United States Patent

[11] 3,584,197

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[54] **RANGE CONTROL SYSTEM**
20 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **219/487,** 116/133
[51] **Int. Cl.** **H05b 1/02**
[50] **Field of Search** 219/487, 453, 506, 398; 116/133, 124; 338/122

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ABSTRACT: A single control knob for controlling both the bake burner and the broil burner of a range. When the bake burner is operational, a display is provided to so indicate. When the control knob is turned to its maximum operating condition, the bake burner is disconnected and the broil burner then becomes operational; and simultaneously, a display indication is provided to that effect. Should the operator desire to operate the broil burner at a reduced temperature, the control may then be turned to the reduced operating temperature. Should it once again be necessary to operate the bake burner, the control knob is turned to the "OFF" position, whereupon, the knob may then be returned to a temperature whereby the bake burner will be operational.

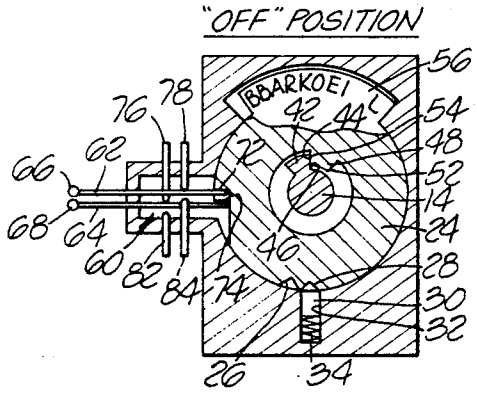
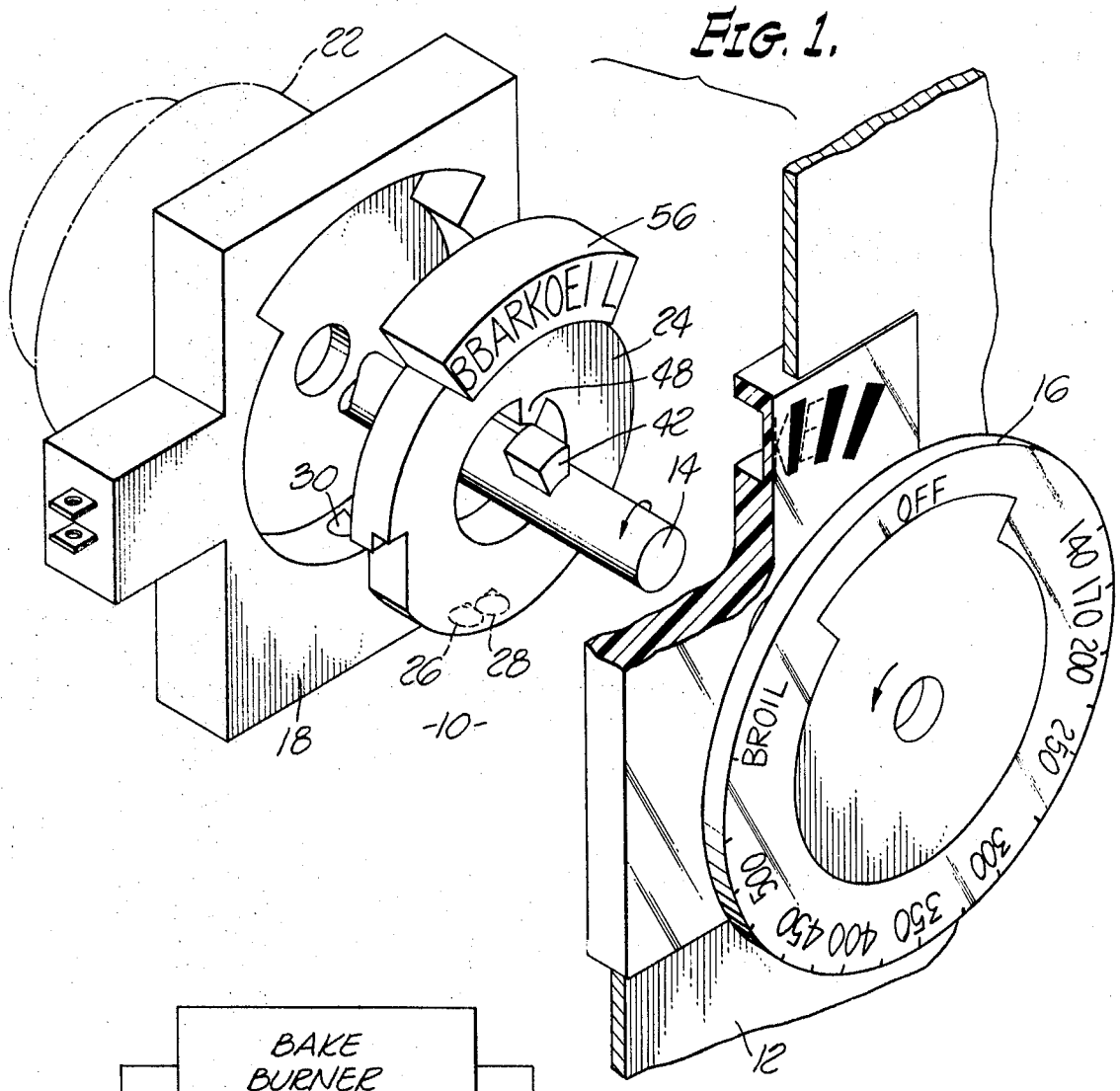


