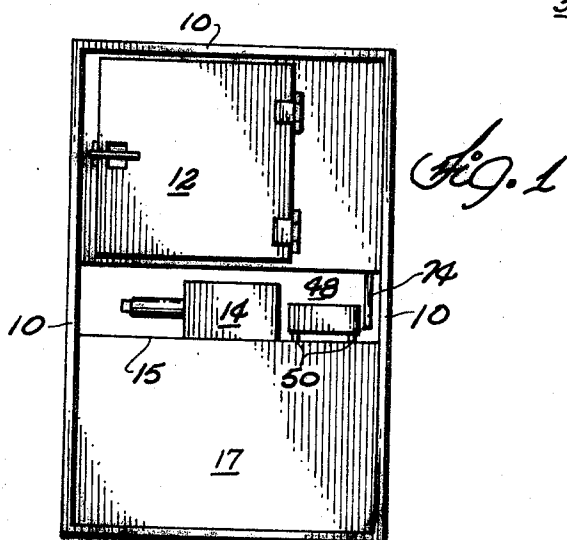
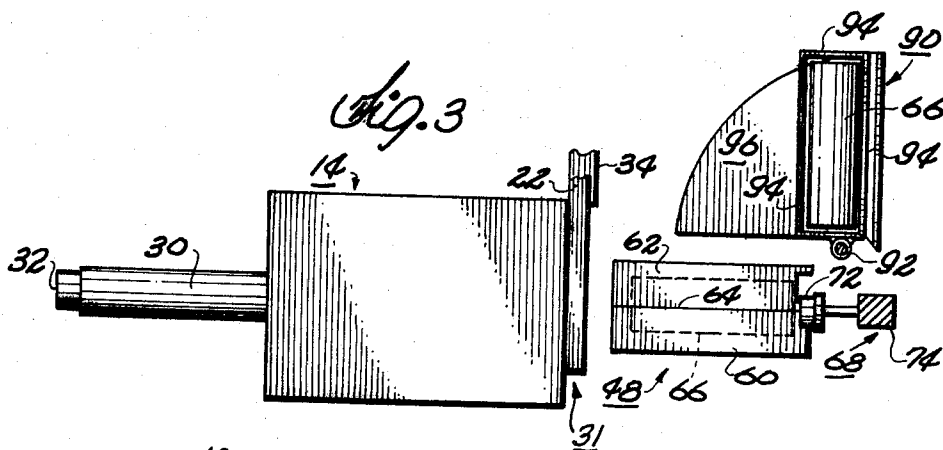
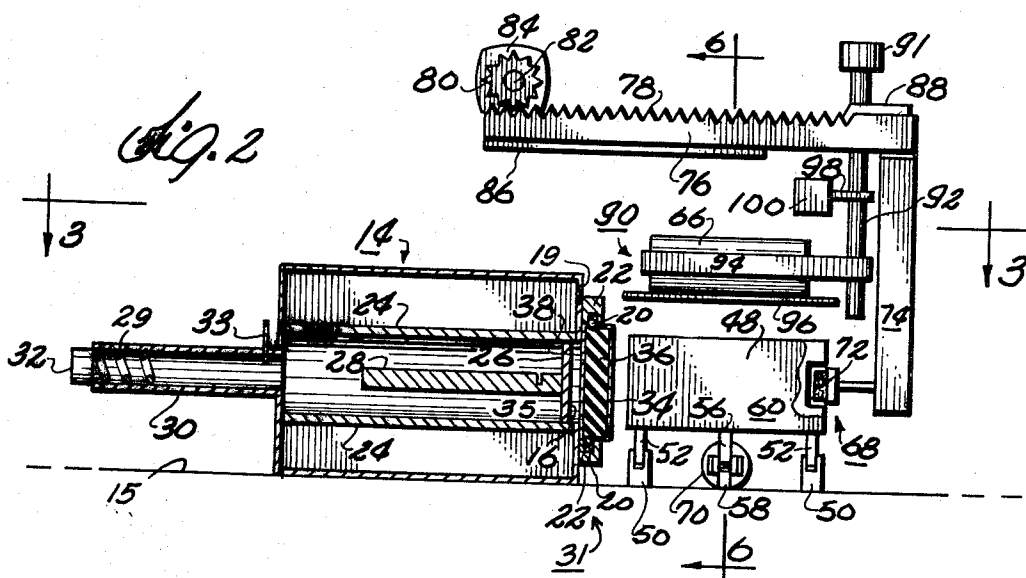


