United States Patent

Wise

[15] **3,692,979**

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[54] **ELECTRIC COOKER CONTROL**

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[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

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[52] **U.S. Cl.** **219/493,** 337/51, 337/301

[51] **Int. Cl.**.....**H05b 1/02**

[58] **Field of Search** 219/492, 493, 512; 337/51, 337/82, 83, 84, 93, 94, 116, 301, 302, 303, 304, 305

[56] **References Cited**

UNITED STATES PATENTS

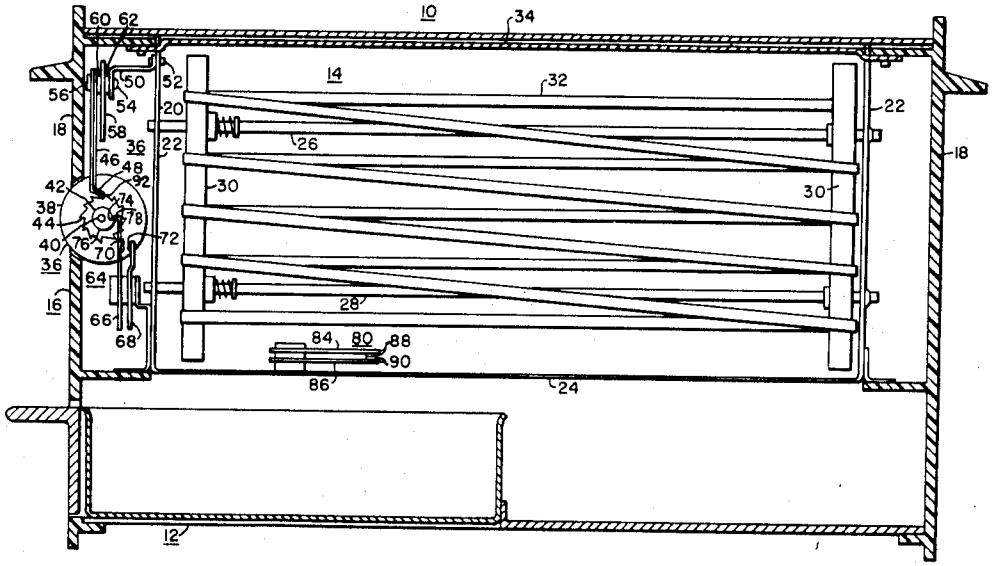
3,585,365	6/1971	Kircher	219/512
3,202,842	8/1965	Sherwood	337/51
1,745,934	2/1930	Kauch et al	337/51
2,841,680	7/1958	Tuttle	219/493
3,113,438	12/1963	Hubacker et al.	337/51
3,521,211	7/1970	Thorner	337/301

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[57] **ABSTRACT**

The invention defines a control mechanism for a cooking device that is capable of turning the cooking device off after a selectively variable time has elapsed. The control mechanism utilizes a ratchet wheel operated by a bimetal element which heats up and cools down as the cooking device cycles as determined by a main heater thermostat. The variable cooking time is arrived at by manual manipulation of a dial which presets the ratchet wheel for a desirable number of cycles of operation by the bimetallic element.

