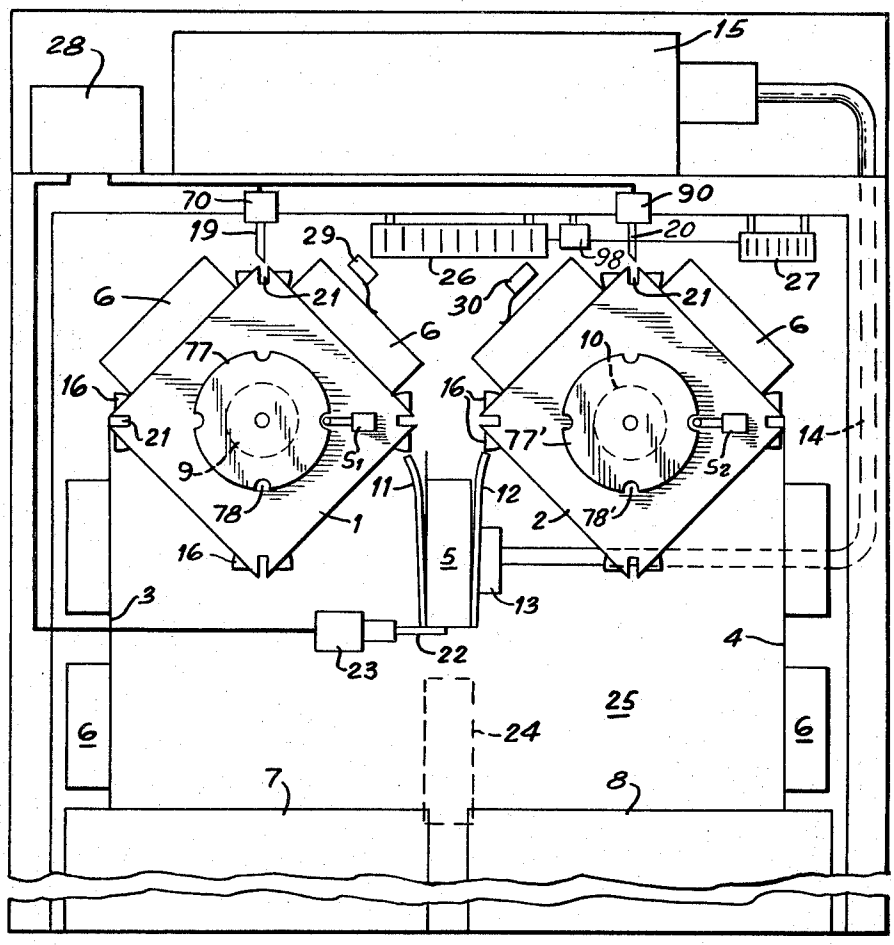
Sept. 26, 1967 Y. A. E. WASSBERG 3,343,479

