(54) Title: COMMERCIAL TOASTER APPARATUS

(57) Abstract: A commercial toaster apparatus that has a quick start feature that nearly instantaneously changes a lower "standby" temperature to a "full on" temperature that is sufficient to toast a product. The apparatus has heating elements using open coils using a resistance nickel chromium ribbon. A conveyor is used to move the product through the oven of the apparatus so that it may be toasted. The speed of the conveyor is user-controlled so that different degrees of toasting may be obtained. The toaster also provides a rear discharge feature so that the apparatus can function continuously for pass-through operation. The "standby" mode uses less energy since the heating elements are cycled such that only two-seconds of heating occur during every ten-second cycle.
Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(U))

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(Hi))

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COMMERCIAL TOASTER APPARATUS

FIELD OF THE INVENTION

This present invention relates to the manufacture of cooking appliances for use in commercial settings such as hospitals, motels, restaurants and other locations where large quantities of food are prepared, and, in particular, food products that are to be toasted such bread, rolls, bagels, muffins, etc. prior to serving.

BACKGROUND OF THE INVENTION

The method of scorching bread to preserve it dates back to the Romans. Additionally, toasting makes the bread crunchier and thus provides an ideal surface for spreading all sorts of things. In fact, the word "toast" comes from the Latin terms *torrere, tostum* - meaning to scorch or burn. The tradition spread to Britain and the English colonists brought the tradition to America.

Electric toaster appliances date back at least to the early 1900’s. The earliest electric toaster was invented by Charles Strite in 1919. The first units utilized an open resistive wire arrangement, that, upon having a current placed in the wire, caused the wire to heat and glow. The untoasted slice of bread was placed in the unit adjacent to the heating element and left there for a period of time until the slice of bread was properly browned. Since, frequently, the toast ended up 'black' due to forgetting to remove it in a timely manner, a timer was added and pop-up features were added to remove the toast when done.

To provide for large quantities of toast products to be produced quickly, commercial toasters were developed that made use of a conveyor belt sandwiched between heating elements that typically used CALROD elements to provide the heat.
In this manner, slices of bread or other products that are to be toasted are fed into the feed port in the top front of the appliance and a conveyor slowly passes the slices of bread between the heating elements. By controlling the length of time the slices of bread are exposed to the heating elements by controlling the speed and length of the conveyor and by controlling the temperature of heating elements, the product can be uniformly toasted.

Once the slice of bread reaches the end of the conveyor, it is dropped into an exit below. For continuous operation, the unit can be designed to have an adjustable baffle that changes the direction of the exit from the bottom front of the unit to the rear.

Representative of this type of apparatus is APW Wyott's model XTRM-2. This device uses a radiant heating system with a convection pre-heat system to pre-dry the bread (or product to be toasted) in the loading zone. The unit is said to produce 800 slices of toast per hour.

While this device works well, it does have some drawbacks. In order to ensure that the time spent toasting the product is uniform; the unit must be in the "standby" mode to allow the CALROD heating elements to reach proper toasting temperature before the slices of bread are presented to the conveyor. While the "standby" position does reduce the energy requirements by approximately 50%, the cost to keep the unit ready for use in a quick fashion is still considerable. Also, by having the unit "on" constantly during the time that it is not being fully utilized wastes energy. Also, this type of heating unit takes time to heat which wastes energy necessary to get the unit to operating temperature.

A toaster that has a "ready" mode that can be changed to nearly instantaneous "toasting" mode is not found in the prior art. Further, a toaster having that capability
that uses a heating element that maximizes transfer of radiant energy to the product that is to be toasted is also not found in the prior art devices.

SUMMARY OF THE INVENTION

It is an aspect of the invention to provide a commercial toaster apparatus that has a quick start feature that nearly instantaneously changes the "stand-by" mode to toasting mode.

It is another aspect of the invention to provide a commercial toaster apparatus that has heating elements using open coils.

It is still another aspect of the invention to provide a commercial toaster apparatus that has heating elements that are made from a resistance ribbon.