FIG. 1.



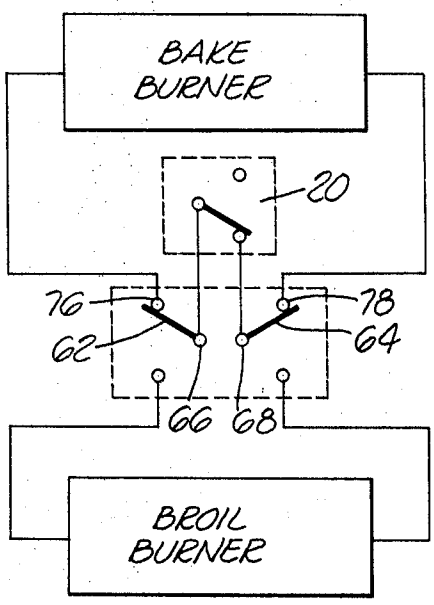


FIG. 6.

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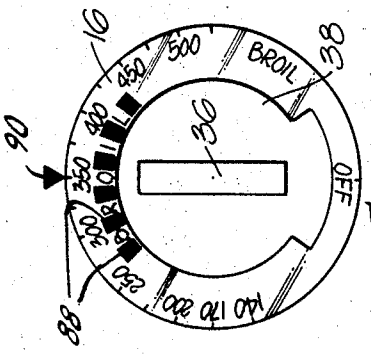


FIG. 5A.

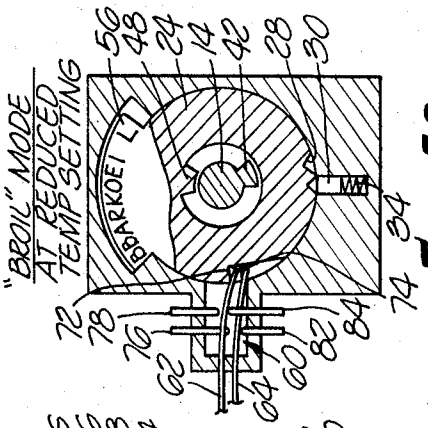


FIG. 5B.

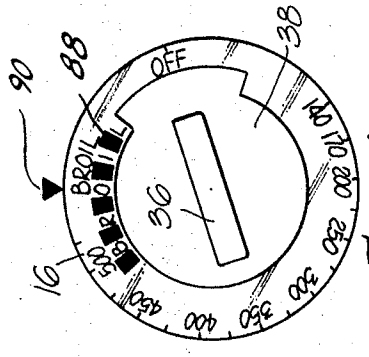


FIG. 4A.

