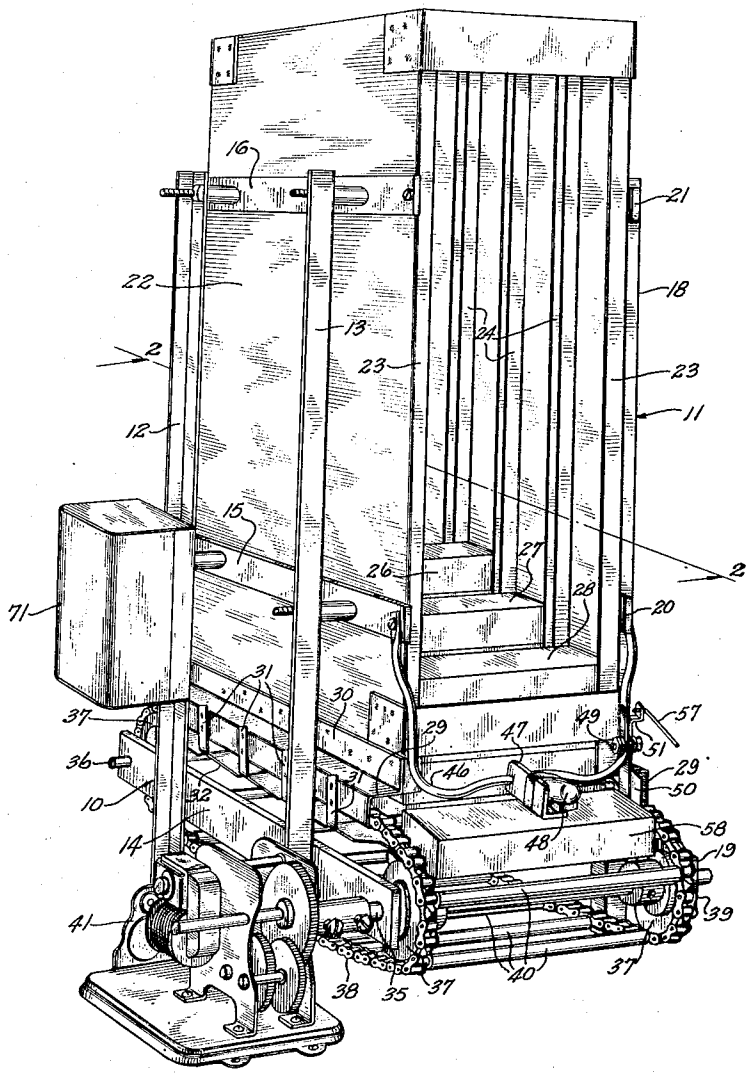
Dec. 11, 1951 G. W. HAASE ET AL 2,578,545

VENDING MACHINE

Filed May 7, 1948 4 Sheets-Sheet 1

Fig. 1.



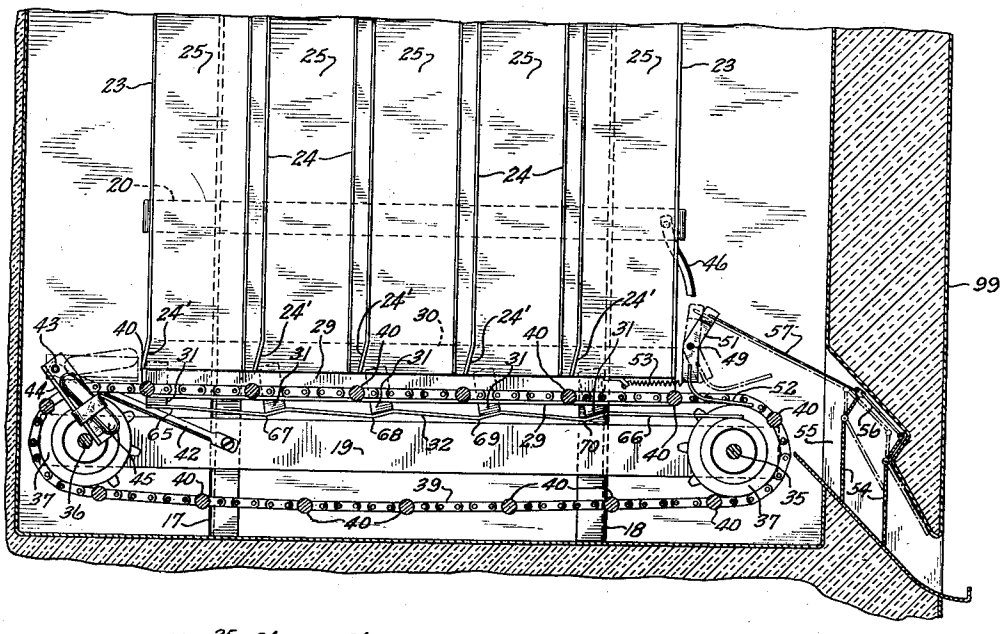
INVENTORS
G. W. Haase
L. O. Myhl
BY
Mosell & Mosell
ATTORNEYS.

Dec. 11, 1951 G. W. HAASE ET AL 2,578,545

VENDING MACHINE

Filed May 7, 1948 4 Sheets-Sheet 2

Fig. 2.



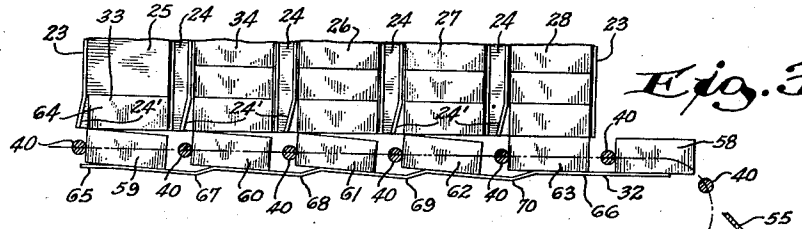


Fig. 3.

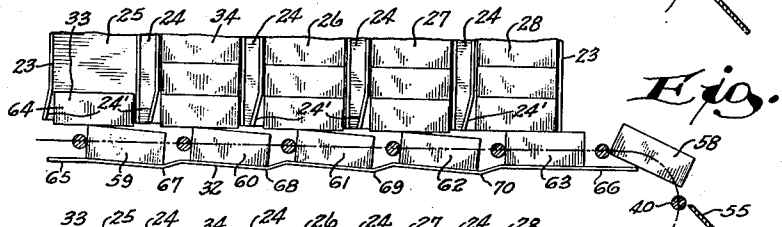


Fig. 4.

