

United States Patent

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[54] **ELECTRIC TOASTER WITH HEAT UP COOL
 DOWN BIMETAL TIMER**
10 Claims, 11 Drawing Figs.

[52] U.S. Cl. **99/329,**
337/3

[51] Int. Cl. **A47j 37/08**

[50] Field of Search **99/327,**
328, 329, 331, 332, 333; 337/3

[56]

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ABSTRACT: An electric toaster with a heat up cool down bimetal timer wherein a switch blade is directly connected to a bimetal for controlling operation of the toaster.

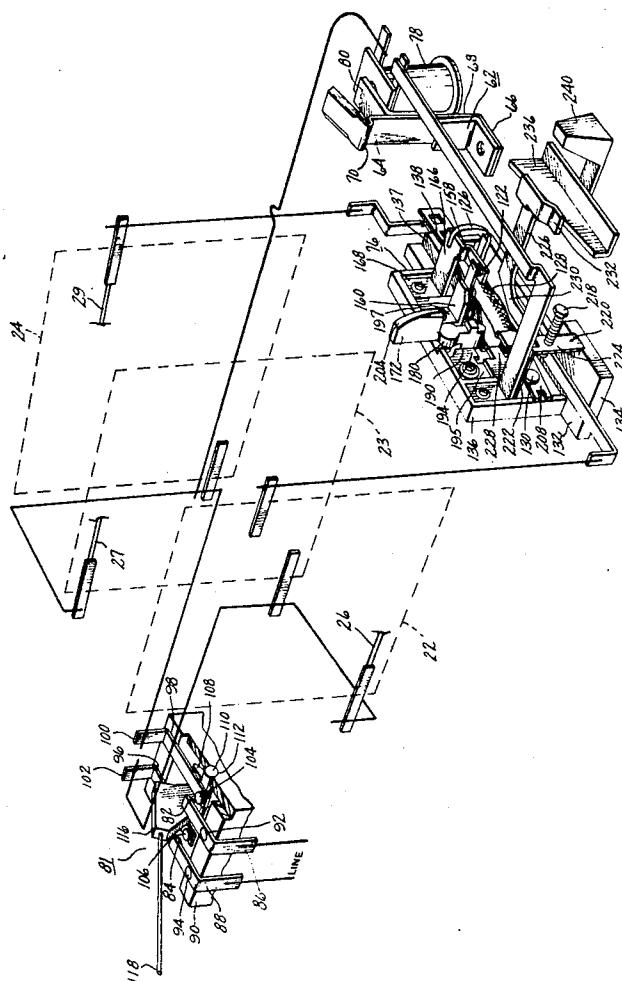


Fig. 1.