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VENDING APPARATUS

2 Sheets-Sheet 1



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VENDING APPARATUS

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Fig. 6

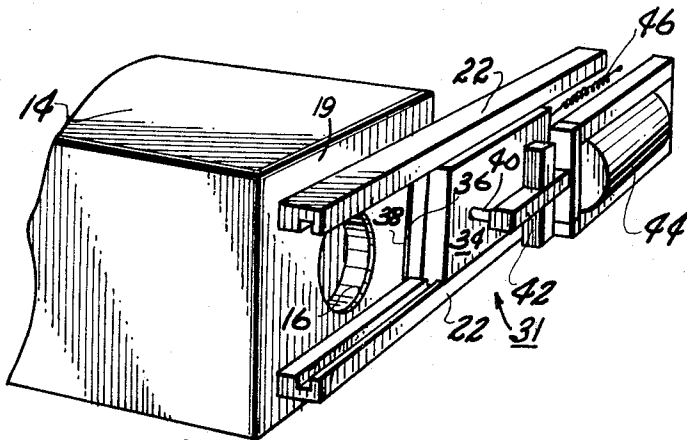
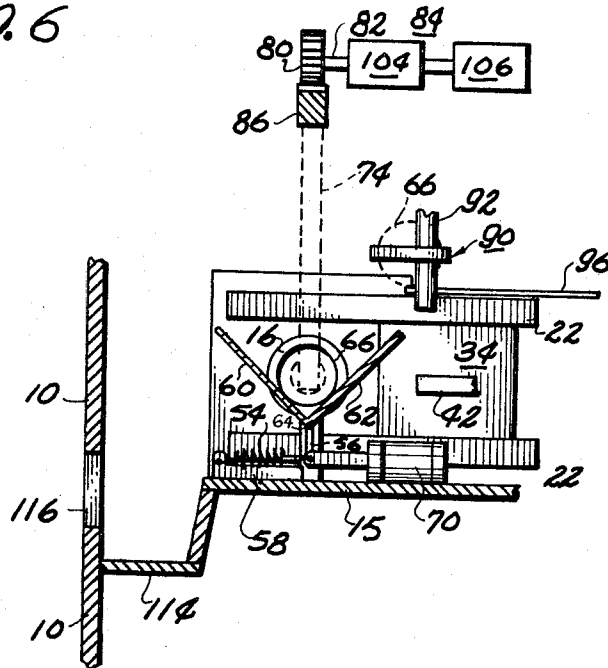


Fig. 1

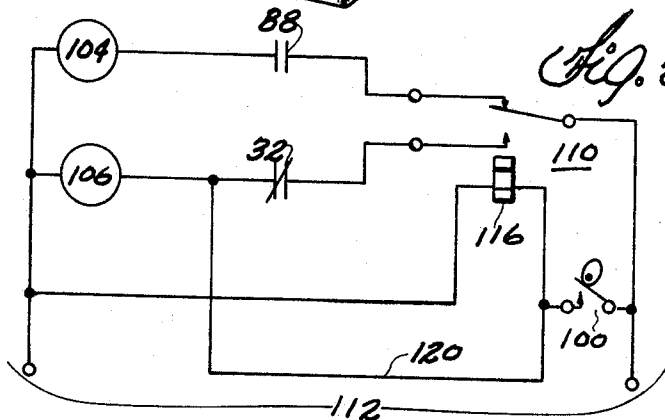


Fig. 5

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VENDING APPARATUS

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6 Claims. (Cl. 99—357)

This application relates to vending apparatus, and more particularly such apparatus adapted to automatically heat and vend frankfurter sandwiches or hot dogs or the like, in response to the insertion of coins into a coin receiving mechanism.

In the prior art, apparatus for vending hot dogs has been known, but this apparatus has suffered from the limitation of requiring too long a time for the heating portion of an operating cycle. When the required heating time is long, a limit is placed on the number of hot dogs a machine can vend during a specific interval, such as lunch time, for example, with the result that such vending machines are not economic for use in many applications. A second disadvantage of such prior art machines is that the product vended or dispensed therefrom has not, in all cases, been uniformly heated, but has tended to be warm on its exterior surface, while its center is still substantially at the colder temperature at which the hot dogs are maintained in storage prior to being dispensed.