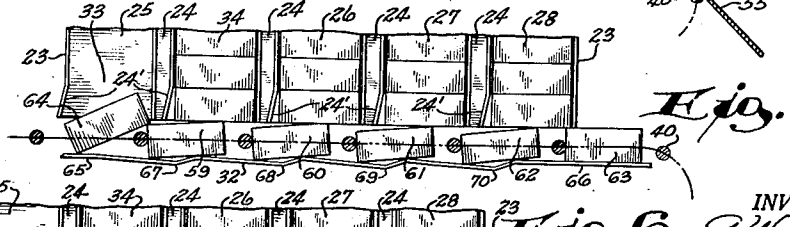


Fig. 5.

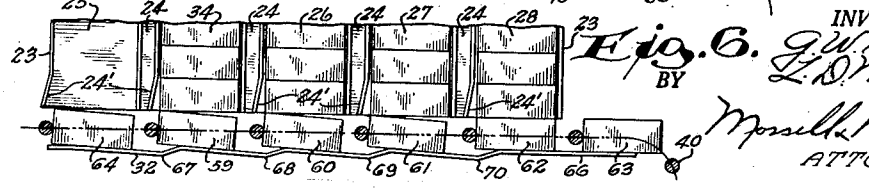


Fig. 6.

INVENTORS
G. W. Haase
L. D. Merkl
Morsell & Morsell
ATTORNEYS.

BY

Dec. 11, 1951 G. W. HAASE ET AL 2,578,545

VENDING MACHINE

Filed May 7, 1948 4 Sheets-Sheet 3

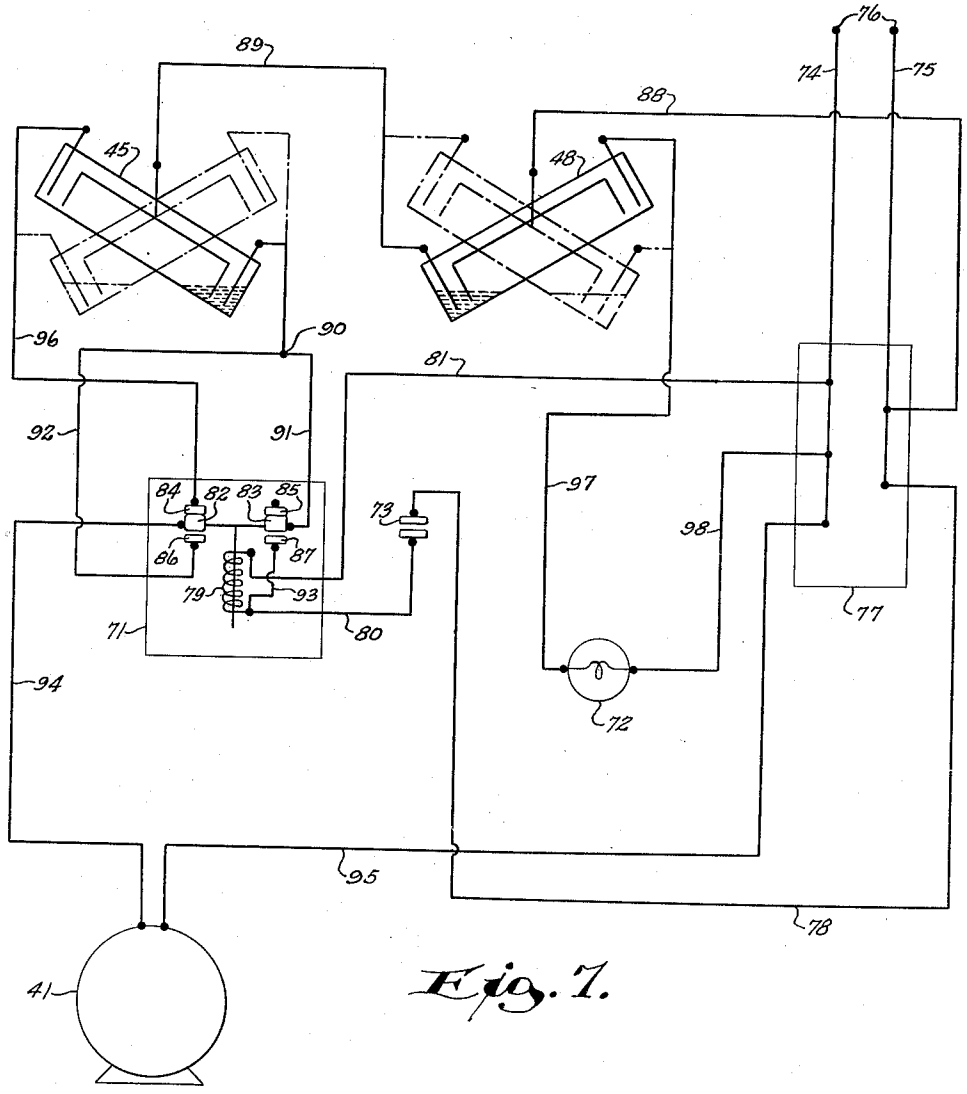


Fig. 7.

INVENTORS
G. W. Haase
L. O. Myrhl
BY Morsell & Morsell
ATTORNEYS.

Dec. 11, 1951 G. W. HAASE ET AL 2,578,545

VENDING MACHINE

Filed May 7, 1948 4 Sheets-Sheet 4

Fig. 8.

