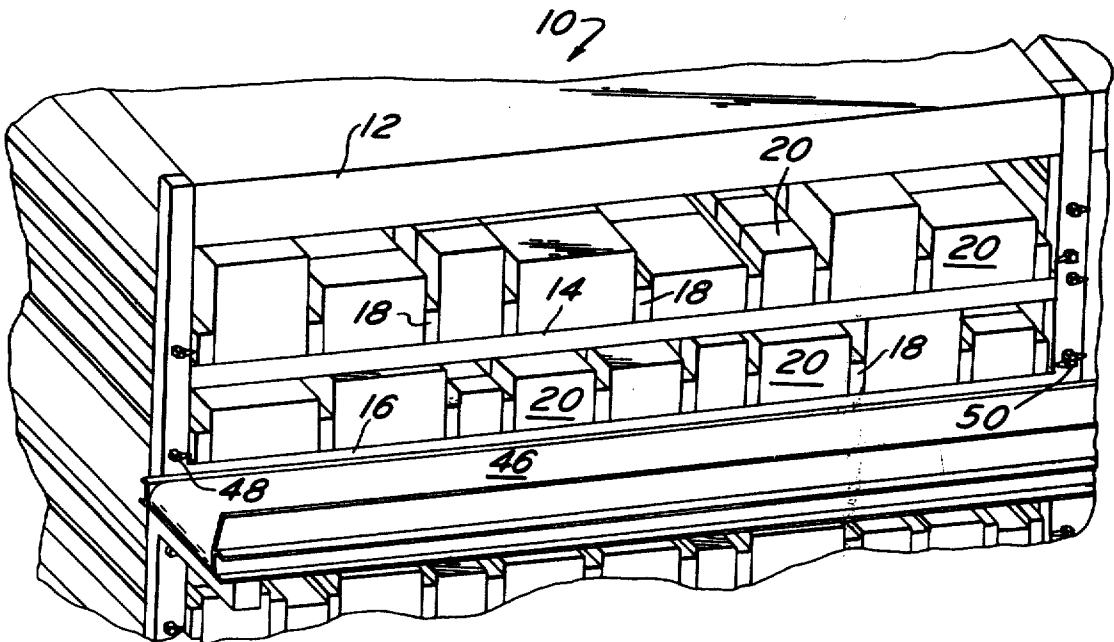
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[57] ABSTRACT

Apparatus is disclosed for pushing a row of items from the rear so that one or more of the items falls off or is otherwise transferred from the front end of the shelf onto a conveyor. The apparatus includes a plurality of shelves, each divided into a plurality of lines.