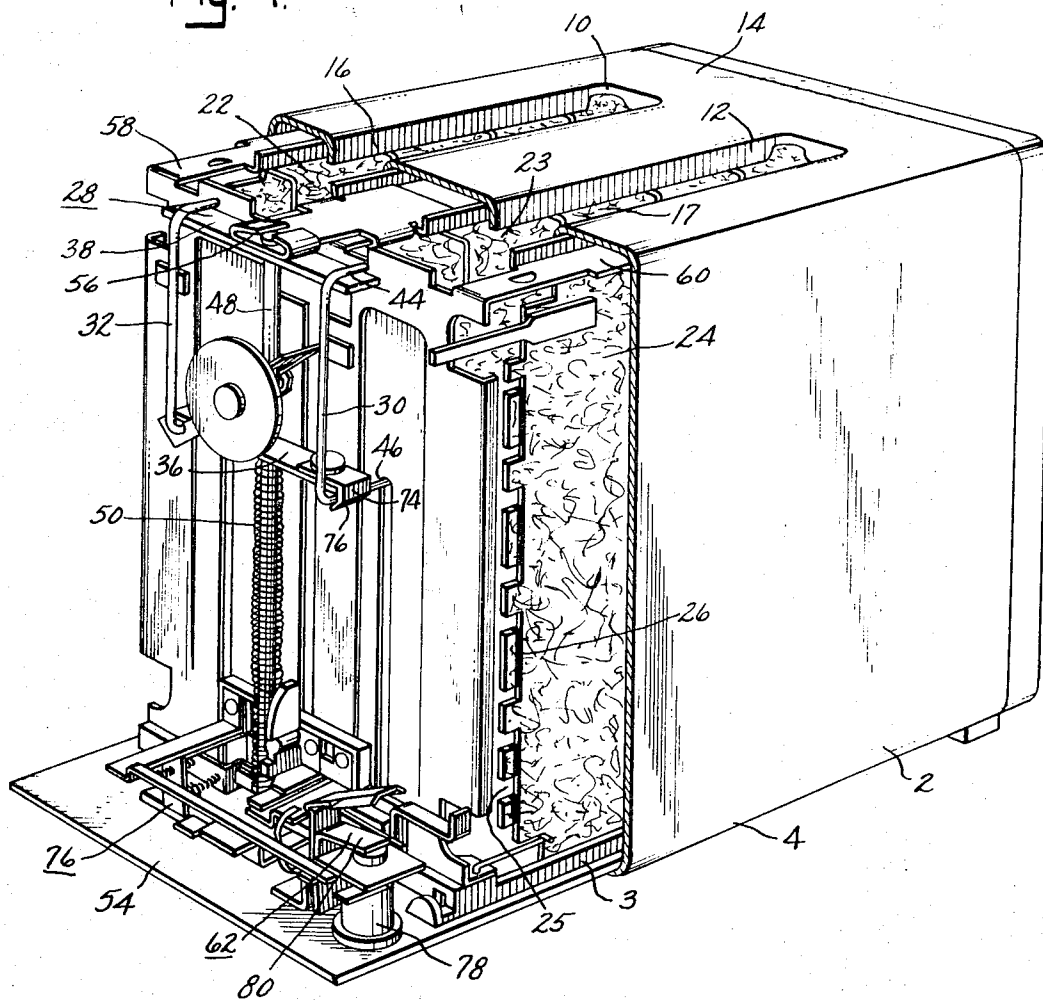
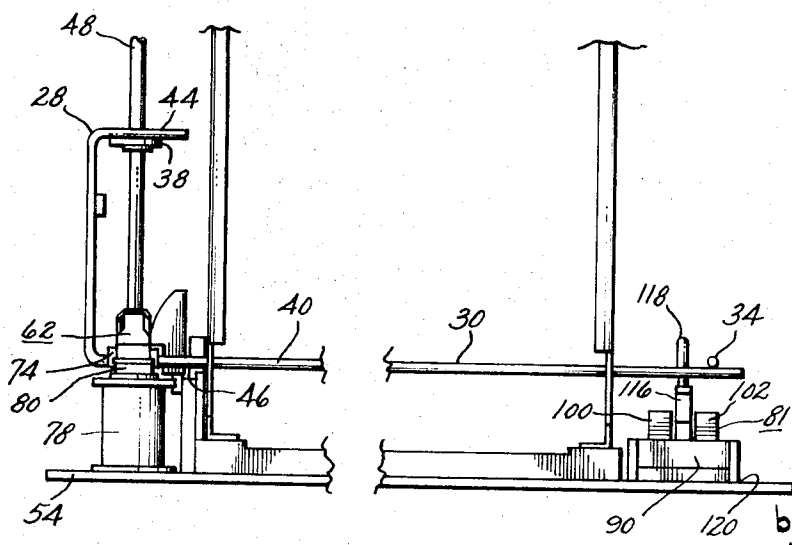


Fig. 2.



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Fig. 3.

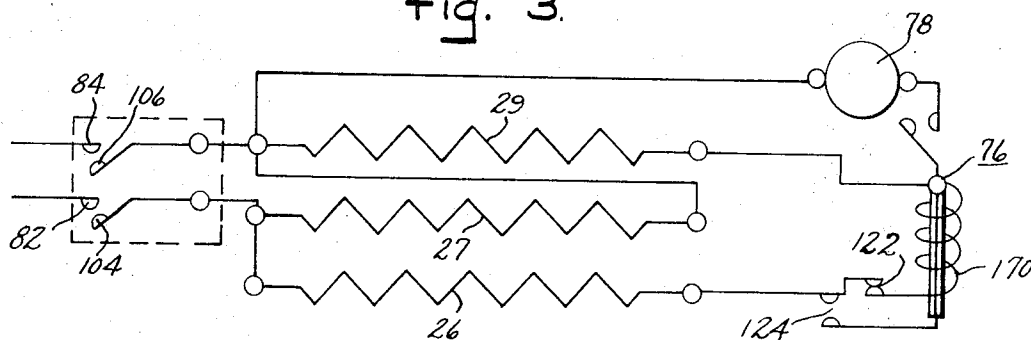


Fig. 4.