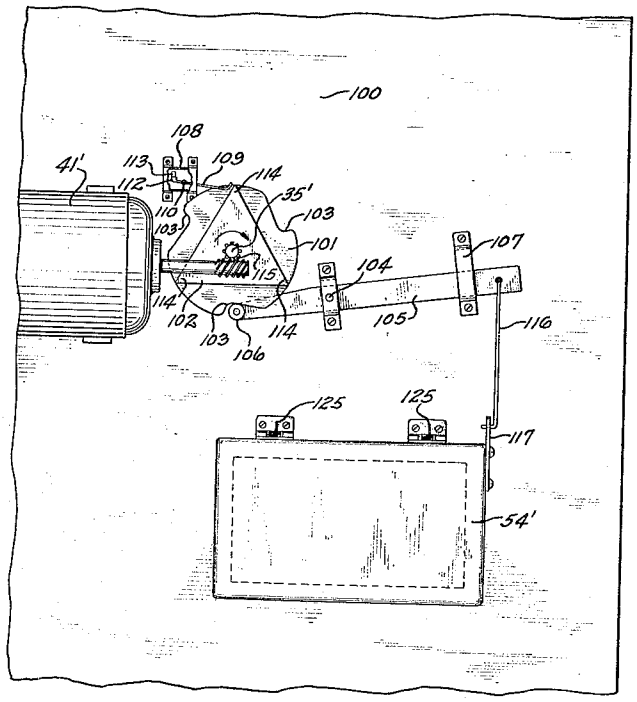
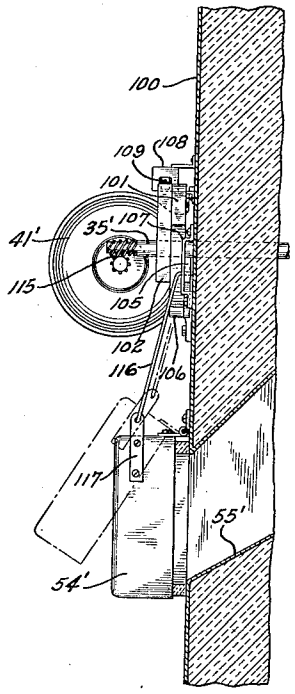


Fig. 9.



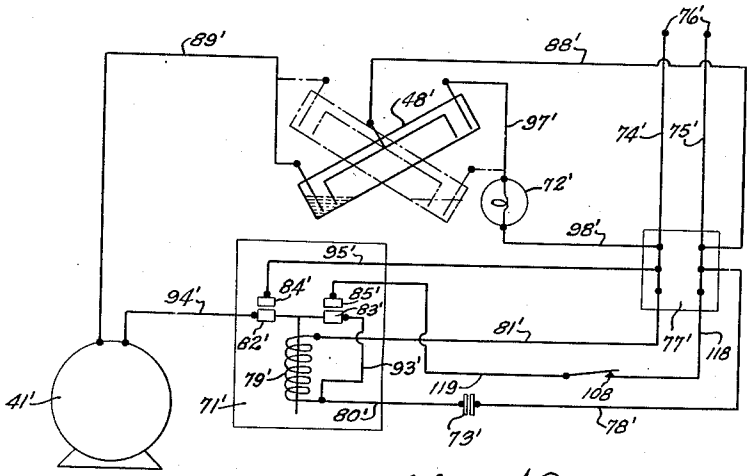


Fig. 10.

INVENTORS
G. W. Haase
BY L. O. Merkel
Morsell & Morsell
ATTORNEYS.

Patented Dec. 11, 1951

2,578,545

UNITED STATES PATENT OFFICE

2,578,545

VENDING MACHINE

Gordon W. Haase and Lloyd D. Merkl, Appleton, Wis.; said Merkl assignor to said Haase

Application May 7, 1948, Serial No. 25,588

10 Claims. (Cl. 312—63)

1

This invention relates to improvements in vending machines.

The vending machines which have been heretofore developed have not proven entirely satisfactory. Some of them depend almost entirely upon the force of gravity to cause the delivery of the packages vended, and a slight displacement of one of the packages stored in the machine is likely to render the machine inoperative. Some machines are not adapted for use in the vending of both refrigerated and non-refrigerated commodities, and still others, in order to provide for adequate storage capacity, embody expensive constructional features involving rotary storage racks or the like.

It is therefore a general object of the present invention to provide a vending machine construction which is adapted for operation in refrigerated cabinets as well as in non-refrigerated cabinets.

A further object of the invention is to provide a machine which does not rely solely upon the force of gravity to provide the impetus necessary for the dispensing operation, but rather, employes a positively acting, horizontal feed member for this purpose.

A further object of the invention is to provide a vending machine which has relatively few working parts and for this reason is economical to manufacture and repair.

A further object of the invention is to provide a vending machine which, simultaneously with the vending operation, opens one or more delivery doors to permit delivery of the vended package.

A further object of the invention is to provide a vending machine which can be easily and quick filled by reason of the fact that the packages stored therein are superimposed upon one another in a plurality of vertical stacks.

A further object of the invention is to provide a vending machine construction which may be provided with any desired amount of storage capacity without necessitating substantial changes in the working mechanism thereof.

With the above and other objects in view, the invention consists of the improved vending machine, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the drawing accompanying and forming a part of this application, wherein is illustrated one complete embodiment of the preferred form of the invention, and wherein the same reference numerals indicate the same parts in all of the views:

2

Fig. 1 is a front perspective view of the invention with the cabinet therefor not being shown;

Fig. 2 is a fragmentary vertical longitudinal sectional view of the invention, including an outer cabinet, taken approximately along the line 2—2 of Fig. 1, parts being removed to more clearly show the door operating mechanism;

Figs. 3, 4, 5 and 6 are fragmentary semi-diagrammatic vertical sectional views similar to Fig. 2, showing the movement of packages and of the conveyor flight bars during one dispensing operation;

Fig. 7 is an electrical diagram showing the circuit employed in the preferred form of the invention;

Fig. 8 is a fragmentary view of a modified form of the invention;

Fig. 9 is a fragmentary side view of the modified form of the invention shown in Fig. 8, portions being broken away and shown in section; and

Fig. 10 is an electrical diagram showing the circuit employed in the modified form of the invention.

Referring more particularly to the drawing, the numeral 10 indicates a left hand upright frame and the numeral 11 indicates a right hand upright frame. The frame 10 comprises a pair of spaced upright angle members 12 and 13 and a bar 14 connected to said angle members and extending transversely thereof. Connected to and spaced inwardly of the angle members 12 and 13 and spaced above the bar 14, is a transverse bar 15. Similarly connected to the angle members 12 and 13 and near the upper ends thereof is a bar 16.

The frame 11 includes a pair of spaced upright angle members 17 and 18 corresponding to the members 12 and 13 of the frame 10, to which is connected, near the lower ends thereof, a transverse bar 19. Spaced above the bar 19 and connected to the upright angle members 17 and 18 and spaced inwardly thereof, is a transverse bar 20. Spaced vertically above the member 20, and similarly connected to the angle members 17 and 18 near the upper ends thereof, is a transverse bar 21.