4 Claims, 9 Drawing Figures



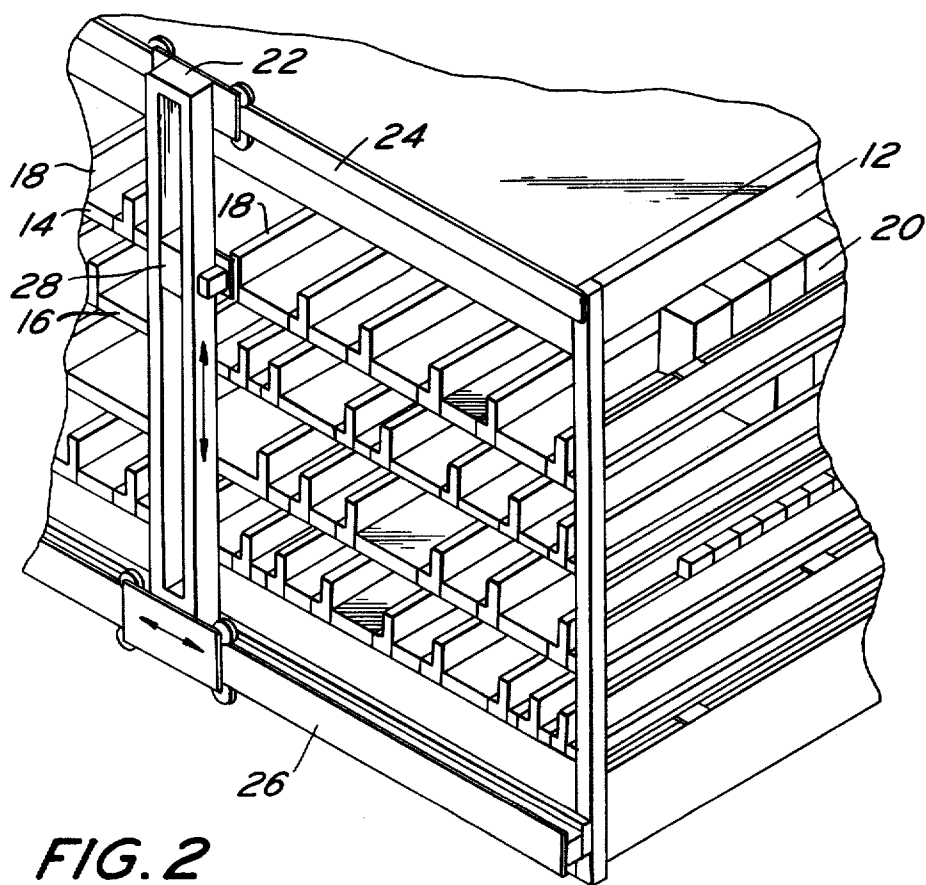
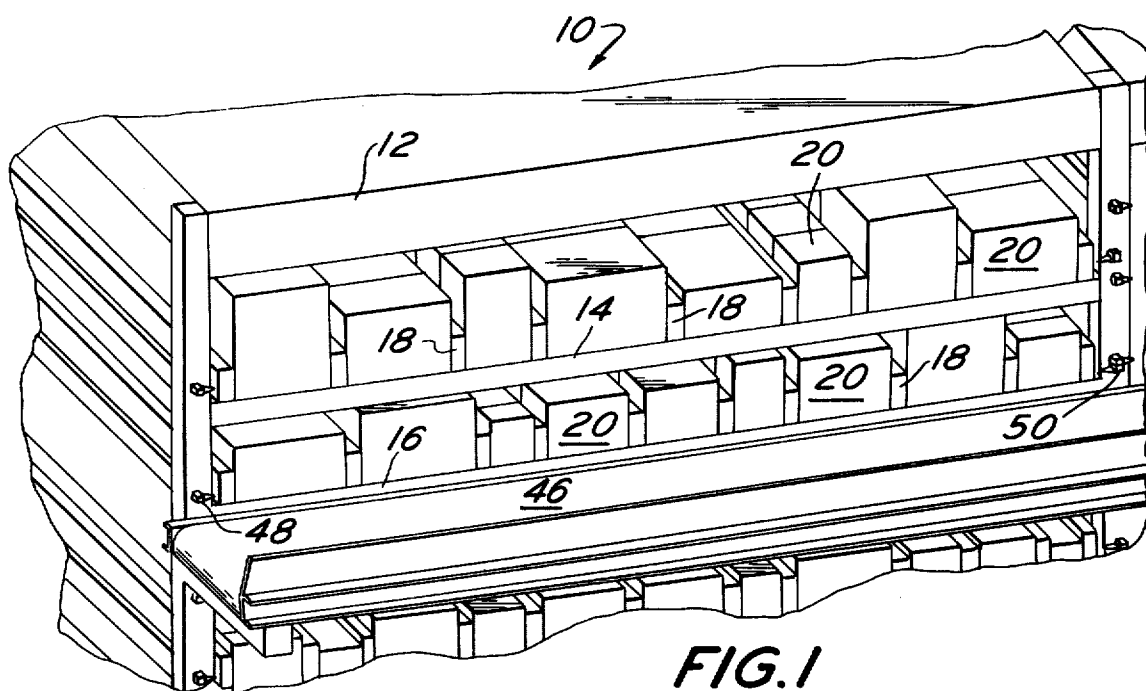