2 Claims, 2 Drawing Figures



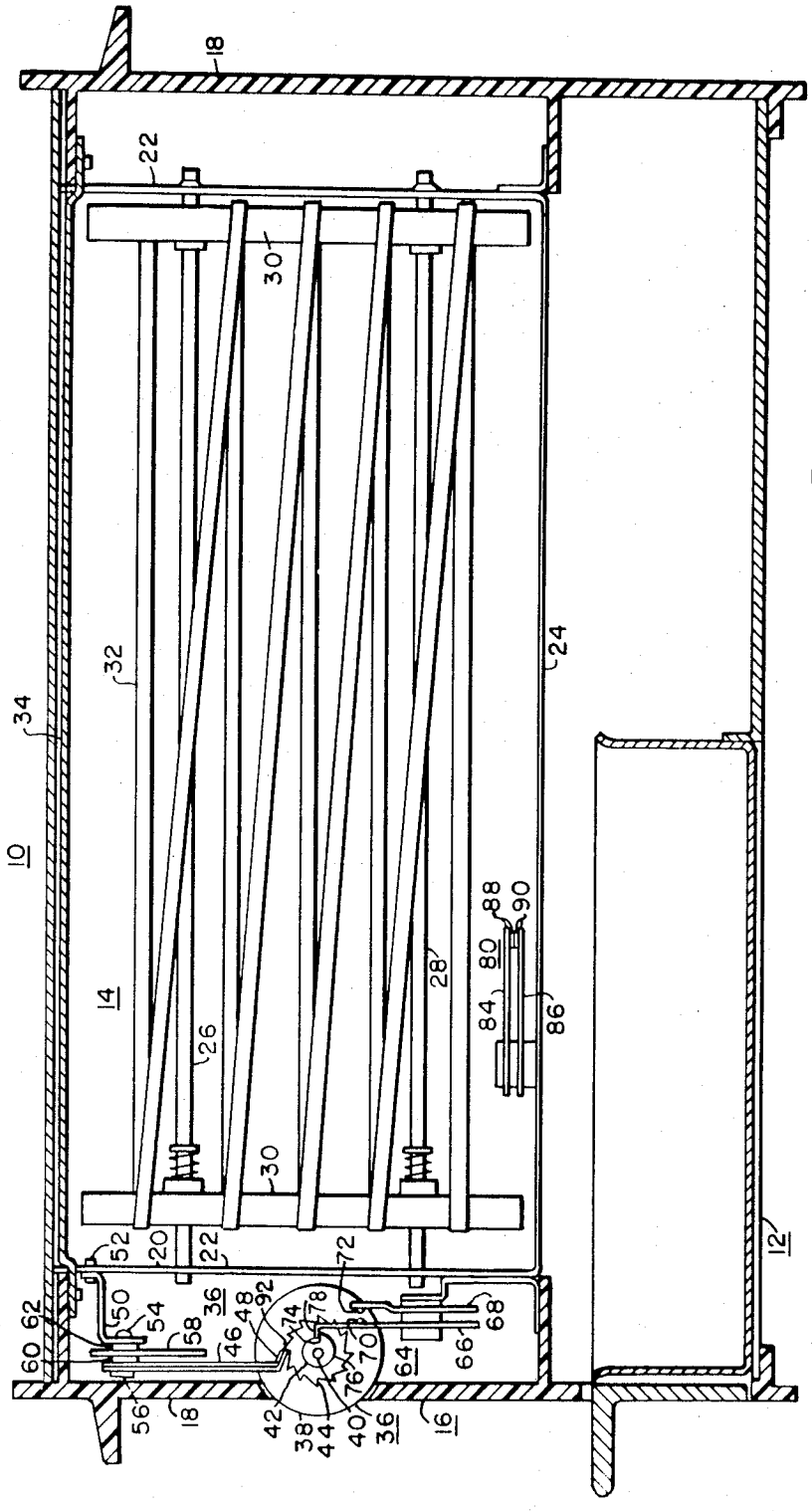

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FIG. 1.

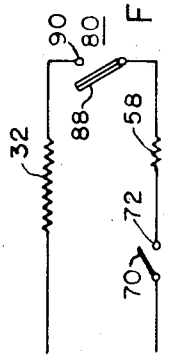

90
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88
58
32
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70

FIG. 2.

ELECTRIC COOKER CONTROL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a control mechanism for an electrical cooking unit and, more particularly, relates to a control mechanism for a meat cooking device that is capable of providing a variable elapsed time for a cooking cycle.

2. Description of the Prior Art

U.S. Pat. application Ser. No. 815,744, filed Apr. 14, 1969, now U.S. Pat. No. 3,585,365, and owned by a common assignee discloses an electrically operated food cooking apparatus which includes a control means for setting the time for which the cooker is going to be operated. The control means in this patent application comprises a pawl member which is fixedly mounted relative to a vertically disposed insulating block upon which the ribbon heating structure for the unit is mounted. This insulating block is capable of movement during the heating cycle, based upon the expansion of the ribbon heater structure, so that the pawl moves therewith. A manually set dial is provided which presets a ratchet wheel for an extended period of cooking and, as the unit heats up and then cools down, based on the main heater thermostat, the pawl moves the ratchet wheel as the ribbon heater expands and contracts. A main switch within the electric cooking unit opens when a cam means that moves with the ratchet wheel rotates around a sufficient amount to bring that portion of the cam means into engagement with the main switch which permits it to open. The cooking time duration is thereby controlled in a satisfactory and advantageous manner with a control mechanism which also may be fairly easily and inexpensively manufactured.