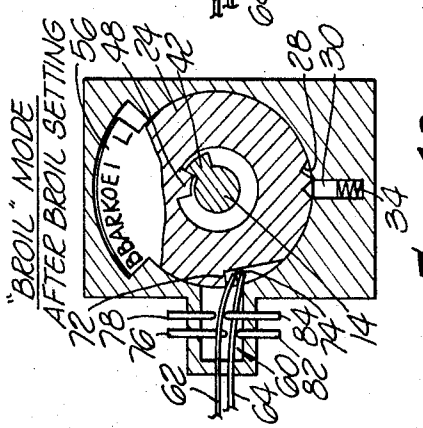


FIG. 4B.

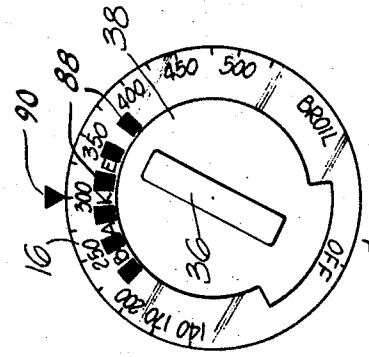


FIG. 3A.

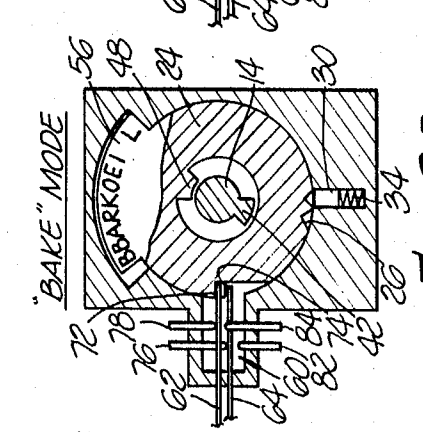


FIG. 3B.

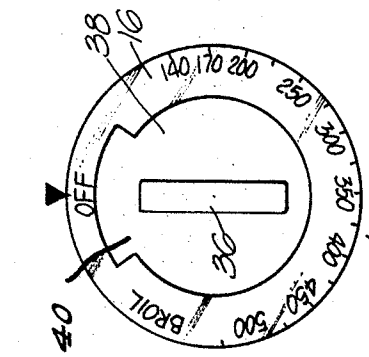


FIG. 2A.

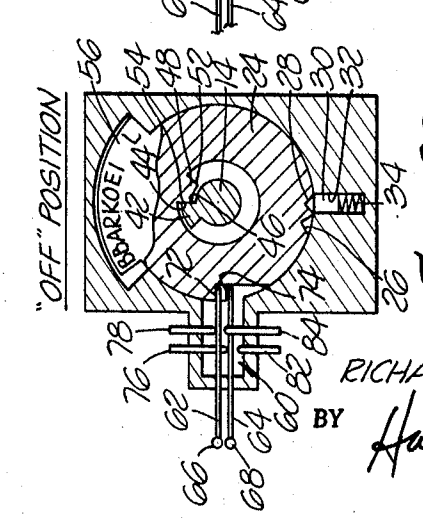


FIG. 2B.

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RANGE CONTROL SYSTEM

The present invention relates, in general, to a range control system and, more particularly, to a system where a pair of burner elements in the oven compartment are selectively controlled by a single control knob.

BACKGROUND OF THE INVENTION

In certain types of ranges, especially those of residential use, it is desirable to include a pair of burner elements in the oven compartment which are operated on a mutually exclusive basis. The conventional oven arrangement contains a bake burner and a broil burner which are located in different places in the oven. When the one burner is operational, the other burner is off. Heretofore, this kind of system required a first control knob for controlling whether the bake burner or the broiler burner was in operation and a second control knob for controlling the temperature setting thereof. This duplication is, of course, costly from both a material and labor standpoint as well as making extra demands on the mounting space on the range. Moreover, the operator must view both control knobs to determine which element is on and at what temperature the element is operating.

In order to overcome the attendant disadvantages of prior art range control systems, the present invention provides a single control knob for controlling both the selection of the burner element and the temperature thereof. Further means are provided on said single control knob to adequately display which element is operational and the temperature setting of the operating burner.