It is an object of the present invention to provide vending apparatus by which hot dogs which are vended in response to coins being inserted into a coin receiving mechanism, are heated uniformly throughout by microwave energy, and heated in an exceedingly short time.

The invention disclosed and claimed herein is specifically adapted to be employed with the oven disclosed and claimed in copending Smith application Ser. No. 404,770 filed Oct. 19, 1964, for Electronic Ovens now Patent No. 3,289,570 which issued Dec. 6, 1966. That application discloses an oven adapted to accept a tubular food package, for heating the same from a storage temperature to an eating temperature. Microwave energy is employed to heat the food package throughout, while the package is maintained within a closed heating compartment within the oven. Certain modifications of the apparatus disclosed in that application have been made to render the operation thereof fully automatic pursuant to the insertion of coins in a coin receiving apparatus.

One such modification is in the manner in which the door is opened and closed. As described in that application, it is essential that the microwave energy be confined substantially to the heating chamber, and prevented from escaping therefrom, and for this purpose a door is employed by which the opening, through which the food package is inserted into the oven, is closed. The door is closed and sealed during the time the food package is being exposed to microwave radiation to heat the contents thereof. In the aforementioned Smith application, this door is closed manually, and the closure of the door functions to initiate the heating operation by activating the magnetron microwave source. In the present apparatus, however, the closing of the door is accomplished electrically, by means of a solenoid, during a predetermined time interval following initiation of the vending machine.

It is a further object of the present invention to provide vending apparatus in which signals are generated when certain functions have been completed to initiate

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sequential functions involved in heating and vending the food package.

Another object of the present invention is to provide means for automatically transporting a food package from a magazine into a microwave oven, and after a heating period, for automatically withdrawing the food package from the oven and presenting it to an outlet hopper.

These and other objects of the present invention will become manifest by examination of this specification and the accompanying drawings.

In one embodiment of the present invention there is provided, in a vending machine having heating means adapted to heat individually packaged food products to an eating temperature, said packages being loaded into said heating means in one direction along a straight line and ejected from said heating means in the opposite direction along said straight line, the combination comprising an elongated guide member formed with two intersecting planes and disposed with the intersection of said planes parallel to and directly below said straight line, said guide member being adapted for rotation about an axis extending parallelly with said straight line, ram means for individually loading said packages into said heating means by sliding said packages in a straight line longitudinally along said guide means, and means for selectively rotating said guide member about said axis to dump said packages from said guide member.

Reference will now be made to the accompanying drawings in which:

FIG. 1 is a front view of the exterior of the vending apparatus, with its front cover removed;

FIG. 2 is a front view of a portion of the apparatus illustrated in FIG. 1, shown in more detail;

FIG. 3 is a top view of a portion of the apparatus illustrated in FIG. 2;

FIG. 4 is a perspective view of a portion of the apparatus illustrated in FIGS. 2 and 3;

FIG. 5 is a wiring diagram of certain control apparatus associated with the apparatus of FIGS. 1-4; and

FIG. 6 is a cross-sectional view of a portion of the apparatus illustrated in FIG. 2, taken along the line 6-6.

Referring now to the drawings, there is illustrated an automatic vending machine, enclosed in a case 10, with the front cover of the machine removed to expose some of the interior apparatus. It will be understood that a coin receiving mechanism (not shown) is attached to the inside of a front cover adapted to cover the front of the apparatus illustrated in FIG. 1, or in some other convenient location, and is of a type conventional in the art adapted to provide an electric signal when coins adding to the sale price of a food package have been deposited.

Within the case 10, a magazine located behind a door 12 occupies substantially the upper half of the vending machine, with an electronic oven unit 14 being disposed approximately centrally within the machine under the magazine 12, supported on a shelf 15. Below the shelf 15, various control apparatus is disposed in a chamber 17, which control apparatus is adapted to furnish microwave energy to the oven unit 14, furnish the power for refrigeration apparatus associated with the magazine 12, etc. Such apparatus is not specifically illustrated and described herein, for it forms no part of the present invention.