However, the control mechanism disclosed in the subject application can suffer from two deficiencies which may prevent its proper operation as installed or after continued operation of the cooking unit. The first of these deficiencies can occur in the manufacturing cycle in that the ribbon heater must be properly tensioned around the vertically extending insulating elements on which it is mounted or the pawl mounted with the movable insulating element will not have its engaging finger disposed in proper position to engage the teeth on the ratchet wheel to thereby provide a means for urging this wheel in its rotation. In such a case, the finger engaging the pawl element will, essentially, "work beyond the ratchet teeth" during expansion and contraction of the ribbon heater so that the ratchet wheel is not rotated. The second deficiency which the control mechanism for the cooking unit disclosed in the subject application may suffer from, is creep which effects the ribbon heater over continued operation for a long period of time. More specifically, the ribbon heater in the cooking unit is heated to a red hot temperature during cooking. Each time this elevated temperature is reached, the ribbon heater has a tendency to creep a slight distance so that the cumulative effect of creep over a very extended operational period can be sufficient to again place the finger on the pawl in a position where it works "beyond the ratchet teeth."

Both of these deficiencies are minimized by proper manufacturing procedures, that is, proper tensioning of the ribbon heater can be achieved through care in

manufacturing and proper inspection while the creepage engendered through extended operation of the cooking unit of the subject application is somewhat minimized unless the period of operation is considerably over the predicted operating life of the appliance. However, if sufficient controls are not applied during the manufacturing process, slightly improper tensioning of the ribbon heater may provide, cumulatively with some slight creep, an appliance which does not operate properly due to a defective control mechanism.

Accordingly, it would be advantageous to provide a control mechanism for an electric cooking unit which was not as subject to creep and which did not require extremely close tensioning tolerances on the ribbon heater during manufacture.

SUMMARY OF THE INVENTION

The invention provides a control mechanism for an electric cooking device which turns the cooking unit off after a preset period of time which may be varied in accordance with manual setting of a dial. Movement of the dial to select a particular cooking period moves a ratchet wheel which is connected therewith, with this ratchet wheel then serving as a counter to move backwardly until zero time for the dial setting is reached. A bimetal pawl element is utilized as a pawl for driving of this ratchet backwardly to zero time, with the bimetal pawl expanding and contracting as the main heater thermostat for the cooking unit energizes and deenergizes the ribbon heater. During its expansive movement, heating the bimetal pawl causes it to slip over a tooth on the ratchet wheel and during its contracting movement (cooling), the same bimetal pawl engages behind a tooth on the ratchet wheel and moves the ratchet the distance of one tooth. The ratchet wheel has movable therewith a cam element which includes a cam surface which permits opening of the main on-off switch for the cooking unit. As the ratchet wheel turns, this cam surface comes closer and closer to a point of engagement with the on-off switch that permits termination of the cooking period thereby providing an electrical cooking unit which has a variable time period control mechanism that is settable manually through the aforementioned manipulating dial.

DRAWING DESCRIPTION

For a better understanding of the invention, reference may be had to the preferred embodiment, exemplary of the invention, shown in the accompanying drawings in which:

FIG. 1 is a sectional elevational view showing an electrical cooking unit in accordance with the principles of this invention and with some of the elements shown in cross-section and some of the other elements shown in full view; and

FIG. 2 is a schematic illustration of the circuitry of the electrical cooking unit.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, it can be seen that an electrical food cooking unit 10 is comprised of two major portions, a base 12 and a self-contained cooking unit 14.

Cooking unit **14** includes a housing **16** formed by opposite end caps **18**, that seat on base **12** and which, in turn, are attached to a frame-like support structure **20**.

The support structure **20** consists of spaced apart vertically oriented members **22**, **22** and an integral horizontal cross member **24** so that the support structure **20** is in the form of an upwardly open U-shape to mount therein horizontally disposed rods **26**, **28**. These rods extend between the vertically oriented members **22**, **22** to provide support for vertically extending insulating blocks **30**, **30** which have extending between and wrapped around them, a heater structure in the form of a ribbon heater **32**. The ribbon heater provides heat for the cooking of food on the electric cooking unit **10**.