SUMMARY OF THE INVENTION

More particularly, the invention comprises a single control knob which when actuated, allows the bake burner to operate and simultaneously display an indication that the bake burner is operational. When the control is turned to its maximum operating position, the bake burner is disconnected and the broiler burner than becomes operational with an accompanying display indication of its operation. Should the operator desire to operate the broiler burner at a reduced temperature other than maximum, the control knob may then be turned to the reduced operating temperature. Should it once again be necessary to operate the bake burner, the control knob is turned to the "OFF" position whereupon the knob may be then returned to a temperature whereby the bake burner will be operational.

The advantages of this invention, both as its construction and mode of operation, will be readily appreciated as the same and becomes better understood by references to the following detailed descriptions when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures and wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of the range control system of a preferred embodiment of the invention, partly in section;

FIGS. 2A and 2B depict the relative positions of the dial and switch members, respectively, of the system in FIG. 1 when the system is in the "OFF" position;

FIGS. 3A and 3B, 4A and 4B, and 5A and 5B depict the relative positions of the dial and switch members, respectively, of the system in FIG. 1 when the system is in different operational modes; and

FIG. 6 is a schematic diagram of the system in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a range control system **10** is shown mounted on a range panel **12**. The range control system comprises a thermostat shaft **14** which has a temperature indicating dial **16** mounted thereon which is visible from the front of the system **10**. The shaft **14** extends through a hollow

housing member **18** and is directly connected to a conventional oven thermostat switch **20** mounted in a housing **22**. The hollow portion of the member **18** contains a switch actuator element **24** having a pair of grooves **26** and **28** for mating with a detent means **30** mounted in a hollow, cylindrical slot **32** in the member **18**. A spring **34** biases the detent means **30** into contact with one of the grooves **26** or **28**.

Referring now to FIG. 2A, the temperature indicating dial comprises a transparent plastic member having the various operational temperatures of the burners from "OFF" to a maximum position of "BROIL" indicated along the periphery thereof. Mounted on the thermostat shaft **14** in the center of the dial is a control knob **36**. The indicating dial further comprises a first circular opaque region **38** whose purpose is merely aesthetic and a semicircular opaque region **40** whose function will be explained hereinafter.

Referring now to FIG. 2B, the interrelationship between the position of the shaft **14** and the switch actuator element **24** is depicted. Extending outwardly from the shaft is a trapezoidal-shaped member **42** having a first side edge **44** and a second side edge **46**. The switch actuator element has a hollow center with a trapezoidal-shaped member **48** extending into the hollow center and having a first side edge **52** and a second side edge **54**. Rotation of the shaft **14** will cause edge **46** to abut edge **52** at one end of the rotation cycle and the edge **44** to abut edge **54** at the other end of the rotation cycle.

The outer surface of the element **24** generally is circular with a semicircular ridge **56** extending from the top section thereof, upon which are written the letters BBARKOEI L which are used to denote the operational mode of the oven as will be explained hereinafter.

A mode selector switch **60** is mounted within a U-shaped portion of the housing member **18** and comprises a pair of flexible switch actuator elements **62** and **64**. At one end of the elements **62** and **64**, there are terminals **66** and **68**, respectively, for connection to the thermostat switch. Lips **72** and **74** on the outer edge of the switch element **24** abut the other end of the elements **62** and **64**, respectively. A pair of bake terminals **76** and **78** and a pair of broil terminals **82** and **84** are connected to their respective elements through the thermostat switch **20**. Either pair of terminals **76** and **78** or **82** and **84** may contact one of the contact elements **62** and **64**, respectively.

The housing member portion directly adjacent to the ridge **56** is transparent with six opaque-coated members **88** which are shown more clearly in FIGS. 3A, 4A, and 5A. Each of the members **88** are a width slightly greater than the letters on the ridge **56**.

With the foregoing in mind, operation of the range control system is as follows:

Prior to use of the range, the dial **16** and shaft **14** are in the position shown in FIGS. 2A and 2B, respectively, with elements **62** and **64** connected to terminals **76** and **78**, respectively, and region **40** covering the lettering on ridge **56** and members **88**. Should the operator wish to use the oven in the bake mode, shaft **14** is rotated in a counterclockwise direction until the desired temperature indication on dial **16** is opposite an indicator arrow **90** mounted on the range panel **12** as shown in FIG. 3A.