The oven 14 comprises an electronic oven substantially as disclosed in the aforementioned Smith application, and is provided with an opening 16 adapted to be selectively

opened and closed by a slidable door 31 which is provided with guides 20 engageable in slides 22 and 23. The oven 14 contains therein a heating chamber 24 in the shape of a hollow right circular cylinder of dielectric material, as described in the aforementioned Smith application. Within the heating chamber 24 is a piston 26 adapted to be displaced by insertion of a food-containing package into the heating chamber 24, thereby displacing a shaft 28 axially disposed within a tube 30 projecting from the side of the oven unit 14 opposite the opening 16. As described in the aforementioned application, the displacement of the shaft 28 compresses a spring (which is illustrated diagrammatically as the spring 29 in FIG. 2). The shaft 28 is adapted to energize a switch 32 when it is moved toward its extreme leftward position as illustrated in FIG. 1, and a latch member 33 is provided for latching the shaft 28 in this position, by engaging a slot 35. Unlatching means (not shown) is also provided for preventing the shaft 28 and piston 26 from moving rightwardly toward their normal rightward positions under the influence of the spring 29, all as described in the aforementioned Smith application.

The door 31 comprises a relatively rigid base 34 having guide members 20 which are slidably engageable in the slides 22 and 23 for allowing movement of the door 31 in a direction parallel to the plane of the opening 16. A resilient pad 36 of polyurethane, or the like, it secured to the interior side of the door 31, and a thin sheet of conductive material 38 is secured to the opposite face of the pad 36, and is forced by the pad into intimate contact with the surface of the end wall 19 of the oven unit 14, in which the door opening 16 is disposed. As described in the aforementioned Smith application, this door assembly provides an effective seal against the escape of microwave radiation from the heating chamber 24.

A connecting member 40 is secured to the external side of the door 31, and connected to an operating shaft 42 of a solenoid 44. The door is adapted to be closed by energization of the solenoid, and the shaft 42 is pushed forwardly as illustrated in FIG. 4, thereby sliding the sheet 38 along the surface of the wall 19 until the opening 16 is completely covered. Upon de-energization of the solenoid 44, the door 31 immediately slides to its open position under the influence of a return spring 46.

Disposed directly in front of the door 31 is a V guide 48 having downwardly extending tabs 52 which are pivotally secured to support members 50. The V guide 48 is urged into the position illustrated in the drawings by a spring 54. The spring 54 is connected to and urges the member 56 against a stop member 58, secured to the frame of the apparatus.

The V guide 48 comprises two rigid planes 60 and 62 which intersect along a line 64 extending parallel to the axis of the heating chamber 24. The guide 48 may conveniently be formed of a piece of sheet metal bent along the line 64, or alternatively may be a solid block of material with a V groove cut therein. In the position illustrated in FIGS. 2 and 3, the V guide 48 is adapted to support a food package 66 (shown in phantom form in FIG. 3) in the form of a right circular cylinder, such that the package 66 is coaxial with the heating chamber 24. When the door 31 is in its open position, the package 66 may be slid directly into the heating chamber 24 of the oven 14 by means of a ram 68. A solenoid 70 is secured to the downwardly extending member 56, and upon energization of the solenoid 70, the member 56 is drawn rearwardly, causing the V guide 48 to rotate about the support members 50. When the solenoid 70 is de-energized, the spring 54 causes the V guide 48 to return to its normal position.

The ram 68 includes a resilient pad 72 disposed coaxially with the food package 66 supported on the V guide 48, and the pad 72 is secured to an upwardly extending member 74 which is connected at its upper end to a rack 76. The pad 72, the upwardly extending member 74 and

the rack 76 are all rigidly connected together, and are adapted to move first leftwardly, during which the ram 68 inserts the package 66 into the heating chamber 24, and then rightwardly to permit the door 31 to close over the opening 16 for the duration of the heating period.

The rack 76 is provided with a set of teeth 78 on its upper surface, and a gear 80 engages the teeth 78. The gear 80 is supported on shaft 82 adapted to be rotated as illustrated in FIG. 2, first clockwise and then counterclockwise by a motor 84, to bring about the required movement of the ram 68. The rack 76 is supported on a guide member 86 mounted on a bracket (not shown) for rectilinear movement. A limit switch 88 is disposed adjacent the rack 76 near the rightward end thereof, and is adapted to produce an electrical signal when the rack 76 is moved leftwardly from the normal position illustrated in FIG. 2. After the rack 76 has returned to its normal position, the signal generated by the limit switch 88 is terminated. Such limit switches are well known in the art.