SYSTEM FOR HEATING AND VENDING PACKAGED FOOD

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FIG. 1



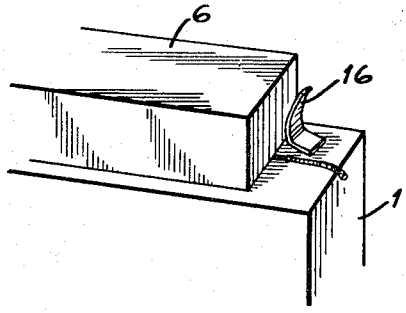


FIG. 3

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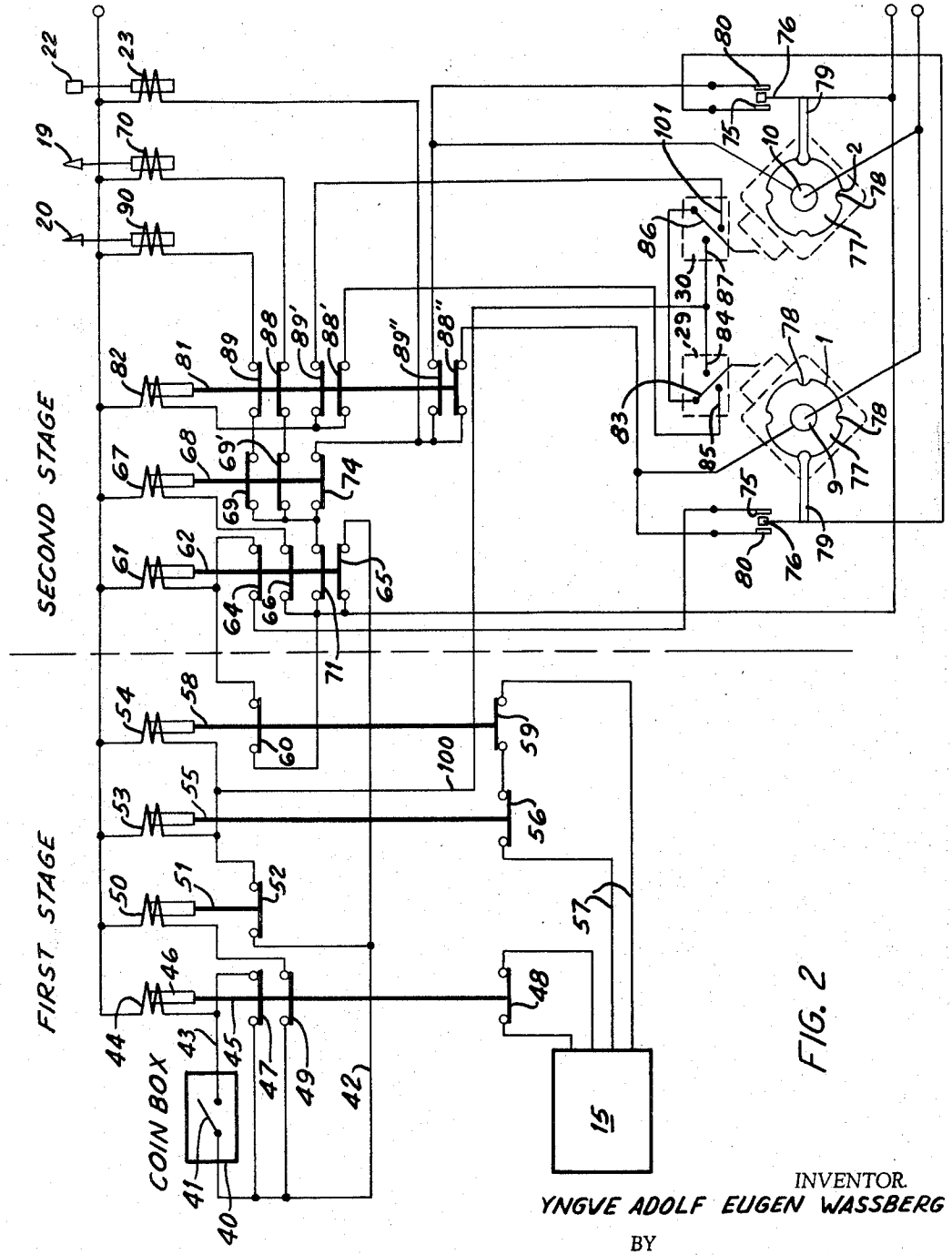


FIG. 2

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3,343,479

SYSTEM FOR HEATING AND VENDING PACKAGED FOOD

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1 Claim. (Cl. 99—352)

Apparatus for vending hot foods are known in which the apparatus is divided into a cold chamber and a discrete heating chamber. A door, or similar mechanism, provides passage of the food from the cold chamber to the heating chamber and from there the food is dispensed to the customer. In general, the known vending machines are complex and expensive devices and the sequence of operations thereof require a considerable period of time, since the food must be first removed from the cold storage and placed in the heater compartment before cooking or heating can commence.

A primary object of this invention is to provide a method of operating a vending machine which provides fast service to the customers.

Another object of the invention is to provide a vending machine of simplified design and therefore inexpensive to manufacture.

Another object of the invention is to provide a microwave hot food vending machine in which a wave guide horn is located within the cold storage compartment and is connected with a remote microwave generator whereby the heating chamber and the cold storage chamber are defined by substantially the same space.

Further objects and advantages will become apparent from the following description taken with the drawing in which:

FIG. 1 is a schematic representation of a vending machine according to the invention.

FIG. 2 is a diagram of a circuit for alternatively driving one or the other of the driving wheels shown in FIG. 1 and performing the sequence of operations for vending a hot food package according to the invention.

FIG. 3 is a detail view of a feature shown in FIG. 1.