Another aspect of the invention is to provide a commercial toaster apparatus that features a conveyor to move the product to be toasted in the apparatus.

It is an aspect of the invention to provide a commercial toaster apparatus that has a conveyor wherein the speed of the conveyor can be controlled by an operator using a potentiometer.

Another aspect of the invention is to provide a commercial toaster apparatus that has a rear discharge feature so that the apparatus can function continuously for pass-through operation.

Still another aspect of the invention is to provide a commercial toaster apparatus that has exterior surfaces cool-to-the-touch during toasting operations.

Another aspect of the invention is to provide a commercial toaster apparatus that has a "sleep" mode wherein heating elements are cycled such that only two-seconds of heating occur during every ten-second cycle.
Still another aspect of the invention is to provide a commercial toaster apparatus that saves energy yet is able to achieve a quick start feature by cycling the heating elements.

Another aspect of the invention is to provide a commercial toaster apparatus that uses nickel chromium ribbon in a novel configuration instead of CALROD.

Still another aspect of the invention is to provide a commercial toaster apparatus that features a temperature controller that can use a temperature sensor preferably a J-type thermocouple or an RTD type sensor for feedback on temperature with a potentiometer controllable by the user to control oven temperature in the "standby" mode.

Another aspect of the invention is to provide a commercial toaster apparatus that features a temperature controller and a solid-state relay in a single unit.

Finally, it is an aspect of the invention to provide a commercial toaster apparatus that has two heating elements sandwiching a conveyor belt wherein the temperature of each heating element is individually controlled using a potentiometer.

These aspects of the invention are not meant to be exclusive and other features, aspects, and advantages of the present invention will be readily apparent to those of ordinary skill in the art when read in conjunction with the following description, appended claims and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an isometric view of the commercial toaster apparatus in accordance with the invention.

Fig. 2 is a detailed planar view of the mica insulator part of the winder element subassembly.
Fig. 3 is a detailed planar view of the mica winder part of the winder element subassembly.

Fig. 4 is a detailed planar view of the mica support part of the winder element subassembly.

Fig. 5 is a detailed planar bottom view of the winder subassembly with parts shown in Figs. 2, 3, 4 assembled.

Fig. 6 is detailed planar view of the base, which the winder subassembly is attached thereto.

Fig. 7 is a detailed planar view of the assembled heating element.

Fig. 8 is detailed end view of the assembled heating element.

Fig. 9 is an exploded side view of the heating element.

Fig. 10 is a rear view of an alternative embodiment of the apparatus shown in Fig. 1.

DETAILED DESCRIPTION OF THE INVENTION

As shown in Fig. 1, Fig. 1 is an isometric view of the commercial toaster apparatus 10 in accordance with the invention. Cabinet 12 is preferably sheet metal, preferably galvanized, with a translucent powder coat that can be easily cleaned. High temperature insulation protects control panel 25 and cabinet 12 and renders them cool to the touch. Control panel 26 provides controls that can be easily reached and operated. Switch 24 turns toaster 10 on or off. Once switch 24 is on, thermocouple 58 (See Fig. 6) is used to maintain the oven temperature of apparatus 10 settable at a "standby" temperature so that apparatus 10 is able to have a "quick start" feature. This is accomplished by the use of a combination temperature controller and solid-state relay in a single unit. An example of this type of unit is manufactured by CRYDOM MCTC2450JLA (not shown) that utilizes a microprocessor based on a
solid-state relay having a sensor for feedback on temperature. Potentiometers 18, 20 are used to modify the oven temperature and are user-controlled to obtain the desired "standby" temperature. There is a second microprocessor based on a solid-state relay in the CRYDOM that pulses the heating elements on and off to keep 'apparatus 10 at a "standby" status for "quick start" operation. This second microprocessor bumps the power to the heating elements "full on" for two seconds in every ten-second cycle. In this manner, the thermal inertia of a cold chamber is overcome yet without the energy cost required to keep the unit constantly on when apparatus 10 is only being used intermittently.