FIG. 3

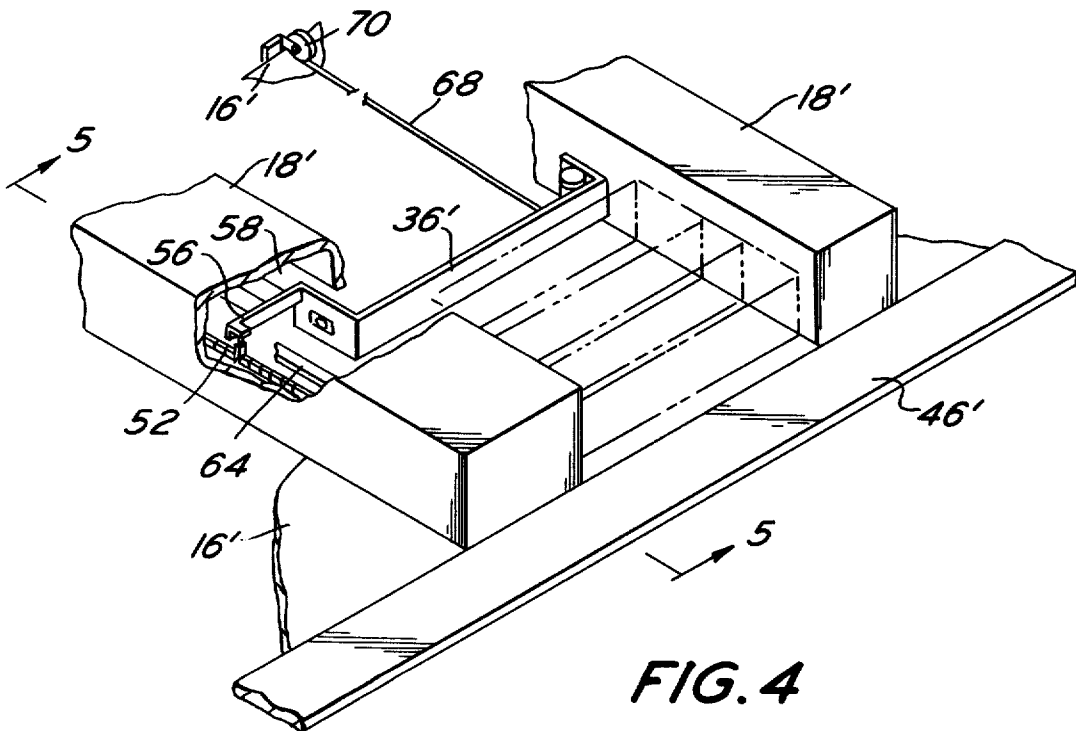
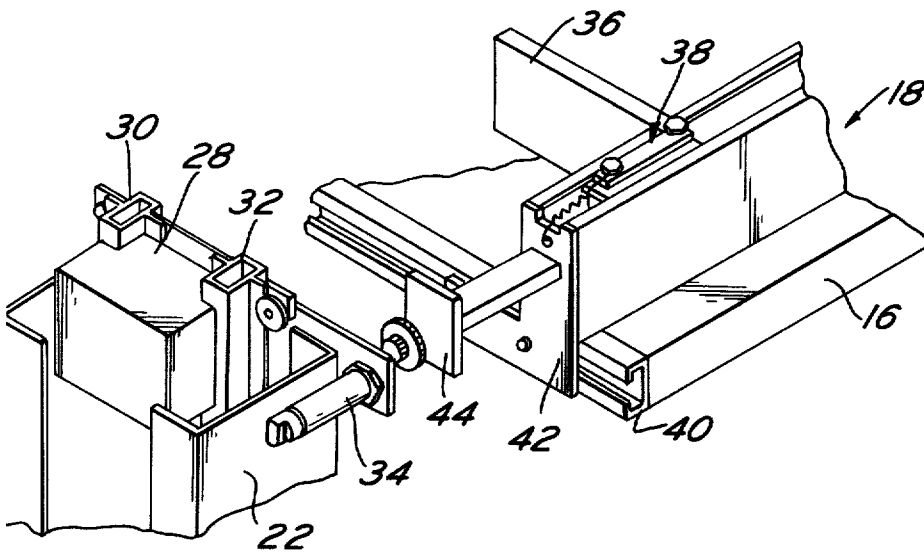