In this position, the dial **16** has been rotated sufficiently so that member **40** no longer covers the members **88** or the letting on ridge **56**. However, the alternate-spaced members **88** cover the letters B-R-O-I-L on ridge **56**, exposing the letters B-A-K-E, thus indicating to the operator that the oven is in the bake mode of operation.

Should the operator desire to use the oven in the broil mode, the shaft and knob are rotated until edge **44** abuts edge **54**. Further counterclockwise rotation of the shaft **14** causes element **24** to rotate slightly counterclockwise until detent means **30** is secured in groove **26**, as shown in FIGS. 3A and 3B. Further, lips **72** and **74** bend elements **62** and **64**, respectively, so that elements **62** and **64** are now in contact with elements **82** and **84**, respectively, thus, deactivating the bake burner and activating the broil burner. As can be seen from

FIGS. 3A and 3B, rotation of the shaft **14** and dial **16** to the "-BROIL" position and the attendant movement of the element **24** causes ridge **56** to move a distance equal to one of the letters thereon, and the letters B-R-O-I-L now are displayed between the members **88**.

It should be understood that when the broil mode is actuated, the resultant heat is the maximum possible. However, should it be desired to operate the broil mode at a reduced temperature, the shaft **14** is rotated in a clockwise direction until the desired temperature is reached, as shown in FIGS. **5A** and **5B**. Should it be desired to operate the temperature once again in the bake mode, it is necessary to turn the shaft **14** clockwise until the indicator is at the "OFF" position, whereupon detent means **30** is returned to groove **28** and the elements **62** and **64** are once again in contact with terminals **76** and **78**. Rotation of the shaft **14** in a counterclockwise direction will once again operate the bake burner.

FIG. **6** depicts a simplified schematic of the operation of the oven. With the oven in the bake mode, elements **62** and **64** connect the bake burner, through the terminals **76** and **78**, to the thermostat switch **20**. As is conventional, in order to maintain the oven at the desired temperature, thermostat switch **20** periodically is opened and closed. Further, when the broil burner is operational, elements **62** and **64** contact the broiler burner through the thermostat switch.

The term "interlock" and the phrase "stable state" are hereby defined as relating at least to apparatus which has only a plurality of states of conduction such as a flip-flop, as opposed to some other physical or mechanical state or mechanical position state.

The term "interlock" and the phrase "stable state" are also hereby defined as relating to systems of the type disclosed herein, to any electromechanical or other system, or to any purely mechanical or purely electrical system or otherwise.

The term "interlock" and the phrase "stable state" are also hereby defined to relate to a mechanical structure having two stable positions.

The term "switch" is hereby defined to include, but not be limited to, a pair of relay contacts or a switch having one or more contacts or no contacts such as an electronic switch.

The phrase "device actuable to provide heat" is hereby defined to include, but not to be limited to, an electric heating element or both a gas burner and a valve, or otherwise.

The phrase "coupling means" is hereby defined to include, but not to be limited to, solely electrical coupling means, solely mechanical coupling means, electromechanical coupling means, and one or more valves or valves in combination with any of the said electrical, mechanical or electromechanical coupling means.

The phrase "connection means" is hereby defined to include, but not to be limited to, switches, other conductive apparatus, semiconductors, gates or otherwise.

In FIG. **1**, note will be taken that the order of letters are in the following sequence: BBARKOEIL, there being no substantial space between any two adjacent letters except the letters I and L, one blank letter space being provided between the letters I and L. This first set of letters is provided on ridge **56**.

Although one set of letters are shown on the ridge **56**, a second set in FIG. **1**, alternative thereto, which will work is BBARKOEIL, In this case, there is no substantial space between any two adjacent letters. However, there is a blank letter space after the letter L.

The second set of letters just given is required whenever a reversal is desired or necessary. For example, thermostat shaft **14** may have a left-hand screw thread to cause the thermostat temperature setting to increase. If the screw thread of shaft **14** is made a right-hand screw thread, and everything else is the same, the thermostat temperature setting may be increased by rotating shaft **14** to the right. Dial **16** then must be changed so that the off position is the same, but the new right-hand half is the mirror image of the old left-hand half. Similarly, the new left-hand half must thus be the mirror image of the old right-hand half.