Supported between the upper portions of the frames 10 and 11 by being connected on the left side to the bar members 15 and 16, and on the right side of the bar members 20 and 21, is an elongated substantially rectangular magazine 22. The magazine 22 is preferably open at both top and bottom, as well as at the front and rear, as shown. Each side of the magazine 22, at both the front and rear ends, is vertically inwardly flanged,

as at 23 (see Figs. 1 and 2). On each side of the interior of the magazine 22 are connected a plurality of equally spaced vertically extending U-shaped channel dividing members 24, each having the flanges thereof extending inwardly. The dividers 24 and the flanges 23 provide each side of the interior of the magazine 22 with five separated vertically extending surfaces 25. Any desired number may, however, be employed. Since the flanges 23 and the dividers 24 on each side of the interior of the magazine are oppositely disposed, they cooperate with the surfaces 25 to provide storage means which permit the introduction therebetween of five separate stacks of packages, i. e., 33, 34, 26, 27 and 28 (see Figs. 3 to 6), one stack for each pair of oppositely disposed surfaces 25. The stacks 26, 27 and 28 are shown in Fig. 1.

It will be noted that the lower end of the forward flange of each of the channel dividing members 24, as well as the lower end of the rear flanges 23 are bent rearwardly as at 24' (see Figs. 2 to 6) for a purpose which will be hereinafter pointed out.

Attached to the bottom of each side of the magazine 22 is an elongated U-shaped channel member 29. The members 29 have their open sides facing inwardly, as shown in Figs. 1 and 2. The members 29 are positioned with their closed sides or webs spaced outwardly from an attaching flange 30 which projects upwardly from the inner edge of the upper flange thereof. The lower flange of the member 29 is of substantially the same length as the upper flange thereof.

Supported from the web of and spaced below each of the channels 29, as by the brackets 31, is a horizontally extending elongated undulous plate member 32. The plates 32 are preferably of such width that they project inwardly of the vertical dividers 24 of the magazine 22. It will be noted that when packages, such as those in the stacks indicated by the numerals 26, 27 and 28 of Fig. 1, are introduced into the magazine 22 through the top thereof, they will drop down toward and be supported at both ends on the plates 32. Fig. 3 shows the relationship between stacks of packages 33, 34, 26, 27 and 28 in the magazine 22, and shows the plates 32 thereunder supporting said stacks.

The lower transverse bars 14 and 19 of the frames 10 and 11 respectively are formed with alined apertures adjacent the ends thereof. Rotatably mounted in said apertures are a front shaft 35 and a rear shaft 36 which extend in a horizontal plane and at substantially right angles to the members 14 and 19. Immediately inwardly of the members 14 and 19 the shafts 35 and 36 each have fixed thereon a pair of spaced wheels 37. Mounted on the left hand sprockets of the shafts 35 and 36, and having the upper horizontal extent thereof extending along the upper surface of the lower flange of the left hand channel member 29, is an endless chain 38. Similarly mounted on the right hand sprockets of the shafts 36 and 37 and with the upper horizontal extent thereof extending along the upper surface of the lower flange of the right hand channel member 29 is an endless chain 39. Connected to and carried by the chains 38 and 39 are a plurality of transversely extending flight bars 40 which are spaced apart equally a distance slightly greater than the width of the surfaces 25, as shown in Fig. 2. The shaft 35 extends outwardly of the left hand bar 14, and is preferably removably connected to any suitable source of rotative power, such as an electric motor 41 provided with a suitable built-in gear reduction unit. Fig. 1 shows the motor removably connected to the shaft 35 relatively close to the bar 14. Where the unit is used in a refrigerated cabinet, the shaft 35 may be extended through the insulated wall of the cabinet and connected to the motor 41 in a non-refrigerated part of the cabinet. In this way the motor 41 and the gear reduction unit incorporated therein need not be subjected to refrigerating temperatures.

Referring to Fig. 2, a preferably tubular generally U-shaped supporting member 42 is fixedly connected at the ends of its arms to the horizontal bar member 14 and 19 adjacent the vertical frame members 12 and 17 resptctively. The arms of the member 42 extend upwardly, outwardly, and rearwardly from the points of connection, as shown in Fig. 2, and extend around the chains 38 and 39 to connect with a horizontal transverse extent 43 (shown only in cross-section in Fig. 2), which is disposed above the rear sprockets 37. Pivotally mounted on the transverse extent 43 of the member 42 for movement in a vertical plane is a short section of angle iron 44, on which is mounted, as shown, a tilable three-wire mercury switch 45.

The mercury switch 45 has an electrode which is common to both ends thereof (see Fig. 7), as well as a separate electrode at each end. The angle 44 is normally in the downwardly inclined position of the full line showing thereof in Fig. 2, but since it is in the path of the flight bars 40 when they move forwardly from the rear sprockets 35, the angle 44 and the switch 45 are tilted upwardly to the dot and dash line showing of Fig. 2 during a dispensing operation, by the advance of a bar 40 from the position to the rear of the angle 44 to its next position of rest. The angle 44 and switch 45 swing downwardly to the full line position of Fig. 2 upon disengagement from the bar 40 which has passed thereunder. The effect of this swinging movement of the mercury switch 45 will be described hereinafter.

Fixedly connected to the front ends of the horizontal bars 15 and 20 is a generally U-shaped, preferably tubular support member 46, which extends downwardly and forwardly as shown in Fig. 1. Mounted for pivotal movement in a vertical plane about an intermediate portion of the support 46, is preferably a short section of angle iron 47 to which is attached, as shown in Fig. 1, a mercury switch 48. The angle 47 is normally in the generally horiztontal position shown in Fig. 1 and the mercury switch 48 is corerspondingly normally in the tilted position shown in Fig. 1 and in the full line position of Fig. 7. The angle 47 is held in this horizontal position as long as there are any packages in the machine, but when the machine becomes empty, gravity causes the angle 47 and the switch 48 to swing downwardly, thereby causing the switch 48 to resume the position shown by the dot and dash lines of Fig. 7. The effect of this tilting movement of the switch 48 will also be described hereinafter.