Above the V guide 48, and to one side thereof, is disposed a swinging member 90 secured to a vertical shaft 92 which is mounted on a bracket (not shown). The member 90 is formed with four sheet-like sides 94, in the form of a hollow rectangle, and is adapted to permit a food package 66 to nest within the opening in the hollow rectangle while supported on a plate 96 directly below the swinging member 90. The member 90 may be considered a part of the magazine of the machine, and its function is to deliver food packages from the upper part of the magazine to the V guide 48.

As illustrated in FIG. 3, the normal position of the swinging member 90 is with the long dimension of the hollow rectangle extending normally to the axis of the heating chamber 24 of the oven 14. The upper part of the magazine of the machine is adapted to drop a food package into the swinging member when it is in this position, after which the shaft 92 is rotated by a motor 91 in a counterclockwise direction as viewed in FIG. 3, to swing the package 66 beyond the edge of the shelf 96, and cause the package 66 to drop through the hollow rectangle into the V guide 48. In this position, it is ready to be inserted into the oven by the ram 68.

A cam 98 is provided on the shaft 92 in proximity to a switch 100, such that when the shaft 92 rotates enough so that the package 66 is deposited within the V guide 48, the switch 100 is closed to indicate that fact. As described later, the closing of the switch 100 will trigger succeeding operations of the apparatus to insert the package into the oven 14, heat it, and then eject it into an outlet hopper.

The details of the magazine for storing the food packages are not specifically illustrated, for this unit in itself forms no part of the present invention. Any suitable magazine in which the food packages are maintained at a refrigerated temperature, and which drop the packages into place within the hollow rectangle of the swinging member 90, may be employed.

Referring now to FIG. 5, a wiring diagram is illustrated by which the sequence of operations of the apparatus illustrated in the figures is controlled. The motor 84 (FIG. 2) comprises two separate motors 104 and 106 disposed on the shaft 82, and each of the motors 104 and 106 is of the shaded pole type. The motors 104 and 106 are shaded differently so that they tend to cause rotation of the shaft in opposite directions when they are respectively energized. The switch 88 is in circuit with the right-hand terminal of the motor 104, and is connected to the normally closed contact of a single pole double throw relay 110. The movable contact of the relay 110 is connected to one terminal of a voltage source 112, while the left-hand terminals of the motors 104 and 106 are connected in common to the opposite pole of the source 112.

The right-hand terminal of the motor 106 is connected through a normally closed switch 32 to the normally open

contact of the relay 110. The winding 116 of the relay 110 has one of its terminals connected to one pole of the voltage source 112, and the other terminal is connected in series through the cam operated switch 100 (FIG. 2) to the opposite pole of the source 112. The common connection between the motor 106 and the switch 32 is connected to the common connection between the coil 116 and the cam operated switch 100 by a line 120.

The mode of operation of the apparatus illustrated in the drawings is as follows: After insertion of the proper amount of money in coins, the shaft 92 is rotated by the motor 91, and transports a package 66 within the hollow rectangle of the swivel mechanism from the position at which the package 66 emerges from the magazine, over the edge of the supporting plate 96, and permits the package 66 to fall into the V guide 48. When the shaft 92 is rotated through a sufficient angle to cause the package 66 to be loaded into the V guide, the cam operated switch 100 is closed, thereby energizing the relay coil 116, and reversing the contacts of the relay switch 110. The motor 106 is energized directly through the cam operated switch 100 to rotate the gear 80 and cause the rack 76 to be moved leftwardly as illustrated in FIG. 3. In addition to being energized through the cam switch 100, the motor 106 is also energized through the normally closed switch 32 and the normally open contact (now closed) of the relay switch 110. The shaft 92 thereupon begins to rotate the swinging member 90 back to its normal position as illustrated in FIG. 3. As the shaft 92 returns to its normal position, the cam switch 100 is opened, but does not disable the operation of the motor 106, or the relay coil 116, because of the closed circuit through the normally open contact of the relay switch 110 and the switch 32.