In the case just described, the second set of letters is necessary due to the reversal of the rotation.

In the case just given, the bake burner and broil burner connections to the terminals **76** and **78** and the two corresponding lower terminals must be reversed as well.

As can readily be seen, the system may be designed for operation of either a gas or electric range where two burners are not operated simultaneously. Further, the system allows either burner to be operated through a continuous range of temperatures with the burner mode displayed. Moreover, a single control knob is utilized on the range panel which minimizes the number of controls.

It should be further understood that the foregoing disclosure relates only to preferred embodiments of the invention, and that it is intended to cover all changes and modifications of the examples of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention.

What I claim is:

1. A range control comprising: at least two devices actuable to provide heat; an adjustable thermostat to actuate said devices including a member movable to adjust the thermostat; and means responsive to movement of the self-same movable member to change the heat supplied by said devices in addition to modulation thereof by the operation of said thermostat, said movable member being a rotatable shaft, said means including an annular auxiliary member rotatable relative to said shaft, said auxiliary member having an inward radial projection, said shaft having an outward radial projection to engage said inward projection, said means including a leaf spring electrical conductor and first and second fixed contacts, said auxiliary member having an outward radial projection to hold said conductor in contact only with said first contact, said conductor being sprung to engage said second contact, releasable detent means to prevent rotation of said auxiliary member in first and second positions when said conductor engages said first and second contacts, respectively, said auxiliary member having the letters BBARKOEIL thereon on the arc of a circle concentric with the axis thereof, no substantial space being provided between said letters except the letters I and L, one letter space being provided between the letters I and L, and fixed means to mask at least five alternate ones of the letter spaces, said fixed means being adapted to expose the word BAKE when said annular member is in said first position and to expose the word BROIL when said annular member is in said second position, the angular extent of both of said projections being substantially less than 360°, said shaft having a knob fixed thereto with a projection to cover all the holes in said fixed means when said knob is turned to one predetermined position, and to expose said holes when it is turned to another position, and stop means to limit movement of said auxiliary member beyond said first and second positions thereof.

2. A range control comprising: at least two devices actuable to provide heat; an adjustable thermostat to actuate said devices including a member movable to adjust the thermostat; and means responsive to movement of the self-same movable member to change the heat supplied by said devices in addition to modulation thereof by the operation of said thermostat, said movable member having two opposite extreme limits of travel, said means being actuable by said movable member only at said extreme limits of travel, said movable member being movable a predetermined distance at each end of its travel to actuate said means, said predetermined distance being substantially smaller than the entire travel of said movable member, said movable member being a rotatable member, said means including an auxiliary member rotatable concentric with said movable member, said auxiliary member having a first radial projection, said movable member having a second radial projection to engage said first projection, said means including a mechanism actuable by rotation of said auxiliary member to one of extreme limits of its travel, said mechanism being adapted to change the heat supplied by said devices,

said auxiliary member having the letters BBARKOEIL thereon on the arc of a circle concentric with the axis thereof, no substantial space being provided between said letters except the letters I and L, one letter space being provided between the letters I and L, and fixed means to mask at least five alternate ones of the letter spaces, said fixed means being adapted to expose the word BAKE when said annular member is in said first position and to expose the word BROIL when said annular member is in said second position.

3. An oven comprising: a housing; at least first and second devices mounted inside said housing, both of said devices being actuable to provide heat; an adjustable thermostat having a base fixed relative to said housing, said thermostat including a main member mounted on said base and movable to adjust the thermostat temperature setting, said thermostat being responsive to the temperature inside said housing and having control means actuable to vary the heat output of each one of said devices when connected thereto; an interlock, said main member being coupled to said interlock to actuate it to first and second stable states in response to movement of said main member to first and second spaced and different predetermined positions, respectively, said interlock being actuated to change from said second state to said first state when said main member is moved to said first position, said interlock being actuated to change from said first state to said second state when said main member is moved to said second position, said interlock being adapted to change states only upon arrival of said main member at said positions, said main member being free to move in the space between said positions without changing the state of said interlock so long as said main member does not actually arrive at either one of said positions, the state of said interlock being independent of said main member location so long as said main member is located in the space between said positions and does not actually arrive at either one of said positions, said interlock including coupling means actuable in response to movement of said main member to said first and second positions to connect said control means to said first and second devices, respectively, said interlock being actuable in response to movement of said main member to said first position to disconnect said second device from said control means when said first device is connected thereto and vice versa when said main member is moved to said second position, movement of said main member to a predetermined selected position corresponding to a predetermined temperature setting causing said thermostat to control the said heat outputs of said first and second devices when said interlock is in said first and second stable states, respectively, said thermostat being adapted to control the heat outputs of both of said first and second devices but only one at a time, said selected position being between but not actually at said first and second positions; and display means connected to said coupling means to indicate selectively which one of said devices is connected to said control means.