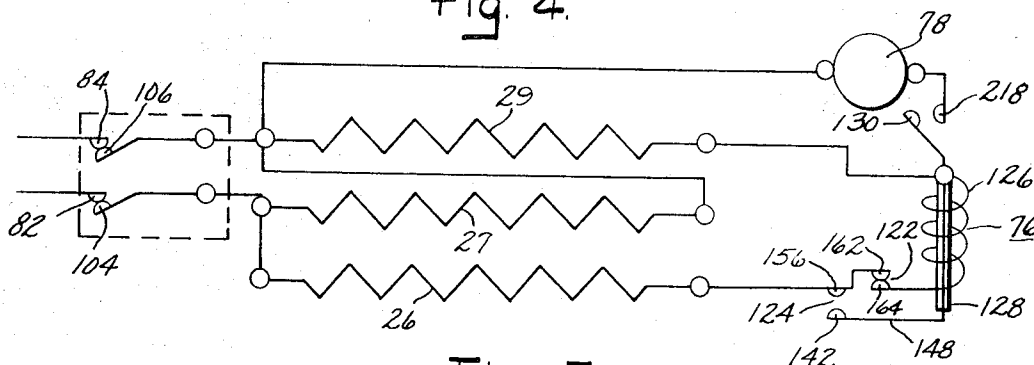


Fig. 5.

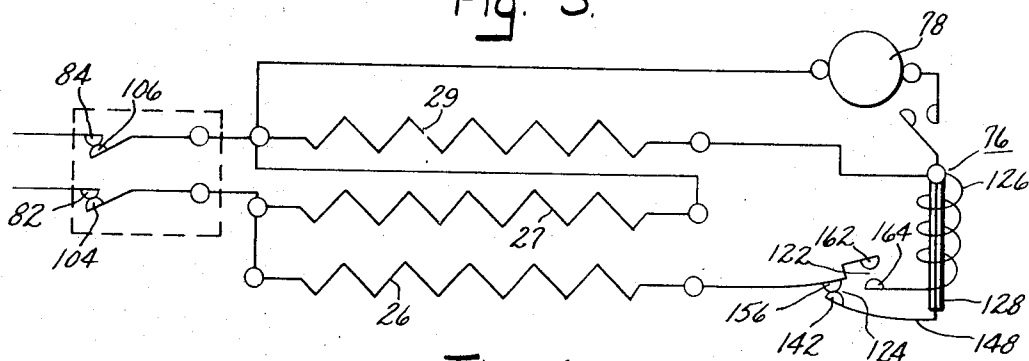
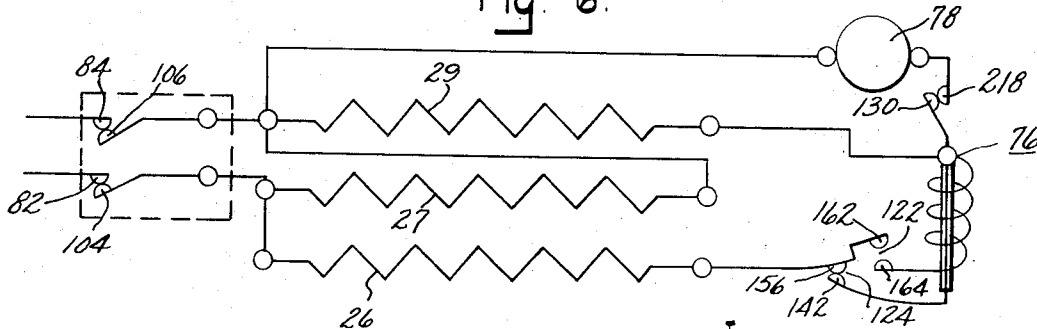