Fixedly connected to the right hand arm of the member 46, as at 49, is a deflecting plate 50 which extends downwardly therefrom and which extends from a point immediately inwardly of the chain 39 (and slightly thereabove) forwardly and inwardly, as shown in Fig. 1. Pivotally mounted at 49 for movement in a vertical plane is a spring loaded bell crank lever 51. The lever 51 is positioned outwardly of the member 46, and

the deflecting plate 50, and the lower arm thereof is provided with a contact member 52 which normally extends in the path of the flight bars 40, as shown in the solid lines of Fig. 2. As the flight bar 40 which is rearwardly of the contact member 52 advances during a vending cycle, it forces the member 52 and the lower arm of the lever 51 to swing forwardly and upwardly to the dot and dash line showing of Fig. 2. As the flight bar moves forwardly out of engagement with the contact member 52, the member 52 and lever 51 are returned to normal position by the spring 53 which is connected between the lower end of the lever 51 and the magazine 22, as shown in Fig. 2. The invention includes a pair of spaced swingable doors 54 which are mounted in a delivery chute 55 and which have angularly offset upper portions which are connected by a link 56. The upper arm of the lever 51 is connected by a rod 57 to the doors 54 in the manner shown in Fig. 2. The doors 54 are normally in the closed vertical position shown by solid lines in Fig. 2. It will be seen from Fig. 2, that as the lever 51 pivots to the dot and dash line position therein, it will simultaneously swing the doors 54 to the dot and dash line open position. Conversely, as the lever 51 swings back to its normal position, the doors will also swing back to their normal closed position. It is, of course, obvious that a single insulated door may be used to seal off the delivery chute in place of the double doors 54.

During one vending operation, the chains 38 and 39, as well as the flight bars 40, move forwardly a distance substantially equal to the distance between adjacent pairs of flight bars 40. The mechanism controlling this measured movement will be explained hereinafter. Fig. 3 discloses the invention with stacks of packages 33, 34, 26, 27 and 28, stored in the magazine 22, and with a package 58 on the forward end of the plates 32 in position to be vended. It will be noted that the lower packages 59, 60, 61, 62 and 63, of the stacks 33, 34, 26, 27 and 28 respectively, are positioned on the plates 32 and support the remainder of the stacks thereabove. Only one package other than the package 59, i. e., the package 64, is shown in stack 33, in order that the operation of the invention will be more easily understood.

The undulous plates 32 are preferably formed with a relatively short horizontal extent 65 at the rear end and with a relatively long horizontal extent 66 at the forward end. The vertical spacing between said horizontal extents and the lower ends of the guides 24 and flanges 23 is preferably slightly greater than the thickness of one of the packages to be vended by the machine. Between the horizontal extents 65 and 66 the plates 32 are formed with a wavy extent which is made up of a series of downwardly inclined portions, each of whose forward ends 67, 68, 69 and 70 is slightly overlapped by the rear of the stack ahead. The number of said inclined portions is preferably one less than the number of stacks of packages stored in the magazine 22. At the forward end of each downwardly inclined portion is a relatively short surface sloping rather sharply upwardly and forwardly away from the apex. The apexes 67, 68, 69 and 70 are positioned slightly forwardly of the plane of the major portion of the forward side of each of the divider channels 24 as is clearly shown in Figs. 2 to 6.

The movement of the packages 59 to 64 during one vending operation will now be described.

As has been previously stated, the flights 40, during each vending operation, move a distance approximately equal to the distance at which they are spaced apart. Figs. 3 to 6 show various positions during one such operation, and since Figs. 3 and 6 represent the beginning and the end of a vending operation, it will be noted that the positions occupied by the flight bars 40, in both Fig. 3 and Fig. 6, are the same.

At the beginning of a vending operation (see Fig. 3), the bottom package in each of the stacks, i. e., 59, 60, 61, 62 and 63, as well as the package 58, is rearwardly engaged by a flight bar 40 and is being urged forwardly thereby. This urges the packages 59, 60, 61 and 62 down the downwardly inclined portions of the plates 32 toward the apexes 67, 68, 69 and 70, as well as urging the box 58 forwardly along the horizontal extents of the plates 32 as shown in Fig. 4. By their movement to the positions shown in Fig. 4, the forward ends of the packages 59, 60, 61 and 62 have been brought underneath the rear ends of the stacks 34, 26, 27 and 28 respectively, so that they are overlapped thereby. Further forward movement of the flight bars 40 will push the box 58 off of the forward ends of the plates 32 and onto the delivery chute 55. In addition, this further forward movement will cause the packages 59, 60, 61 and 62 to move up the relatively steep, short surface portions of the plates 32 which extend forwardly from the apexes 67, 68, 69 and 70, and to work their way forwardly under the stacks 34, 26, 27 and 28 respectively, as shown in Fig. 5. It will be noted that in Fig. 5 the box 58 does not appear, because it has already been delivered to the chute 55. In addition, Fig. 5 shows that as the box 59 moves forwardly out from under the box 64 to the position shown in Fig. 5, the rear end of the box 64 drops down into contact with the plates 32, leaving the forward edge of the box supported on the upper rear edge of the box 59. The portions 24' of the flanges 23 and the dividers 24 are bent rearwardly in a manner to provide sufficient clearance space at the bottom of each space 25 so that the lowermost box in the stack will swing down, as did the box 64, without any danger of the box becoming wedged between the guiding flanges adjacent thereto. In this way any possibility of jamming is avoided. Fig. 5 also shows that the box 63 has been moved horizontally forward along the extent 66 of the plates 32. Further forward movement of the flight bars 40 will move the packages 59, 60, 61 and 62 directly under the stacks 34, 26, 27 and 28 respectively, and will move the package 63 to the position occupied in Fig. 3 by the package 58. This forward movement will, as a result of moving the package 59 entirely out from under the package 64, cause the package 64 to drop down onto the plates 32 into the position occupied by the package 59 in Fig. 3.

It will be seen, therefore, that as the vending operations are carried on, packages from the rear stack 33 will be dispensed first. When the supply of packages in this stack becomes exhausted, then the next stack forward of the stack 33, i. e., the stack 34, will be drawn from, and then the stacks 26, 27 and 28, in order, until the supply of packages has been exhausted.

In order to control the movement of the flight bars 40, satisfactory results have been obtained from an electrical relay 71, associated in the electrical circuit of Fig. 7 with the mercury

switches 45 and 48, with the coil slot contacts 73 and with the motor 41. Also, in the circuit of Fig. 7, is shown a warning light 72 which, along with a coin slot containing the contacts 73, may be mounted in any convenient place on the exterior of the cabinet 99 (see Fig. 2) in which the improved vending machine is preferably housed. While the relay 71 is shown in Fig. 1 as being mounted on the unit itself, when used in a refrigerated cabinet it is preferably mounted in a non-refrigerated portion of the cabinet.

Since the invention works equally well under a wide range of temperature conditions, the interior of the cabinet 99 surrounding the invention may be provided with any suitable refrigerating means, such as refrigerating coils of conventional mechanical refrigerating units, when it is desired to vend such refrigerated products as ice cream bars, packaged ice cream, or the like. However, the invention is also well adapted to the vending of unrefrigerated products, and in such a case no refrigerating means need be provided.