FIG. 5

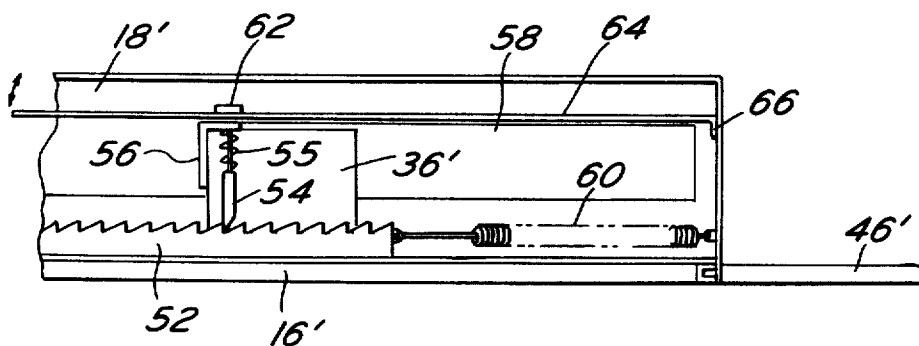


FIG. 6

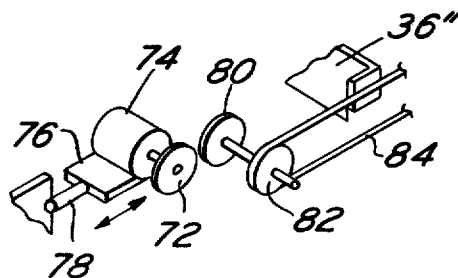
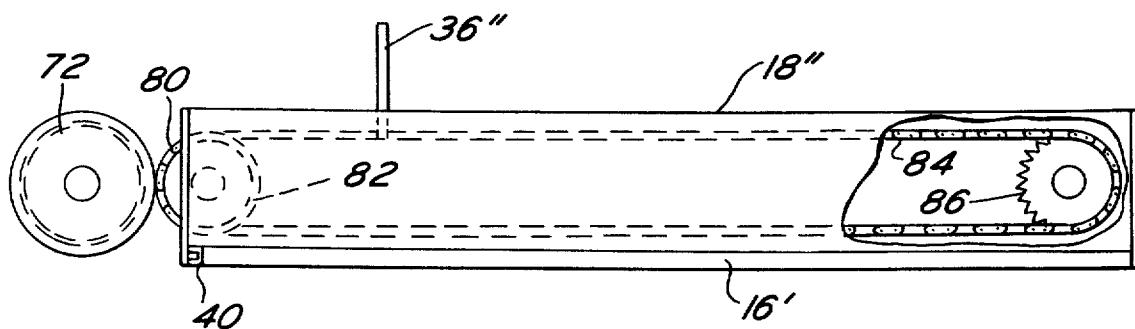