The reason for pulsing the heating elements is to keep heat in the toasting chamber because operating from a cold chamber with radiant heating elements gives very inconsistent results.

The temperature of upper heating element 38 is controlled by potentiometer 18.

The temperature of lower heating element 36 is controlled by potentiometer 20. The speed of conveyor 40 is controlled by potentiometer 16 that has readings 1 - 9 corresponding to the degree of toasting ranging from light (1) to dark (9).

To toast a product such as bread 28, the user presses switch 14. Switch 14 is a momentary switch that provides a signal to the solid-state relay of the CRYDOM unit that causes apparatus 10 to go to the "full on" cycle state. The "full on" cycle is then controlled by an adjustable timer (not shown). Also, switch 14 also energizes the conveyor motor for conveyor 40.

The product that is to be toasted, e.g., bread slice 28 is fed into a feed hopper (this has been removed for clarity), which causes slice 28 to enter conveyor 40. Once slice 28 travels through the unit via conveyor 40, it is dropped onto chute 32 and
stored on tray 31. To provide greater storage for toasted slices, extension tray 30 is provided. Tray 30 can be slid into apparatus 10 when not needed.

When the adjustable timer completes the cycle, apparatus 10 reverts to the "ready" state until switch 14 is pressed again. If switch 14 is pressed during a toasting cycle, the timer will reset back to the original setting and will complete the full toasting cycle. The "quick start" feature has other benefits other than just energy conservation. Less heat is being radiated to the surroundings. Also, since apparatus 10 must spend less time in the "full on" condition, the operating life of the elements should be longer.

If switch 22 is pressed, the apparatus is placed in the "full on" condition continuously. This condition is used when products must be run through continuously. In this status, more than 600 slices of bread can be toasted in an hour. Also, as shown in the alternative embodiment depicted in Fig. 10, product can be placed into path 74 to go through conveyor 40, and exit the back of the unit through path 70 rather down path 76 to chute 32. The apparatus is easily converted to a back exiting device via fold down chute 72.

Figs. 2, 3, 4 and 5 show the assembly of the nickel chromium heating ribbon that makes up the heater winder element subassembly 60. While ribbon heaters are not new in the art, prior art methods typically use the ribbon on edge so as to be basically perpendicular to the product that is to be toasted. Since radiant energy follows a line of sight principle, there will be more heating ribbon surface area exposed to the product that is to be toasted if the ribbon is placed on-the-flat toward the product.
Fig. 2 is a detailed planar view of mica insulator 42 of the winder element subassembly 60. Mica insulator is preferably a sheet of mica about .012 inches thick, and about 6 inches wide and 10 inches long.

Fig. 3 is a detailed planar view of the mica winder 44 of the winder element subassembly 60. The winder 44 is preferably about .060 inches thick having slightly longer dimensions than the insulator so that it overlaps insulator 42 slightly.

Fig. 4 is a detailed planar view of the mica support 46 of the winder element subassembly 60. Support 46 is also preferably about .060” thick. Bus ribbon 48 and resistance ribbon 50 (see Fig. 7) is then wound on mica winder 44.

Fig. 5 is a detailed planar view of the winder element subassembly 60 with parts shown in Figs. 2, 3, 4 assembled. Lead wires 56 are then attached to terminals 54 to provide power via bus ribbon 48 to resistance ribbon 50.

Fig. 6 is detailed planar view of base pan 52 to which the winder element subassembly 60 is attached using rivets and eyelets through openings 43 in each part of the subassembly. Base pan 52 is preferably a 20 gauge aluminized steel pan. Note that thermocouple 58 is fastened to base pan 52 on top of mica insulator 42.

As shown in Figs. 7, 8, 9, heating elements 36, 38 are formed. After subassembly 60 is manufactured, it is finished by mounting it along with base pan 52 to glass channel 57 that holds glass cover 62 to complete the heater assembly. Glass channel 57 is preferably made from 20-gauge aluminum and glass cover 62 is preferably 3mm thick.