4. The invention as defined in claim 2, wherein said shaft has a knob fixed thereto with a projection to cover all the holes in said fixed means when said knob is turned to one predetermined position, and to expose said holes when it is turned to another position.

5. The invention as defined in claim 4, wherein said fixed means includes stop means to limit movement of said auxiliary member beyond said first and second positions thereof.

6. The invention as defined in claim 3, wherein said control means turns one of said devices off when the temperature inside said housing is greater than said set temperature, and turns said one device on when the oven temperature is less than said set temperature, said one device being that particular device which happens to be connected to said control means by said coupling means at a particular time.

7. The invention as defined in claim 6, wherein said interlock includes a bistable auxiliary member, said main member being movable into engagement with said auxiliary member at two points to move said auxiliary member back and forth between two extreme limits of its travel, said coupling means being engageable by said auxiliary member to connect both of said devices to said control means, but only one at a time, said members having a lost motion connection therebetween.

8. The invention as defined in claim 7, wherein said control means includes an electrical switch, said coupling means including first and second circuits connected with said first and second devices, respectively, said circuits being actuable to cause said devices to provide heat, each of said circuits having a gap therein, said coupling means including connection means actuable in response to movement of said main member to one of said first and second positions to connect said switch in series in both of said gaps but in only one of said gaps at a time and to complete only the one circuit having the said switch connected in the gap thereof, said connection means being selectively actuable by and being engageable by said auxiliary member movement of said auxiliary member in one direction causing said switch to be connected in said first circuit and disconnected from said second circuit, movement of said auxiliary member in a direction opposite said one direction causing said switch to be connected in said second circuit and disconnected from said first circuit.

9. The invention as defined in claim 8, wherein said interlock includes detent means mounted on said auxiliary member mounting means in a position to hold said auxiliary member in a substantially fixed but releasable position at each of the extreme limits of its travel.

10. The invention as defined in claim 9, wherein both of said members are rotary, said auxiliary member having a cylindrical surface rotatable concentric with its axis of rotation, said detent means including an inward radially extending pawl and a spring between said mounting means and said pawl to urge said pawl into engagement with said surface, said surface being smooth except for two inwardly extending, angularly spaced grooves lying in a rotary path extending beneath said pawl, and a stop fixed relative to said mounting means to prevent rotation of said auxiliary member beyond each end of its travel to protect said connection means from overtravel of said auxiliary member.

11. The invention as defined in claim 10, wherein said connection means includes at least one electrical switch.

12. The invention as defined in claim 3, wherein said control means includes an electrical switch, said coupling means including first and second circuits connected with said first and second devices, respectively, said circuits being actuable to cause said devices to provide heat, each of said circuits having gap therein, said coupling means including connection means actuable in response to movement of said main member to one of said first and second positions to connect said switch in series in both of said gaps but in only one of said gaps at a time and to complete only the one circuit having the said switch connected in the gap thereof.

13. The invention as defined in claim 12, wherein said display means is fixed to said auxiliary member and movable back and forth therewith in a manner to indicate which device is connected to said control means by said coupling means, said auxiliary member being at one extreme limit of its travel to cause said display means to indicate the said connection of said first device, and at the other extreme limit of its travel to cause said display means to indicate the said connection of said second device.