FIG. 7

FIG. 9

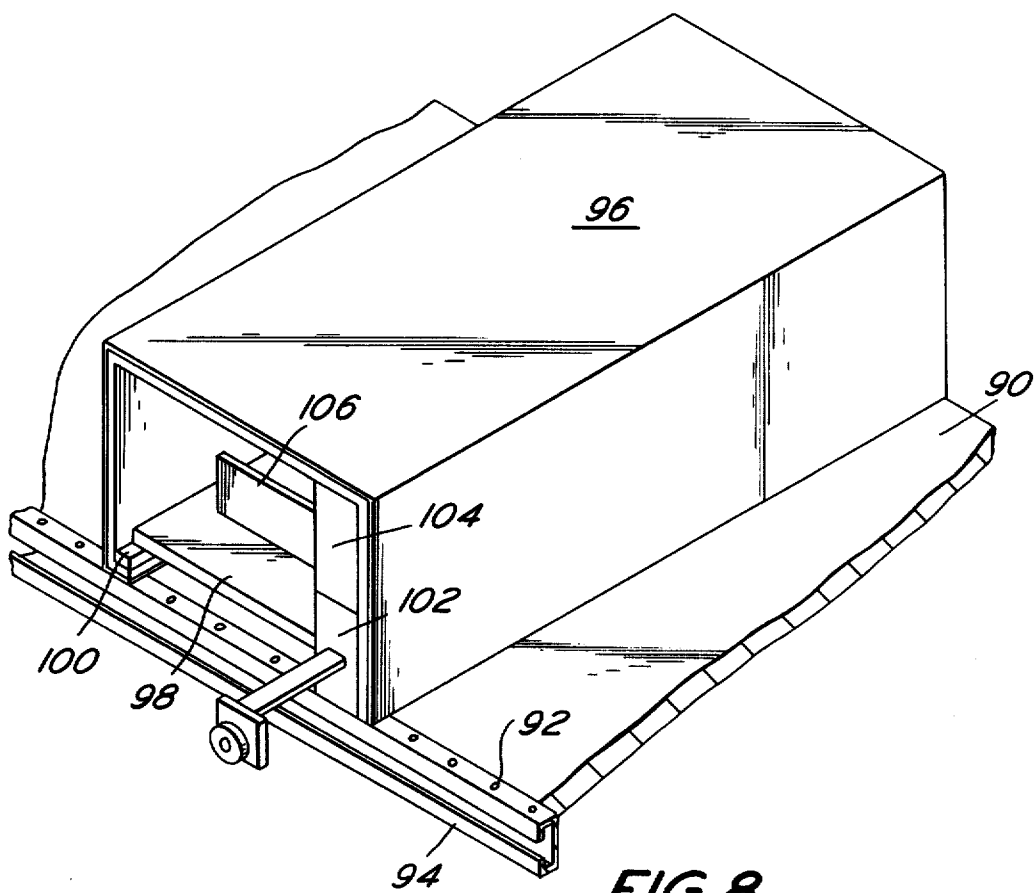
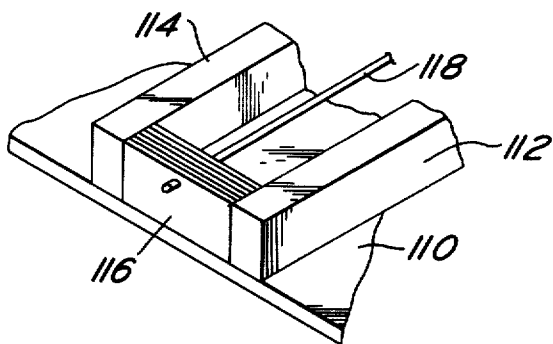


FIG. 8

APPARATUS FOR DISPENSING ITEMS FROM SHELVES

This invention is directed to an apparatus which may take the form of an automatic warehouse, a coin-operated vending machine, etc., wherein items are to be selectively dispensed from lanes on shelves. The items are capable of being of different sizes of shapes and are stored in parallel lanes on horizontally disposed shelves.

In one embodiment, the apparatus includes a slider for each lane. The slider pushes the items in each lane forwardly until they fall off or are otherwise transferred from the front end of the lane onto a conveyor or the like. Thus, the conveyor or other take-away device is on the front of the apparatus whereas the means for selectively effecting dispensing is on the opposite side or rear of the apparatus. The means for effecting dispensing includes a horizontally reciprocal carriage containing a vertically reciprocable motor means. The motor means is connected to or supports an actuator means adapted to selectively effect dispensing from any of the lanes on any of the shelves.

The apparatus of the present invention is adapted to be automatic. Movement of the motor means and carriage may be controlled by a program containing data indicative of the respective items on the respective shelves to be dispensed as well as the number of such items. Alternatively, the apparatus of the present invention may be constructed so as to operate as a vending machine responsive to coins, credit card or some other device for vending a wide variety of items including pharmaceuticals, foodstuffs, cleaning compositions, etc.