Referring to Fig. 7, the preferred electrical control circuit will now be explained. In Fig. 7, the solid line showing of the mercury switch 45 corresponds to the solid line position of the switch 45 in Fig. 2. The solid line showing of the mercury switch 48 in Fig. 7 corresponds to the position of the switch 48 shown in Fig. 1. These solid line positions are the normal positions of the switches in question.

In Fig. 7, the lines 74 and 75 connect a source of electricity 76 with the terminals of a suitable distribution block 77, which may be part of the construction of the relay 71, though it is not shown to be such. Electricity passing through the lines 75 and 78 goes to one of the coin slot contacts 73. When a coin is inserted in the coin slot it passes between the contacts 73, thereby momentarily closing the circuit between the two contacts and permitting the electricity to pass to and through the solenoid coil 79 of the relay 71, via the line 80, and back to the source, via the lines 81 and 74. This momentary current flow energizes the solenoid coil 79 sufficiently to draw the contacts 82 and 83 of the relay 71 (which are normally urged by a spring into engagement with the contacts 84 and 85) into engagement with the contacts 86 and 87. With the relay contacts in this position, current flows from the source, through the lines 75 and 88, through the mercury switch 48, and through the line 89 and the mercury switch 45 to the point 90. From the point 90, current flows into both the lines 91 and 92. From the line 91, the current flows through the contacts 83 and 87, through the line 93, through the solenoid coil 79, and back to the source line 74 via the line 81. This keeps the solenoid coil 79 energized and the contacts 82 and 83 pulled into engagement with the contacts 86 and 87 after the coin has passed through the contacts 73. Current passing from the point 90 and through the line 92 goes through the contacts 86 and 82, through the line 94, to and through the motor 41, and back to the source line 74 via the line 95.

At this point the motor 41 is running and is moving the flight bars 40 forwardly along the upper extents of the chains 38 and 39 to perform the vending operation. As one of the flight bars 40 (see Fig. 2) engages the pivotally mounted angle support 44 of the mercury switch 45 and swings it upwardly to the dot and dash line position of Figs. 2 and 7, the circuit connecting the point 90 with the source 76 via the line 89 is broken, thereby shutting off the current flowing to the motor and to the solenoid coil 79 via the lines 92 and 91 respectively. As a result, the motor 41 stops, and the solenoid coil 79 becomes deenergized, thereby permitting the contacts 82 and 83 of the relay 71 to return to their normal positions in engagement with the contacts 84 and 85 respectively.

When the mercury switch has reached the dot and dash line position of Figs. 2 and 7, the line 89, leading from the source 76, is connected to the line 96. Current, therefore, travels from the source, through the line 89 as before described, through the mercury switch 45, through the line 96, through the contacts 84 and 82, through the line 94 to the motor 41, and back to the source line 74 via the line 95. This causes the motor 41 to again start running, after the momentary stoppage thereof which occurred while the mercury switch 45 was in the process of tilting to the dot and dash position.

As the flight bar 40, which caused the tilting of the mercury switch 45, moves forwardly out of contact with the angle support 44, said support and the mercury switch 45 again swing down to the normal solid line position of Figs. 2 and 7. This breaks the connection between the lines 89 and 96, and shuts off the current to the motor 41, thereby causing it to stop. Thus, one vending operation is completed. During this operation the flight bars 40 have moved ahead a distance approximately equal to the spacing therebetween. The result of this forward movement is clearly shown by Figs. 3 to 6, and will be readily understood from the description hereinbefore given with respect to said figures. Concurrent with this vending operation, the lever 51 (see Fig. 2) acts, in the manner previously described, to open the doors 54 in the delivery chute 55, thereby permitting the passage therethrough of the package being vended. After this has occurred and prior to the end of the vending operation the lever 51 acts as previously described, to close the doors 54, thereby preventing theft, as well as preventing (in the case of a refrigerated cabinet 99), entry of warm air into the interior of the cabinet.

When the machine becomes empty, the mercury switch 48, which is normally in the full line position of Figs. 1 and 7, swings downwardly to the dot and dash line position of Fig. 7. This breaks the connection between the lines 89 and 88 leading to the source line 75, thereby preventing any current from reaching the motor 41. This condition, of course, precludes any operation of the motor 41. The dot and dash position of the mercury switch 48 results in a connection between the lines 88 and 97. As a result, current flows through said lines, through the warning bulb 72, and through the line 98, back to the source line 74. This causes the warning bulb 72, which is preferably mounted on the exterior of the cabinet 99, to light up and to indicate to the public that the machine is empty.

A modified form of the invention is shown in Figs. 8 to 10 inclusive. In this modification a normally closed single pole, single throw switch 108 is used in a modified electrical circuit in conjunction with a double pole, single throw relay switch 71' in place of the mercury switch 45 and the double pole double throw relay switch 71 used in the circuit of Fig. 7. The modified form of the invention also provides an alternative

door opening mechanism which may be used with a cabinet having a curved chute which discharges the bars toward one side of the machine rather than substantially axially of the machine as shown in Fig. 2. The modification also discloses a single door 54' made of insulating material, rather than the double doors 54 of Fig. 2.

Referring to Figs. 8 and 9, the numeral 100 indicates an insulating side wall of a cabinet such as the cabinet 99 of Fig. 2. The wall 100 is formed with a discharge opening 55' which is covered with a hinged door 54' made of any suitable insulating material. A shaft 35', which corresponds to shaft 35 of Figs. 1 and 2, extends from the interior of the cabinet (which may or may not be refrigerated) through the wall 100, to the outer non-refrigerated side thereof. Mounted on the shaft 35' exteriorly of the wall 100 and fixed to the shaft 35' is a pair of cam members 101 and 102. The shape of the cams 101 and 102 may vary as the design of the unit is modified to suit various conditions, but the shapes shown in Figs. 8 and 9 have given satisfactory results.

In the preferred form of the invention one complete revolution of the shaft 35 is made for every three complete vending operations. The cams 101 and 102 are designed with as many like peripheral portions as there are vending operations for each revolution of the shaft 35'. In the case of the preferred form of the invention, this number is three.