Again, referring to Fig. 10, an optional alternative embodiment is shown which provides for a rear discharge feature when a continuous operation is desirable.
Although the present invention has been described with reference to certain preferred embodiments thereof, other versions are readily apparent to those of ordinary skill in the art of the preferred embodiments contained herein.
What is claimed is:

L) A toaster apparatus for toasting a product and having an oven for toasting that is heated with heating elements, said apparatus comprising:

a first solid-state microprocessor having a temperature sensor positioned in said oven such that said sensor provides feedback of the temperature of said toaster to said microprocessor;

at least one potentiometer, associated with said first solid state microprocessor, wherein said at least one potentiometer is user-controlled to modify the oven temperature to obtain a predetermined "standby" temperature;

a second solid state relay that pulses the heating elements on and off to keep said toaster at the predetermined "standby" temperature in the oven in order to provide a "quick start" to toast capability.

2.) The toaster apparatus of Claim 1 wherein heating elements are at full power for approximately two seconds for every 10 seconds of operation when said toaster is in the "standby" temperature mode.

3.) The toaster apparatus of Claim 1 wherein said heating elements are made from a nickel chromium ribbon having a width wherein the width of the ribbon is substantially parallel to the product that is to be toasted.

4.) The toaster apparatus of Claim 1 further comprising a conveyor wherein the product to be toasted is placed on said conveyor so that the product is within the oven for a predetermined time.

5.) The toaster apparatus of Claim 4 wherein the speed of said conveyor is user-controlled by a conveyor speed potentiometer so that the speed potentiometer is adjustable in accordance with the degree of toasting desired.
6.) The toaster apparatus of Claim 1 further comprising a "full on" switch such that said toaster heating elements and said conveyor will be on for a predetermined length of time.

7.) A method of toasting a product using a conveyor type toasting apparatus having an oven, said method comprising the steps of:

- heating said oven to a predetermined "standby" temperature;
- activating said oven and said conveyor to a "full on" condition wherein said oven is heated quickly to a predetermined toasting temperature and a predetermined conveyor speed for a predetermined length of time;
- returning said oven to the predetermined "standby" temperature once said predetermined length of time has expired and the toasted product has been obtained.

8.) The method of Claim 7 further comprising a user-controlled continuous operation step for producing a predetermined number of toasted products wherein said oven is continuously at said predetermined toasting temperature and said conveyor is continuously at said predetermined speed until the predetermined number of toasted products is obtained.
INTERNATIONAL SEARCH REPORT

A CLASSIFICATION OF SUBJECT MATTER

IPC(8) - ... PCT Helpdesk. 571 272-4300
Facsimile No 571-273-3201 PCT OSP 571 272 7774
Form PCT/ISA/210 (second sheet) (July 2009)

Name
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PubWest
Category*

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USPC
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99/327,328,331-333,386,389,443C, 219/388,409,414,419,422,494,501,507-510,515 (see search terms below)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC 99/327,328,331-333,386,389,443C, 219/388,409,414,419,422,494,501,507-510,515 (see search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWest (PGPB, USPT, USOC, EPAB, JPAB), Google Scholar
Search Terms toaster, broiler, temperature, control, setting, adjust, potentiometer, belt, conveyor, endless, speed, time, nickel, chromium, sensor, detector,ribbon, element, user, controlled, oven, heater, predetermined, number, cooked

C DOCUMENTS CONSIDERED TO BE RELEVANT

Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No


Y US 5,812,411 A (Calabrese et al) 22 September 1998 (22 09 1998) col 1, ln 29-31, col 1, ln 50 to col 2, ln 4 1-6

Y US 5,473,975 A (Bruno et al) 12 December 1995 (12 12 1995) Fig 4, col 2, ln 31-41, col 4, ln 48-52 3-6


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Y US 5,866,004 A (Schneider) 11 November 1997 (11 11 1997) col 2, ln 38-47 8

Further documents are listed in the continuation of Box C

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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29 September 2010 (29 09 2010)

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07 OCT 2010

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