It is an object of the present invention to provide a novel apparatus for dispensing items from shelves.

It is another object of the present invention to provide an automatic dispensing apparatus for pushing rows of items from the rear until one or more of the items fall off or are otherwise transferred from the front end of the shelf onto a conveyor or similar device.

It is an object of the present invention to provide an automatic dispensing apparatus which is simple, easy to maintain, and reliable.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a partial perspective view of the front of the apparatus in accordance with the present invention.

FIG. 2 is a partial rear perspective view of the apparatus shown in FIG. 1.

FIG. 3 is an enlarged partial perspective view of details as seen from the rear of the apparatus of the present invention.

FIG. 4 is a partial perspective view as seen from the front of an alternative embodiment. FIG. 5 is a sectional view taken along the line 5—5 in FIG. 4.

FIG. 6 is a side elevation view, partly cut away, of another embodiment of the present invention.

FIG. 7 is a schematic exploded view of the embodiment shown in FIG. 6.

FIG. 8 is a partial perspective view of another embodiment.

FIG. 9 is a partial perspective view of another embodiment.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 a partial front perspective view of apparatus in accordance with the present invention. The apparatus includes a frame 12 having a plurality of horizontally disposed shelves 14, 16, etc. disposed one above the other. Each of the shelves is divided into lanes by a lane divider 18. The lane dividers 18 are removably coupled to the shelves so that the width of the lanes may be adjusted as desired to correspond to the width of the item 20 to be dispensed. Each lane contains a row of the items 20. See FIGS. 1 and 2.

In order to effect a dispensing of the item from a selected one of the lanes containing a row of items 20, at the rear of the frame 12, there is provided a horizontally movable carriage 22. The carriage 22 is supported at the top and bottom by guide means 24 and 26, respectively. Any conventional means, such as a rack and pinion arrangement, not shown, is utilized to cause the carriage 22 to reciprocate horizontally on the guide means 24 and 26.

Referring to FIGS. 2 and 3, the carriage 22 includes a motor means 28. The motor means 28 which may be a high r.p.m. DC motor, is guided for vertical reciprocation on the carriage 22 by guide means 30, 32. The guide means 30 and 32 are integral with the carriage 22 and can be tracks, linear bearings, etc. A motor, such as a DC motor, coupled to a rack and pinion may be utilized to effect vertical reciprocation of the motor means 28 to the desired elevation of the desired shelf containing a row of items 20 to be dispensed.

In order to permit adjustment of the width of lanes, any conventional means may be utilized to removably attach the lane divider 18 to the shelves, such as shelf 16. One suitable manner of accomplishing this is shown in FIG. 3 wherein the shelf 16 is provided at its rear surface with a channel 40. A plate 42 on the end face of the lane divider 18 is removably bolted to the channel 40.

The lane divider 18 may include an increment control mechanism designated generally as 38 to effect incremental movement of the slider 36. The slider 36 extends between adjacent lane dividers and is adapted to engage the last item 20 in a row of items to be dispensed. Each lane includes a slider 36 which remains in contact with the last item 20 in that lane.

Motor means 28 supports and/or is coupled to an actuator means 34. Actuator means 34 is adapted to selectively push against and reciprocate member 44 in a horizontal direction as indicated by arrow 43. Each lane divider 18 may be provided with a member 44. Member 44 is connected to the increment control mechanism 38 in each of the lane dividers 18. Each time member 44 is pushed inwardly toward its lane divider by actuator means 34, the slider 36 is moved an incremental like distance. Actuator means 34 may be an electrical motor, a solenoid, a mechanical device, etc.

The incremental control mechanism 38 couples the member 44 to the slider 36. This coupling is preferably a one-way coupling. As member 44 reciprocates horizontally in the direction from the rear to the front of the frame 12, the slider 36 moves a like distance. Thereafter, a spring returns the member 44 to its original position while slider 36 remains stationary. The mechanism 38 could be a conventional friction coupling such as that disclosed in U.S. Pat. No. 3,348,732.