The cam 101 is preferably substantially disc-shaped and has three equally spaced peripheral recesses 103. Mounted on the wall 100 for pivotal movement about a pin 104 is a lever 105. One end of the lever 105 carries a roller 106 which engages the peripheral edge of the cam 101. The other end of the lever 105 is pivotally connected to a rod 116 which in turn is pivotally connected to an arm 108 projecting from the door 54'. Normal clockwise rotation of the shaft 35' and the cam 101 will cause the roller 106 to move up and down as it follows the peripheral edge of the cam 101, thereby causing the lever 105 to swing the door 54' open and closed as said lever pivots on the pin 104. There are preferably springs 125 embodied in the hinges for the door 54' which normally urge the door to closed position. The weight of the door 54' plus the action of the spring hinges is sufficient to maintain proper contact between the roller 106 and the peripheral edge surface of the cam 101. A suitable guide bracket 107 guides the outer end of the lever 105 during pivotal movement of said lever.

The cam 102 is substantially triangular in shape. Mounted on the wall 100 adjacent the cam 102 is preferably a normally closed, single pole, single throw switch 108. The switch 108 essentially comprises an arm 109 pivoted near one end as at 110 with a spring embodied in said pivot to normally urge the arm toward the cam. The end of the arm 109 near the pivot 110 is provided with a contact 112 which is normally in engagement with a fixed contact 113. The opposite end of the arm 109 extends away from the spring pivot 110 into the path of the apexes 114 of the rotating cam 102. The extending end of the arm 109 is so positioned that as an apex 114 approaches it in a clockwise direction, the apex 114 will lift the arm 109 and pass thereunder. As the arm 109 is lifted by the apex, the electrical connection between the contacts 112 and 113 is broken. As the apex 114 passes out from under the extended portion of the arm 109, the force of gravity plus the spring action at the pivot 110 will cause the extended portion of the arm 109 to drop down to its normal position shown in Fig. 8, thereby again causing engagement of the contact 112 with the contact 113.

A motor 41' having a suitable built-in gear reduction unit similar to that of the motor 41 is mounted on the wall 100 and is connected with the shaft 35' by suitable worm and wormwheel gearing 115, as shown in Figs. 8 and 9.

Referring to Fig. 10, the electrical control circuit of the modified form of the invention contains several components of the preferred form. The mercury switch 48' is the same as the mercury switch 48, and the motor 41' is the same as the motor 41. The coin-slot contacts 73' are the same as the coin slot contacts 73, and the empty light 72' is the same as the empty light 72. The double pole single throw relay switch 71' is substituted for the double pole double throw relay switch 71 of the preferred form, and the single pole single throw switch 108 replaces the mercury switch 45 of the preferred form. The block 77' corresponds with the block 77 of the preferred form.

The relay switch 71' comprises a solenoid coil 79', a pair of fixed contacts 84' and 85', and a pair of movable contacts 82' and 83'. The contacts 82' and 83' are movable into engagement with the contacts 84' and 85' in response to energization of the solenoid coil 79'.

The lines 74' and 75' connect a source of electricity 76' with the terminals of the distribution block 77'. Electricity passing through the lines 75' and 78' goes to one of the coin slot contacts 73'. When a coin is inserted in the coin slot, it passes between the contacts 73' thereby momentarily closing the circuit between them and permitting the electricity to pass to and through the solenoid coil 79' of the relay 71' via the line 80' and back to the source, via the lines 81' and 74'. This momentary current flow energizes the solenoid coil 79' sufficiently to force the contacts 82' and 83' of the relay 71' upwardly into engagement with the contacts 84' and 85'. With the relay contacts in this position of engagement, current flows from the source through the line 118, the line 119, the contacts 85' and 83', and the line 93' to and through the solenoid coil 79' and back to the source via the lines 81' and 74'. The solenoid 79' thereby remains energized and holds the contacts 82' and 83' in engagement with the contacts 84' and 85' respectively. While the contacts are so held in engagement, current also flows from the source through the lines 75' and 88' through the mercury switch 48' and the line 89' to and through the motor 41' and back to the source via the line 94', the contacts 82' and 84', and the lines 95' and 74'.

At this point, the motor 41' is running and is rotating the shaft 35' to begin the vending operation. Fig. 8 shows the position of the cams 101 and 102 relative to the door opening mechanism and the switch 108 respectively, at the beginning of a vending operation. As the shaft 35' is rotated in a clockwise direction by the motor 41' the roller 106 is forced downwardly, thereby causing the lever 105 to swing the door 54' upwardly and outwardly (as shown by the dot and dash lines of Fig. 9) to permit delivery of the vended bar from the chute 55'. Rotation of the shaft 35' which is sufficient to cause delivery of a bar to the chute 55' will also cause an apex 114 of the cam 102 to move into position wherein it has

lifted the extended arm 109 of the switch 108 sufficiently to separate the contacts 112 and 113 thereof. This causes deenergization of the solenoid coil 79', thereby permitting the contacts 82' and 83' to drop out of engagement with the respective contacts 84' and 85'. As the contact 82' drops out of engagement with the contact 84', current ceases to flow through the motor 41', and the motor stops. Referring to Fig. 8, the arm 109 of the switch 108 is being held in "up" position by an apex 114 at the instant the electric current ceases to flow through the motor; however, the momentum of the rotating mechanism is sufficient to rotate the cam far enough to carry the apex 114 out of contact with the arm 109 to the position shown in Fig. 8. As the apex 114 moves out of contact with the arm 109, said arm drops down to its normal position, wherein the contacts 112 and 113 are again in engagement.

Coinciding with the breaking of the electrical connection at the switch 108, a recess 103 of the cam 101 moves into position over the roller 106 as shown in Fig. 8. This permits the roller 106 to move upwardly and causes the opposite end of the arm 105 to move downwardly under the weight of the door 54', thereby permitting the door 54' to swing closed. Thus, one vending operation is completed.

When the machine becomes empty, the mercury swithc 48' will tilt to the dot and dash line position of Fig. 10, thereby breaking the contact between the lines 88' and 89' and making contact between the lines 88' and 97'. Current will, therefore, flow from the source through the lines 75', 88', the switch 48', and the line 97' to and through the empty light 72' and back to the source via the lines 98' and 74'. It is apparent that the motor 41' is precluded from running while the switch 48' is in the dot and dash line position of Fig. 10.

Except as otherwise shown in Figs. 8 to 10 and herein otherwise described, the structure and operation of the modified form of the invention is the same as that of the preferred form.

Various other changes and modifications may be made without departing from the spirit of the invention, and all of such changes and modifications are contemplated as will come within the scope of the claims.