14. The invention as defined in claim 3, wherein said interlock includes a bistable auxiliary member, said main member being movable into engagement with said auxiliary member at two points to move said auxiliary member back and forth between two extreme limits of its travel, said coupling means being engageable by said auxiliary member to connect both of said devices to said control means, but only one at a time, said members having a lost motion connection therebetween.

15. The invention as defined in claim 14, wherein the travel of said main member between said first and second positions thereof is substantially larger than the travel of said auxiliary member between said extreme limits of travel thereof.

16. The invention as defined in claim 14, wherein said control means includes an electrical switch, said coupling means including first and second circuits connected with said first and second devices, respectively, said circuits being actuable to cause said devices to provide heat, each of said circuits having a gap therein, said coupling means including connection means actuable in response to movement of said main member to one of said first and second positions to connect said switch in series in both of said gaps but in only one of said gaps at a time and to complete only the one circuit having the said switch connected in the gap thereof, said connection means also including at least one electrical switch having a leaf spring contact arm, said auxiliary member having a notch therein to engage said arm, detent means between said base and said auxiliary member to hold said auxiliary member in a substantially fixed, but releaseable position at each of the extreme limits of its travel, and a stop for said auxiliary member at each of said limits.

17. The invention as defined in claim 14, wherein said auxiliary member has first and second sets of letters thereon, said first set including the letters B, R, O, I and L, said second set including the letters B, A, K and E, said letters B, A, K and E being positioned on said first member contiguous to the said letters B, R, O and I, respectively; a third member fixed relative to said base and having a construction to mask all of the letters in both of said sets, but not all at one time, said third member having a construction so as to mask all of the letters of said first set without masking any of the letters of said second set and vice versa, said third member being opaque except for certain aperture means therethrough, said aperture means always masking at least five alternate ones of the letter spaces, engagement of said main member with said auxiliary member causing said auxiliary member to move back and forth between two positions relative to said base and in directions along a line, all of said letters being aligned in succession along said line; and means to mount said auxiliary member movably relative to said base, said aperture means including five spaced apertures located on approximately the same said line, each aperture having a width equal to the width one letter space and being at least as large as one letter in height, each said aperture being spaced from each aperture adjacent thereto a distance approximately equal to one letter space width, said two positions being spaced apart one letter space, said letters being arrange in a series in the order B, B, A, R, K, O, E, I and L, no substantial space being provided between the letters except the letters I and L, one blank letter space being provided between the letters I and L.

18. The invention as defined in claim 17, wherein said main member has opaque means fixed thereto to mask all five of said apertures simultaneously when said thermostat is in the "off" position, said opaque means being movable with said main member to several locations over the travel of said main member where said opaque means does not obstruct the view of any of said letters which lie in registration with said apertures.

19. The invention as defined in claim 14, wherein said auxiliary member has first and second sets of letters thereon, said first set including the letters B, R, O, I and L, said second set including the letters B, A, K and E, said letters B, A, K and E being positioned on said first member contiguous to the said letters B, R, O and I, respectively; a third member fixed relative to said base and having a construction to mask all of the letters in both of said sets, but not all at one time, said third member having a construction so as to mask all of the letters of said first set without masking any of the letters of said second set and vice versa, said third member being opaque except for certain aperture means therethrough, said aperture means always masking at least five alternate ones of the letter spaces, engagement of said main member with said auxiliary member causing said auxiliary member to move back and forth between two positions relative to said base and in directions along a line, all of said letters being aligned in succession along said line; and means to mount said auxiliary member movably relative to said base, other of said members being said aperture means including five spaced apertures located on approximately the same said line, each aperture having a width equal to the width one letter space and being at least as large as one letter in height, each said aperture being spaced from each aperture adjacent thereto a distance approximately equal to one letter space width, said two positions being spaced apart one letter space, said letters being arranged in a series in the order B, B, A, R, K, O, E, I and L, no substantial space being provided between the letters except the letters I and L, one blank letter space being provided between the letters I and L.

20. The invention as defined in claim 19, wherein said main member has opaque means fixed thereto to mask all five of said apertures simultaneously when said thermostat is in the "off" position, said opaque means being movable with said main member to several locations over the travel of said main member where said opaque means does not obstruct the view of any of said letters which lie in registration with said apertures.