Any conventional device is utilized to prevent the slider 36 from twisting due to force transmitted thereto from member 44. Thus, the slider 36 must move parallel to the lane. Any conventional release mechanism may be provided so as to permit retraction of the slider 36 to the rear face of the apparatus 10 to facilitate reloading of the lane.

The width and depth of the items 20 may vary. The incremental movement of the slider 36 during each stroke of the member 44 is preferably not less than the depth of the smallest of item 20. If the depth of all of the items is identical, then the incremental stroke may correspond to the depth of a single item 20.

After one or more incremental movements of the slider 36, the row of items 20 in front of the slider 36 will be pushed forwardly to the front of the apparatus 10 for a sufficient distance so that the first item 20 in the row will fall or otherwise be transferred from the shelf onto a conveyor 46. Conveyor 46 may be a continuously moving conveyor. As the item 20 is transferred onto the conveyor 46, it breaks a beam of wave energy between the cells 48 and 50. A set of cells 48 and 50 is provided for each shelf. Cells 48, 50 may be photoelectric, infra red, etc. When the beam of light between the cells 48 and 50 is interrupted, it disables the actuator means 34 and can signal the initiation of movement of the motor means 28 to a different elevation and/or effect horizontal reciprocation of the carriage 22. If the program requires more than one of the specific items which has been transferred from a shelf onto the conveyor 46, the circuitry will cause the actuator means 34 to recycle and the dispensing action to be repeated.

As shown more clearly in connection with the embodiment illustrated in FIGS. 4 and 5, the increment control mechanism may be a ratchet bar having a ratchet 54 associated therewith. Ratchet 54 is biased downwardly by spring 55 and is connected to the slider 36'. Slider 36' includes an arm 56 extending through a slot 58 in a side wall of the lane divider 18'. Each time the ratchet bar is incrementally stroked left to right in FIG. 5 by means of the actuator 34, the spring 60 is compressed and thereafter returns the slider bar 54 to its original position. This causes the slider 36' to move incrementally forward toward the front of the apparatus 10. If desired, slider 36' may be provided with rollers for engaging the side faces of the adjacent lane dividers 18'.

The upper end of the ratchet 54 is provided with an enlarged head 62 guided by a slot in a strip bar 64. Strip bar 64 is pivotably connected at pivot means 66 within the lane divider 18'. When it is selectively desired to disengage the ratchet 54 from contact with the ratchet bar 52 from a position at the rear of the apparatus 10, the bar strip 64 is pivoted upwardly, thereby compressing spring 55 and thereby lifting ratchet 54. Thereafter, the lane divider 18' may be pulled to the rear under the effect of the tension cord 68. Tension cord 68 is connected to a spring wound spool 70 at the rear face of the apparatus 10. Thus, each lane divider would be connected by a tension cord 68 to a spring wound spool 70 in connection with this embodiment. Otherwise, the embodiment shown in FIGS. 4 and 5 is the same as that disclosed above.

In FIGS. 6 and 7, there is illustrated another embodiment of the increment control mechanism. The slider 36'' is incrementally moved along the lane by means of

an endless chain 84 within the lane divider 18''. Chain 84 extends around sprockets 82 and 86. Sprocket 82 is on the same shaft as the friction wheel 80. The friction wheel 80 is adapted to be driven by a friction wheel 72 coupled to the output of motor 74. Motor 74 is mounted on a support 76. The support 76 is adapted to be reciprocated a short distance of approximately one-fourth of an inch by means of actuator 78 to thereby permit wheel 72 to drive wheel 80. Actuator 78 may be a solenoid or other equivalent device.

In connection with the embodiment shown in FIGS. 6 and 7, the speed with which the slider 36'' will move is a direct function of the output speed of motor 74. Motor 74 preferably has a low output speed of 10 rpm. If desired, motor 74 may be a single cycle motor which automatically shuts off after each complete revolution of the friction wheel 72. Each revolution of friction wheel 72 would cause the slider 36'' to move an incremental distance such as one inch. When the particular lane is empty, for purposes of refilling the lane, the motor 74 may be reversed to cause the slider 36'' to retract to the rear face of the frame.