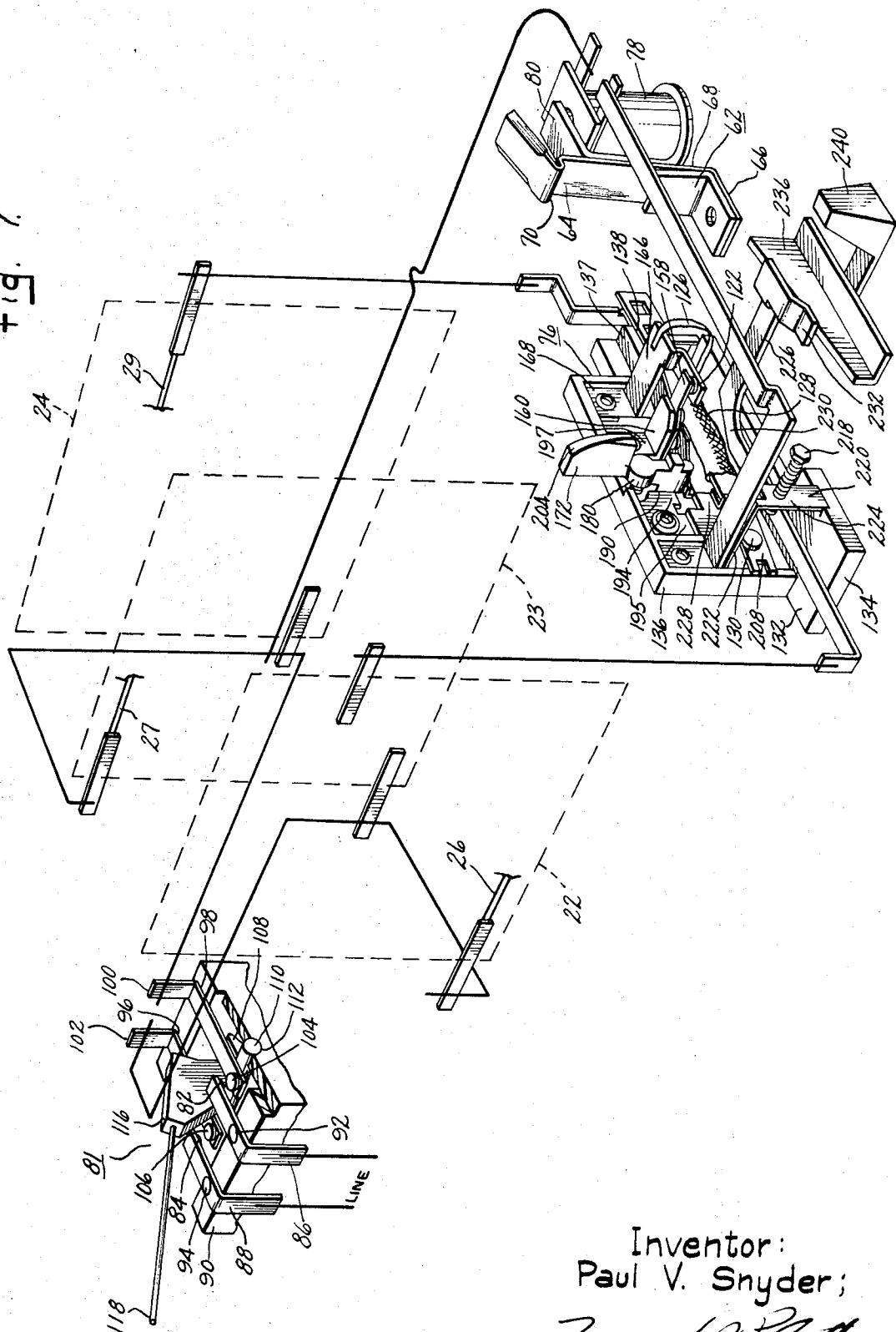
Fig. 6.



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Fig. 7.



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Fig. 8.