As the rack 76 continues to move leftwardly, leaving its normal position as illustrated in FIG. 1, the switch 88 closes, but does not produce any change in operation, for the normally closed contact of the relay switch 110 is now closed. The rack 76 continues to move leftwardly until the ram 68 has pushed the package all the way into the heating chamber 24 of the oven 14, and the piston 26 causes the leftward movement of the shaft 28 until the piston is latched in this position by latch member 33, and the switch 32 is opened. When the switch 32 opens, the relay coil 116 is de-energized, thereby permitting the movable contact of the relay switch 110 to return to its normal position, closing a circuit from the power source through the motor 104 and the now closed switch 88. The motor 104 causes the rack to move in its reverse direction viz, rightwardly, thereby to withdraw the ram 68 from the heating chamber 24. The rack continues to move rightwardly, urged by the motor 104, until it has reached its normal position where the switch 88 opens, thereby de-energizing the motor 104.

Thereafter, the solenoid 44 is energized, and the door 31 is moved by the solenoid 44 into closed position over the opening 16, and the microwave source is energized to supply microwave energy to the heating chamber 24. The duration of energization of the microwave source is controlled by a timer, as described in the aforementioned Smith application. At the conclusion of the heating cycle, the solenoid 44 is de-energized to enable the door 31 to return to its normal open position in response to the urging of the spring 46, and the latch member 33 is unlatched to permit the piston 26 to return to its normal rightward position. As the piston 26 returns to its normal rightward position, the package 66 is ejected from the oven compartment 24, and pushed into the V guide 48. After the V guide 48 receives the package 66, the solenoid 70 is energized to cause the member 56 secured to the bottom of the V guide to move rearwardly, thus tipping the V guide forwardly and dumping the package out of the V guide. An outlet hopper 114 (FIG. 6) is positioned beneath the V guide, so that the package is dumped into the outlet hopper 114 as the V guide is tilted by the solenoid. An opening 116 is provided in the front wall of

the case 10, to permit the package to be withdrawn from the hopper.

The entire sequence of events described above requires less than 20 seconds to withdraw a food package from a refrigerated magazine, heat the contents of the package to eating temperature, and deposit the same in the outlet hopper, after the initial insertion of the coins into the coin receiver. The length of time required by the heating cycle, while the package 66 is within the heating chamber 24, is only 6½ seconds.

From the foregoing description, the present invention has been described so that others skilled in the art may make and use the same, and by applying current knowledge, adapt the same to use under varying conditions without departing from the essential elements of novelty thereof, which are intended to be defined and secured by the appending claims.

What is claimed is:

1. In a vending machine having heating means adapted to heat individual packaged food products to an eating temperature, said packages being loaded into said heating means in one direction along a straight line and ejected from said heating means in the opposite direction along said straight line, the combination comprising an elongated guide member formed with two intersecting planes and disposed with the intersection of said planes parallel to and directly below said straight line, said guide member being adapted for rotation about an axis extending parallel with said straight line, ram means for individually loading said packages into said heating means by sliding said packages in a straight line longitudinally along said guide means, and means for selectively rotating said guide member about said axis to dump said packages from said guide member.

2. In a vending machine having a magazine for storing a plurality of packaged food products and a coin receiver, said vending machine being adapted to vend heated food products; the combination comprising a microwave oven, means for transporting a packaged food product from said magazine into said oven through an access opening therein, means for sealing said product inside said oven, means for unsealing said oven and for ejecting said package from said oven, said transport means comprising supporting means for supporting said package in aligned relation to said opening, and ram means for ramming said package into said oven through said opening.

3. Apparatus according to claim 2, wherein said supporting means comprises an elongated guide means having a V-shaped transverse cross section, with the line formed at the apex of the V being disposed in aligned relation to said opening.

4. Apparatus according to claim 3, wherein said ejecting means ejects said package onto said guide means, and said guide means is adapted for rotation about an axis extending parallel to said line, and including means for rotating said guide means about said axis from a normal position in which said supporting means supports a package in aligned relation with said oven to a second position in which the package is dumped from said supporting means.

5. Apparatus according to claim 4, wherein said rotating means comprises a solenoid for selectively tilting said supporting means.

6. Apparatus according to claim 2, wherein said ram means includes a pushing member, said pushing member having a resilient pad on its terminal face, said pad being adapted to be compressed when said package is fully loaded into said oven, said pushing member being connected to a rack, reversible motor means having a shaft, and a gear disposed on said shaft meshing with said rack, said pushing member being adapted to be moved back and forth for loading said package in response to rotation of said shaft.

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