What we claim is:

1. In a vending machine having a delivery opening, an open bottomed magazine having compartments for at least two spaced stacks of packages, said stacks being positioned in line one behind the other, an undulous plate spaced below said magazine and extending horizontally forward toward said delivery opening, said plate being positioned to support said stacks and having at least one downwardly inclined surface portion, the major part of which is below one of said stacks and the forward end of which is overlapped by the stack ahead, and an endless discharge conveyor having portions movable along said plate and below said magazine toward said discharge opening.

2. In a vending machine having a delivery opening, an open bottomed magazine having compartments for at least two spaced stacks of packages, said stacks being positioned in line one behind the other, an undulous plate spaced below said magazine and extending horizontally forward toward said delivery opening, said plate being adapted to support said stacks and having downwardly inclined surface portions, each of said inclined portions having a major part thereof extending below one stack and having the forward end thereof overlapped by the stack ahead, the number of said inclined surface portions being one less than the total number of stacks in the magazine, and an endless discharge conveyor having portions movable along said plate and below said magazine toward said discharge opening.

3. In a vending machine having a delivery opening, an open bottomed magazine in which packages are adapted to be stacked, a horizontally extending endless conveyor movable below said stack toward said delivery opening for successively moving packages thereto, an electric motor for moving said conveyor, a pair of rotatable cams driven by said motor, at least one normally closed door at said delivery opening, an electrical circuit for said motor, said circuit including a coin-operated switch for starting said motor and including a second switch, said second switch being positioned for engagement by one of said cams during rotation thereof to stop said motor, and means actuated by the other of said cams for opening said door.

4. In a vending machine having a delivery opening near the forward end thereof, an open bottomed magazine in which substantially rectangular boxes are adapted to be stacked, said magazine having substantially vertically extending members for slidably engaging the front, rear and side surfaces of said boxes, the member engaging the rear surface of said boxes terminating at its lower end in a portion which slopes rearwardly away from said stack of boxes, and a horizontally extending endless conveyor movable below said stack toward said delivery opening for successively moving boxes thereto.

5. In a vending machine having a delivery opening: an open-bottomed magazine having compartments for at least two spaced stacks of packages, said stacks being positioned one behind the other; a stack supporting plate spaced below said magazine and extending longitudinally toward said delivery opening, said plate having at least two spaced surface portions each positioned to normally support one of two adjacent stacks, the rear end of the plate portion which supports the forwardmost of said stacks being offset upwardly from the forward end of the plate portion therebehind there being an upwardly inclined portion connecting said two plate portions, the upper end of said connecting plate portion being overlapped by said forwardmost stack; and an endless conveyor having portions movable along said plate and below said magazine toward the delivery opening.

6. In a vending machine having a delivery opening, an open bottomed magazine in which packages are adapted to be stacked, a horizontally extending endless conveyor movable below said stack toward said delivery opening for successively moving packages thereto, an electric motor for moving said conveyor, cam mechanism driven by said motor, a door for said delivery opening, an electrical circuit for said motor, said circuit including a coin operated switch for starting said motor and including a second switch, said second switch being positioned for engagement by said cam mechanism for stopping said motor, and means also actuated by said cam mechanism for opening said door.

7. In a vending machine having a delivery opening near the forward end thereof, an open bottomed magazine in which articles to be vended are adapted to be stacked, said articles having

rear surface portions, said magazine having substantially vertically extending members for slidably engaging said articles to be vended, one of said members being engageable with said rear surface portion of the article to be vended and said member terminating at its lower end in a portion which slopes rearwardly away from said stack, and a horizontally extending endless conveyor movable below said stack toward said delivery opening for successively moving articles thereto.

8. In a vending machine having a delivery opening: an open bottomed magazine having compartments for at least two spaced stacks of packages, said stacks being positioned one behind the other; a stack supporting plate spaced below said magazine and extending longitudinally toward said delivery opening, said plate having at least two spaced surface portions each positioned to normally support one of two adjacent stacks, the rear end of the plate portion which supports the forwardmost of said stacks being offset upwardly from the forward end of the plate portion therebehind, there being an upwardly inclined portion connecting said two plate portions; and an endless conveyor having portions movable along said plate and below said magazine toward the delivery opening.

9. In a vending machine having a delivery opening: an open bottomed magazine having compartments for at least two spaced stacks of packages, said stacks being positioned one behind the other; a pair of like laterally spaced stack supporting plates spaced below said magazine and extending longitudinally toward said delivery opening, each plate having at least two spaced surface portions, positioned to cooperate with like surface portions on the other plate to support one of said stacks, the rear end of the portion of each plate which supports the forwardmost of said stacks being offset upwardly from the forward end of the plate portion therebehind, there being an upwardly inclined portion of each plate connecting said two portions, the upper end of the connecting portion of each plate being overlapped by said forwardmost stack; and an endless conveyor having portions movable along said plates and below said magazine toward the delivery opening.

10. In a vending machine: an open bottomed magazine having a pair of oppositely disposed, spaced, parallel, vertical side walls, said side walls being provided on their inner surfaces with a plurality of corresponding oppositely disposed vertically extending equally spaced stack separating members providing compartments for at least two spaced stacks of packages alined one behind the other; a stack supporting plate means extending longitudinally beneath said magazine, said plate means having at least two spaced surface portions each positioned to normally support one of said stacks, the rear end of the plate portion which supports the forwardmost of said stacks being offset upwardly from the forward end of the plate portion therebehind, there being an upwardly inclined portion connecting said two plate portions; and an endless conveyor extending longitudinally of and below the magazine, said conveyor including an endless chain positioned outwardly of the inner surface of each of said magazine side walls, said chains each having an upper stretch above the stack supporting plate means, there being a plurality of spaced transverse flights connecting said endless chains and extending over said plate means below the magazine, said flights being spaced apart a distance substantially equal to the distance between separating nembers.

GORDON W. HAASE.
LLOYD D. MERKL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
823,955	Meredith	June 19, 1906
1,159,939	Hitchner	Nov. 9, 1915
1,509,249	Miles et al.	Sept. 23, 1924
1,717,926	Horowitz	June 18, 1929
1,986,714	Clayton	Jan. 1, 1935
2,222,862	Tratsch	Nov. 26, 1940
2,233,690	Williamson	Mar. 4, 1941
2,285,435	Holcomb	June 9, 1942
2,488,798	Bouracier	Nov. 22, 1949