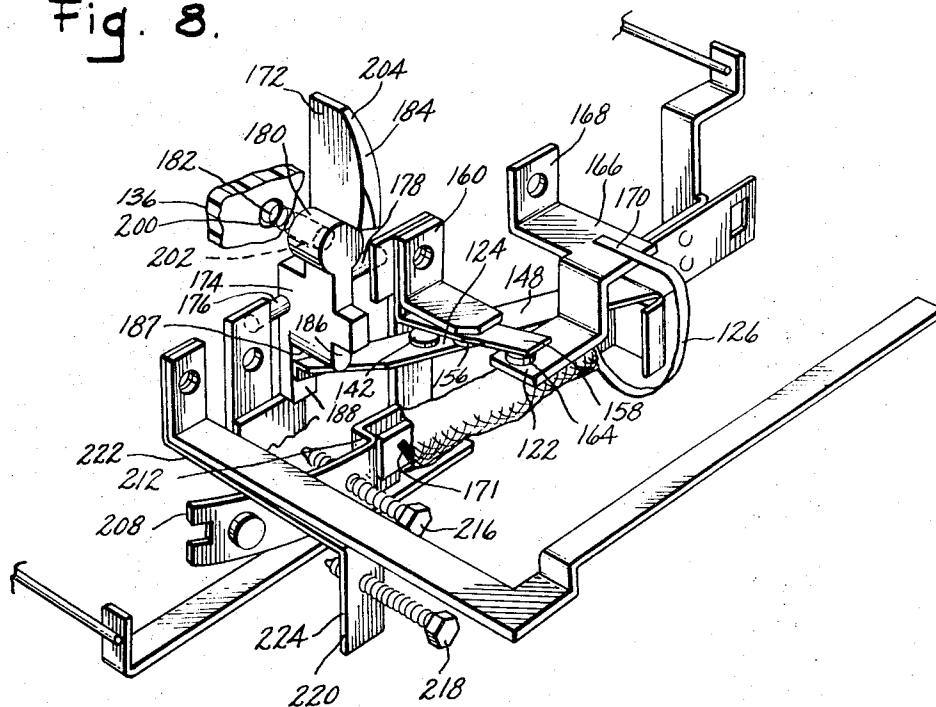
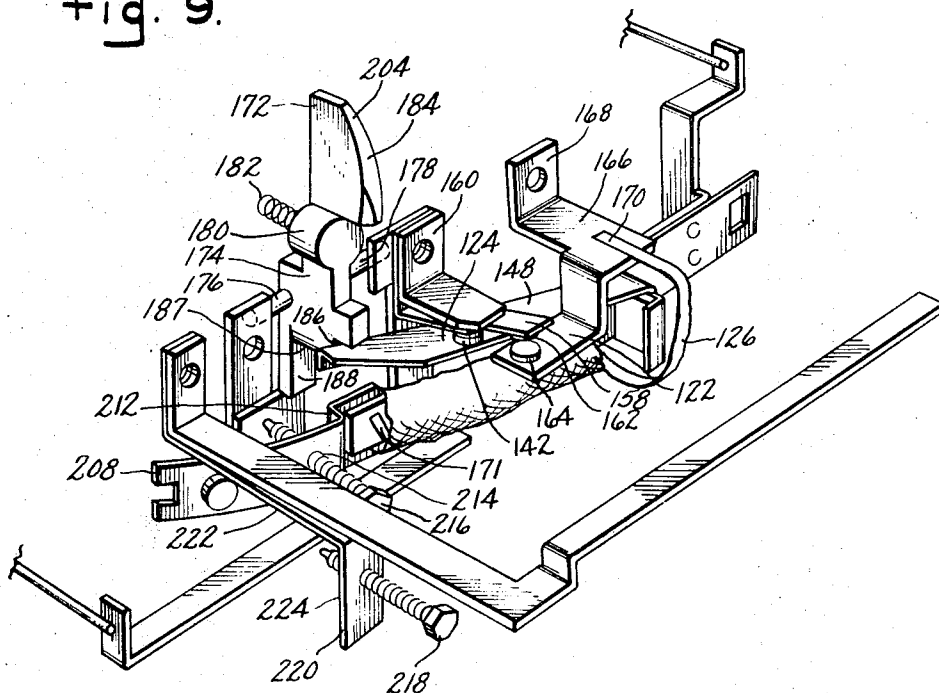


Fig. 9.



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Fig. 10.