The general physical outline and structure of cooking unit **10** is completed by a cooking surface **34** which is in the form of a downwardly opening U-member that covers and encompasses the ribbon heater **32** and vertical extending insulating blocks **30**, **30** so that its total outer surface is presented for the easy reception of food which is to be cooked. This cooking surface may include a coating thereon of a non-stick variety such as polytetrafluoroethylene so that the possibility of food adhering thereto is substantially minimized.

The structure insofar as related is fairly similar in nature to the construction of the electric cooking unit disclosed in the aforementioned U.S. Pat. No. 3,585,365 so that a fuller understanding thereof maybe obtained by reference at this time to that patent.

The control mechanism forming the instant invention is generally referred to by numeral **36** and includes a manually settable dial **38** that may have an indicating index (not shown) for operator guidance in the setting of a desired time period. The dial **38** is mounted on a stub shaft **40** for simultaneous rotational movement thereof by the operator. Stub shaft **40** also includes a cam means **42** and a ratchet wheel **44** mounted on the stub shaft **40** and fixed with it so as to be rotatable with the manual dial **38**. A bimetallic element **46** disposed in depending relation relative to the ratchet wheel **44** serves as a pawl for movement of ratchet wheel **44**, with the bimetallic element **46** having a finger **48** which is angularly directed relative to the major portion of this bimetallic element. The mounting for bimetallic element **46** is provided for by a substantially Z-shaped element **50** which is attached by a rivet **52** or the like to a vertically oriented member **22**, with the rivet **52** extending through one of the vertically directed leg portions of the element **50** and also through the vertical member **22**. The opposite vertically oriented leg portion of element **50** receives a metal cutting threaded bolt **54** which secures the bimetallic element **46** but is electrically insulated from the bolt by insulating washer **56**.

In order to provide the heat to actuate bimetallic element **46**, a resistance heater **58** is provided, with this heater element being mounted on the bolt **54** in close adjacency to the bimetallic element **46**. A pair of insulating washers **60** and **62** space and electrically isolate the bimetallic element **46** from the resistance heater **58** and space and electrically isolate the bimetallic element **58** from the outwardly disposed vertical leg portion of element **50**, respectively. In this manner, the resistance heater **58** and bimetallic element **46** are conveniently mounted in both spaced and insulated relation.

A main on-off switch **64** is included in the control mechanism **36**. This on-off switch comprises a pair of leaves **66** and **68** which are mounted in opposed relationship to each other so that a pair of contacts **70** and **72**, mounted respectively on the leaves **66** and **68**, are positioned so as to be capable of abuttingly contacting one another (the on position). The leaf **66** is made from a spring material so that it is constantly resiliently urged in a counterclockwise direction from its engaged position (not shown) with leaf **68** to a non-contacting position with it (FIG. **1**). In order to permit leaf **66** to move into its noncontacting, unclosed position with leaf **68**, the cam means **42** includes a cam surface **74** that is indented relative to the remaining of the surface **76** of cam means **42** which allows the leaf **66** to be disengaged from contacting abutment with the leaf **68** due to its own resilient bias. The cam surface **76**, of course, serves to urge the leaf **66** against its own bias so that its contact **70** engages with the contact **72** on switch leaf **68**, to close on-off switch **64**. Rotation of cam means **42**, caused by rotation of manually settable dial **38**, then, closes on-off switch **64** when the cam surface **76** engages with leaf **66** through abutment of it with a horizontally extending indexing portion **78** of leaf **66**.

A temperature control thermostat **80** is provided in control mechanism **36** to limit the top temperature to which the cooking surface **34** may reach. Thermostat **80** includes a pair of switch leaves **84** and **86** with these leaves carrying, respectively, contacts **88** and **90**. The normal position of these contacts is in engagement with each other (FIG. **1**) but once an upper temperature set for thermostat **80** is reached, these contacts open interrupting the circuit for the ribbon heater **32**. Such a thermostat is substantially conventional and may be easily constructed by making one of the leaves **84** or **86** from a bimetallic member so that heating thereof causes leaf **84** or **86** to rotate away from contact with its mating leaf.