Referring to FIG. 8, there is illustrated another embodiment of the present invention which is the same as that discussed above except as pointed out hereinafter. A shelf 90 is provided with a plurality of locator holes 92 in any convenient location such as in the channel member 94 on the front edge of the shelf. A lane divider on the shelf 90 may take the form of a thermally insulated housing 96. Housing 96 has pins on its lower surface which are insertable into one of the holes 92.

The housing 96 may be an outer shell of metal or plastic provided with insulation on its inner surface and with a layer of insulation material constituting the floor 98. The floor 98 may be supported by in-turned flanges 100.

Within the housing 96, there is provided an incremental control mechanism 102 which is similar to any one of the previously described increment control mechanisms. Also, there is provided within the housing 102 a chamber 104 containing a thermal control element for controlling the temperature within the housing 96. The temperature control element within chamber 104 may be a cooling coil or a heating coil. Thermally controlled articles are dispensed from the front end of the housing 96, that is the right hand end in FIG. 8 by means of a slider 106 coupled to the increment control mechanism 102. The increment control mechanism 102 may be actuated in any convenient manner such as by the means described above.

Housings 96 may be removably coupled to the shelf 90 in any one of a wide variety of locations. The side walls of housing 96 are straight and uninterrupted so that they may perform the function of a lane divider. The floor 98 is preferably made from a lightweight insulating material having a smooth or slippery upper surface so that articles to be dispensed will slide on the same. A wide variety of such materials is commercially available.

Referring to FIG. 9, there is illustrated another embodiment of the present invention which is the same as that discussed above except as will be made clear hereinafter. A shelf 110 is provided with lane dividers 112 and 114. The items 116 to be dispensed, such as blister packages, are provided with a hole in the packaging and through which extends the elongated guide mem-

ber 118. Guide member 118 may be a cantilever rod, a wire, a string, etc.

Where the nature of the article being dispensed permits, such as where the article is hard and/or securely packaged, slider 36 need not be present between lane dividers. That is, motor means 28 could include an arm with or without an end plate for pushing directly on the last package in the lane. This alternative would eliminate the need for mechanism 38.

Replenishment of stock may be made from the front of the apparatus. Thus, in FIG. 6 articles introduced into a lane would push slider 36'' to the rear. A significant time saving advantage may be achieved by this method of replenishment.

In some situations, a separate motor means may be provided at the elevation of each shelf. This would eliminate the need for vertical reciprocation of the motor means.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. Apparatus for dispensing items comprising a frame, said frame having a plurality of superimposed horizontally disposed shelves, lane dividers supported by said shelves to define parallel lanes, a slider in each lane for pushing against the rear end of a row of items, at least some of said lane dividers including an endless member extending around guides adjacent to and sup-

ported by end portions thereof, each endless member being coupled to a slider in an adjacent lane, a carriage mounted on a rear side of the frame for reciprocation in a first direction behind the shelves, motor means for selectively moving an endless member for pushing its associated slider along its lane, said motor means being mounted on said carriage for reciprocation on the carriage in a second direction perpendicular to said first direction, a conveyor means on the front side of the frame for receiving items pushed off the shelf by one of the sliders and for conveying the item to a discharge point, first support means on the rear side of said frame supporting said carriage, second support means on the front side of said frame supporting said conveyor means.

2. Apparatus in accordance with claim 1 including an insulated housing on at least one of said shelves for containing the items to be pushed off the shelf, and means associated with the housing for varying the temperature therein.

3. Apparatus in accordance with claim 1 including an elongated guide means between an adjacent two lane dividers for extending through aligned holes in packaging items between said two lane dividers and to be pushed off the shelf associated with said two lane dividers.

4. Apparatus in accordance with claim 1 wherein said motor means includes a friction wheel rotatable about a horizontal axis for transmitting a rotary force to move said endless members.

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