Referring to FIG. 1, the apparatus shown comprises two driving wheels 1 and 2 each coupled with a chain of food packages. The wheels 1 and 2 feed the chains to the heating station 5, one package at a time. Each chain of packages consists of a number of discrete packages 6 connected together in any suitable manner by means of a tape, rope, or other flexible means 3 and 4. The tape or rope may be glued or stapled to the packages 6 or other suitable attachment may be used. The two chains of envelopes are each stored in a separate box 7 and 8 respectively, which boxes preferably are removable from the apparatus. The two driving wheels 1 and 2 are rotatable by means of separate electric motors 9 and 10 respectively, such that each wheel when actuated rotates only a quarter of a revolution, i.e., an angle corresponding to the pitch of the polygonal (square in the example shown) periphery of the wheel. A cam disc 77, 77' on the wheel shafts having 90° lobes 78 for opening the motor power circuit is described in detail in connection with FIG. 2. Each side of the wheels 1 and 2 receive a discrete package in the chain. Thus, each wheel will upon each intermittent rotation drive the associated chain of packages a distance corresponding approximately to the length of one package.

The heating station 5 consists of at least two opposite substantially parallel walls 11, 12. However, it may also consist of a channel closed on all sides but open at the ends. In one of the side walls 12 of the heating station 5 there is situated a horn device 13 for radiating high frequency electro-magnetic energy, commonly referred to as

a wave-guide horn. The said device 13 is connected through a wave-guide or a coaxial cable 14 to a high frequency generator 15 of a kind known per se.

The periphery of the driving wheels 1 and 2 are provided with pins 16 for engaging the packages placed on the wheels so that the chain does not slip away from the wheel prematurely by its own weight. As seen in FIG. 1, the pins or clips 16 engage the trailing side of the package in pushing relation. The pins 16 leading the package as shown in FIG. 3 retain the package separated from the chain until the associated wheels rotates a few degrees of arc.

For each wheel 1 and 2, there is a knife 19 and 20 respectively, at the upper corner of the associated driving wheel. Each knife can be brought into a slot 21 in the wheel for cutting the strip connecting the first package in the chain from the following package so that the first package is separated from the chain. These knives may be operated by a solenoid controlled by a relay of the control 28 to be described hereinafter in connection with FIG. 2.

Beneath the heating station 5 there is situated a displaceable stop means 22 which maintains a package in the heating station. The stop means 22 can be removed by means of an electromagnet 23 controlled by a relay in the control 28 so that it releases the package in the heating station, whereby the said package falls by gravity into a pocket or a box 24 which is accessible through the front panel of the apparatus.

The two stores 7 and 8, the driving wheels 1 and 2 and the heating station 5 are suitably arranged in a space 25 within the outer housing of the apparatus which is heat-insulated against the surroundings. Within this space 25 there is suitably arranged a cooling device 26 and a heating device 27 adapted to maintain the temperature within the space 25 at a substantially constant value, for example 0° C., so that the food situated in the apparatus space is not spoiled. The heating device 27 of course is required only when the apparatus is to be placed outdoors where low temperature may spoil the food in the apparatus. The devices 26 and 27 are controlled by a thermostat 98 in known manner.

The high frequency generator 15 is preferably placed outside the temperature controlled space 25 as considerable quantities of heat or produced by the high frequency generator. However, the wave-guide horn 13 is inside the cold space 25.

In order to control the alternative driving of the two wheels 1 and 2 and thus the alternative driving of the two chains 3 and 4, there is provided control devices 29 and 30, for each wheel, actuated by the packages upon the respective wheel. Each device 29 and 30 is shown as a micro-switch but of course may consist of any means for sensing the presence of a package upon the wheel, for example a photocell device. At any rate, the space between packages is accounted for and switches 29, 30 only change position when the chain runs out. Operation of the switches 29 and 30 and motors 9 and 10 is described in connection with FIG. 2. The motors 9 and 10 are not rotating continuously but are driven intermittently under the influence of the control device 28 in a way which is more fully described in the following description of FIG. 2.

FIG. 2 illustrates an electric circuit diagram of an automatic control device 28 for the vending machine of FIG. 1.