The operation of the control mechanism **36** for the electric cooking unit **10** can now be easily understood by reference to both FIGS. **1** and **2**. The manual dial **38** is rotated to provide a desired degree of crispness (a selected time period) to the food to be cooked, e.g., bacon, at which time the finger **48** on bimetallic element **46** engages behind a tooth **92** of the series of teeth provided on the ratchet wheel **44**. Rotation of the manual dial **38** also moves the cam surface **76** into engagement with the index portion **78** of leaf **66** urging the same in a clockwise direction to place the contacts **70** and **72** into abutting position. Since the electric cooking unit **10** has not yet attained its top limiting temperature, thermostat **80** is closed so that the contacts **88** and **90** are in electrical carrying capacity to establish a circuit through resistance heater **58** and ribbon heater **32**. A supply of electrical energy flowing through the closed circuit to the ribbon heater **32** increases its temperature up to a red heat which heats the air around it and ultimately the thermostat **80** to regulate cooking of food that is disposed on cooking surface **34**. During this heating cycle resistance heater **58** also increases in temperature to provide heating to bimetallic element **46**. Bimetallic element **46** rotates clockwise so that finger **48** of it passes over the tooth **92** next adjacent to the tooth **92** which it was previously behind, placing it, then, behind the next tooth **92**.

Upon attainment of the upper temperature set by thermostat **80**, the contacts **88** and **90** thereof open, opening the circuit through the ribbon heater **32** and the resistance heater **58**. The electric cooking unit **10** cools until the lower temperature dictated by thermostat **80** is reached. During this cooling operation bimetallic element **46** rotates or indexes counterclockwise pushing the next tooth **92** on ratchet wheel **44** in a clockwise direction and rotating ratchet wheel **44** one tooth. When the lower temperature for thermostat **80** has been reached, it again closes thereby providing a complete circuit through ribbon heater **32** and resistance heater **58**. Current flow in ribbon heater **32** continues to cook the food disposed on cooking surface **34** while current flow in resistance heater **58** raises its temperature thereby heating bimetallic element **46** urging it in a clockwise direction over the next one of the teeth **92** on ratchet wheel **44**. When the thermostat **80** has again attained its upper temperature, thermostat **80** again opens and the cycle is repeated. It should be noted that each cycling of the thermostat **80** causes a consequent indexing movement of the ratchet wheel **44**, indexing this ratchet wheel one tooth further so that sufficient cycling of the thermostat **80** will cause the cam surface **74** on cam means **42** to move adjacent index portion **78** of leaf **66**, thereby permitting the leaf to resiliently move counterclockwise to open contact **70** and **72** and terminating cooking of the food disposed on electric cooking unit **10**.

It should be clear from the foregoing description that a control mechanism for a cooking unit has been provided which does not depend on the proper tensioning of the ribbon heater for the cooking unit for its operation. Further, it should be clear that the said control mechanism is not subject to creep of the heating element or structure. Also obvious is the replacement of the bimetal and heater with an electromagnetic solenoid ratchet advancing system.

What is claimed is:

1. A control mechanism for an electric cooking appliance, said appliance including a circuit comprising: a main heater, a temperature responsive switch in close heat exchange proximity to said main heater and serially connected to said main heater to cyclically operate said main heater during a cooking operation and, a main on-off switch means for controlling the energization of said circuit, said main switch means manually movable to an on position and automatically movable to an off position by said control mechanism wherein said control mechanism comprises:

a ratchet member drivingly engaging said main switch means;

pawl means for intermittently driving said ratchet member, said pawl means comprising a bi-metal element; and,

a resistance heater means for heating said bi-metal element, said resistance heater means serially connected in said circuit with said temperature responsive switch so that said resistance heater means is energized concurrently with said main heater whereby,

said bi-metal element is placed in driving engagement with said ratchet member in response to energization of said resistance heater means so that said ratchet member is driven by said pawl means once during each cycle of the main heater for intermittently advancing said main on-off switch means to said off position.

2. The control mechanism of claim **1** wherein said bi-metal element comprises a bi-metal strip having one end secured to said appliance and the other end disposed adjacent said ratchet member and said resistance heater means extends in the direction of the longitudinal axis of said strip to expose a length of the strip to said resistance heater means.

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