When a coin is inserted in the box 40 a switch 41 is momentarily closed which connects a conductor 43 and the solenoid 44 of relay 45 to a supply conductor 42. The core 46 of the solenoid 44 actuates the relay 46 to close the three switches 47, 48 and 49 which are normally open. The switch 47 closes a circuit in parallel with the circuit of coin box 40 whereby solenoid 44 remains ac-

tivated and switches 47, 48 and 49 remain closed. Current is therefore conducted through switch 48 for filament heating and magnetization of the magnetron of the high frequency generator 15. After a suitable period of time, a delayed action relay 50, 51, of any suitable known construction, is actuated via the closed switch 49 and current supply conductor 42, to close switch 52. The delay in closing switch 52 is selected to provide sufficient time for the cathode of the magnetron to reach its operating temperature as is known. When solenoid 50 closes switch 52 of relay 51 and the magnetron generator 15 is ready to be energized, two further solenoids 53 and 54 are actuated. The relay 55 via solenoid 53 closes switch 56, which, in turn, closes the current supply circuit 57 to energize the magnetron generator 15, and thereby cause the high frequency heating cycle to begin. The switch 59 is normally closed and is opened by a delayed action relay 54, 58 thereby terminating the heating cycle. The delayed action relay 54, 58 may be of any suitable known type which is adjustable to allow selection of the correct heating period.

The first stage of the circuit diagram of FIG. 2 controls the heating cycle of the vending machine. In non-operation, the first stage contact bridges or switches 47, 48 and 49 of relay 45, bridge 52 of delay relay 51 and bridgs 56 of relay 55 are open. Only bridge 59 of the first stage is normally closed during non-operation of the said heating cycle as well as during the heating cycle and is provided for terminating the heating cycle. When the heating cycle is terminated by operation of delay relay 58 bridge 59 is opened and the bridge 60 is closed. Bridge 60 energizes solenoid 61 of relay 62. The bridge 64 is closed by actuation of relay 62 to provide a holding circuit for maintaining relay 61 actuated when relay 54 is de-energized as follows:

When relay 62 is energized and held, the bridge 65 which is normally closed, is opened whereby the supply conductor 42 is disconnected from the main supply conductor 63. Consequently, solenoids 44, 50, 53 and 54 are de-energized, opening the associated bridge contacts of the first stage except bridge contact 59 which closes. The bridge 60, linking the first and second stage of the circuit of FIG. 2, is also opened, but the holding circuit including bridge 64 and contacts 75, 76 or 75', 76' maintains the solenoid 61 energized and the bridge 64 closed and bridge 65 open.

Since solenoid 61 remains energized, the contact bridges 66 and 71 which are normally opened, are now closed. Bridge 66 provides current for a short-time-delay-relay 67, 68. Bridge 71 supplies current for the bridges 69, 69' and 74 of the delay relay 68.

The bridge contact 69 of relay 68 is normally closed and as a result the electromagnet 70 is energized for activating the knife 19 (FIG. 1) for separating the first two packages of the chain on wheel 1. After a short delay (long enough to operate knife 19), the solenoid 67 of relay 68 is activated and opens the bridge 69 which causes the knife to retract so that the wheel 1 is free to rotate without interference with the knife 19. At the same time that the bridge 69 opens, the bridge 74 closes, whereby the electromagnet 23 is energized to withdraw the stop means 22 (FIG. 1) discharging the hot food package. Closure of bridge 74 also completes the current circuit for motor 9. This motor circuit includes the main conductor 63, bridges 71 and 74, and the bridge 88'' of relay 81. The operation of relay 81 will be described hereinafter in connection with the changeover from one wheel having no food packages remaining thereon to the second wheel having a full chain of packages.

From the foregoing, it will be clear that the package of hot food is discharged substantially simultaneously with termination of the heating cycle and that the next food package to be heated is severed from the associated chain and the wheel carrying this package begins to rotate for delivering it to the heating station 5 (FIG. 1).

It is noted that the stops 16 prevent the package just severed from the chain from falling from the wheel until it has rotated a few degrees of arc.

As soon as the motor 9 begins to rotate, the contacts 75, 76 are opened by the pin 79 which resides in a recess 78 of the disc 77 connected to the motor shaft. The recesses 78 are spaced at 90° intervals from one another. While contacts 75, 76 open, contacts 75, 80 close so that the motor continues to run, however, when contacts 75, 76 open, the solenoid 61 is de-energized since its holding circuit included the closed contacts 75, 76. It is noted here the contacts 75', 76' of motor 10 are in series with the contacts 75, 76 of motor 9. Thus, when motor 9 is started and contacts 75, 76 open the holding circuit of relay 62 is opened and relay 62 returns to its initial condition. Solenoids 67 and 72 are de-energized as a result of the return of relay 62 to its initial condition and the relays of both the first and second stage of the control circuit are ready for the introduction of the next coin.

The motor 9 rotates 90° and when pin 79 enters the next recess 78 it stops because contacts 76 and 80 are disengaged.

When the chain of packages associated with wheel 1 is exhausted, this wheel is automatically disconnected and wheel 2 is connected by virtue of a suitable known bi-stable relay 81 and associated contact bridges. It is known that a bi-stable relay will remain in its actuated position until it receives a current pulse, whereupon it moves to its other position and each time it receives a pulse it changes position.

In order to describe the operation of relay 81, it will be assumed that when the vending machine of FIG. 1 is first stocked with food packages each wheel 1 and 2 is provided with a chain of packages and that the relay 81 has been placed in its lower position manually. In the lower position of relay 81, bridges 89, 89' and 89'' are open and bridges 88, 88' and 88'' are closed. The first customer places a coin in the coin box 40, and during the heating cycle when current is supplied to solenoid 54 a voltage is also applied to conductor 100 to contacts 84, 83 of the sensing device 29 and also to contacts 86, 87 or the sensing device 30, however, no voltage is fed through either of the sensing devices 29 or 30 to either of the bridges 88' or 89' of the relay 81. As a result, the solenoid 82 does not receive a pulse. Referring to the previous description of the second stage of the circuit, wheel 1 will be operated by this first coin and each succeeding coin until the chain of associated food packages is exhausted. Assuming wheel 1 is empty, the next customer inserts a coin in the machine and during the heating cycle energy is supplied to the solenoid 54 and also to conductor 100. Since the wheel 1 has no package on it, the contacts 83, 84 of the sensing device 29 are opened but the contacts 83, 85 or device 29 are closed. Therefore, current passes through closed contacts 86, 87 of the sensing device 30 of wheel 2 which is prepared with a chain of packages. The current then passes through contacts 86, 87 of device 29 and through bridge 88' of relay 81 to solenoid 82. It is noted here that relay 81 was set manually in its lower position which closed bridge 88'. Now that solenoid 82 has received a pulse, it shifts to its upper position which opens bridge 88' as well as bridges 88 and 88''. Now when the second stage relays 62 and 68 are energized, energy will pass through bridges 71, 74 and 89'' to motor 10.

When the next succeeding customer inserts a coin no further pulse will be applied to solenoid 82 because the circuit including elements 100, 87, 86, 83, 85 is open at bridge 88'.

When the wheel 1 is supplied with a chain of packages, wheel 2 continues to dispense the packages associated therewith because the circuit conditions are again as described above when both wheels contained packages and the relay was manually set in its lower position with the exception that relay 81 must now be considered as having been set manually in its upper position.

Now, assuming that the wheel **2** is exhausted of packages, the next coin inserted in the vending machine will supply a pulse to solenoid **82** via conductor **100**, contacts **84**, **83** of sensing device **29** (since wheel **1** has a supply of packages) and then through sensing device **30** via contact **86** and **101** to the bridge **89'** (which is closed in the upper position of relay **81**) and then to the solenoid **82**. This pulse now shifts the relay **81** to its lower position so that no further pulses reach the relay until wheel **1** has exhausted its supply of packages and wheel **2** has been replenished.

It is evident that a number of modifications of the described embodiment are possible within the scope of the invention. Thus, it is not necessary for an apparatus according to the invention to comprise two stores for two chains of envelopes and two driving wheels associated with these two stores, even if such an embodiment is very advantageous. Nor is it necessary for the driving wheels to have a square-shaped circumference as shown. Of course, each polygonal circumference adapted to the length of the envelopes can be used. Furthermore, the knife for cutting the outermost envelope from the chain can be situated immediately at the top of the heating station **5** for cutting the envelope situated in the heating station from the chain only when the envelope is already heated. The envelope situated in the heating station will then be connected to the chain until it has been heated whereby no stop means will be necessary in the heating station. It is furthermore evident that the periphery of the driving wheels must not necessarily be shaped with complete side walls but the said wheels may for example, consist substantially of radial arms only, the outer ends of which define the corners of the polygonal circumference of the driving wheels.

What is claimed to be new and useful and secured by Letters Patent of the United States is:

A hot food vending machine comprising a housing member containing a cold storage compartment, a heating station within said cold storage compartment, said heating station comprising a microwave horn and food package retaining means; a radiant energy generator of high frequency, radiant energy conducting means interconnecting said horn and said generator, said generator being located outside of said cold storage compartment, at least one food package storage container within said compartment, means for sequentially removing food packages from said container and delivering a single food package to said heating station, refrigerating means within said cold storage compartment, a heater device means positioned in said cold storage compartment, said refrigerating means and said heater device means being interconnected thereby regulating the temperature of said cold storage compartment, and means for delivering said heated food package from said heating station.

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