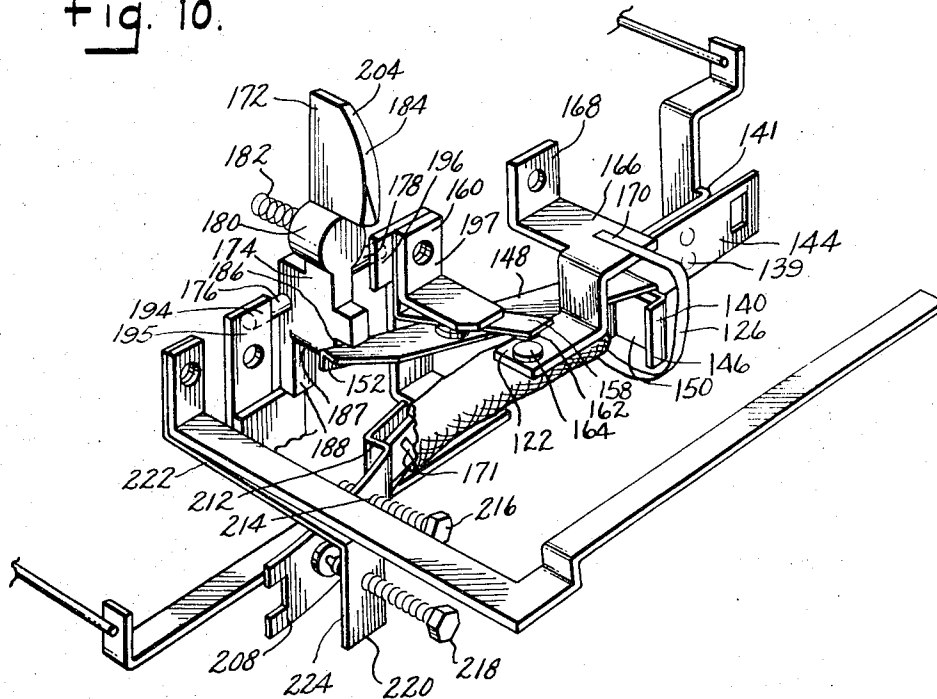
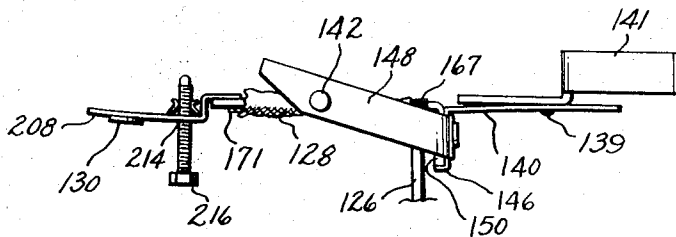


Fig. 11.



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ELECTRIC TOASTER WITH HEAT UP COOL DOWN BIMETAL TIMER

BACKGROUND OF THE INVENTION

This invention relates to an electric toaster and more particularly to an improved compact control for an electric toaster including a heat up cool down bimetal for timing the toaster heating cycle.

Electric toasters have used the heat up and cool down cycle of a bimetal for timing the toasting period. With such a mechanism, when a slice of bread or other food has been placed in the toaster and the food is lowered by a conventional push down lever, a switch closes an electric circuit to energize an electric heater which is provided for toasting the bread. At the same time, another heater is energized for heating a bimetal. After the bimetal has been heated a predetermined amount as indicated by the change in the angle of bow of the bimetal, another switch is actuated to de-energize the bimetal heater. Then, the bimetal cools down and after a predetermined time as evidenced by the reverse change in the angle of bow of the bimetal, the bimetal actuates a mechanism for de-energizing the heating element which has been toasting a slice of bread. At the same time, a mechanism is usually energized for lifting the toast so that it may be removed from the toaster. While the components for such a heat up, cool down bimetal timer have been constructed, sub-assembled and assembled in a number of different ways, it is especially desirable that they be reliable, yet inexpensive, sturdily constructed, and securely and easily assembled in an electric toaster.

In some prior art constructions, relatively massive bimetals having sufficient energy to drive an unlatching system have been utilized. It is an object of this invention to provide a construction which can effectively utilize a relatively inexpensive, small, light bimetal timer.

Other prior art bimetal timers have included a complex array of latching levers and parts for achieving the desired operation; and it is an object of this invention to provide a construction which utilizes a minimum number of parts which may be readily manufactured and assembled to each other.

It is also an object of the invention to provide a more versatile unitary bimetal timer subassembly which may be readily positioned on and connected to other portions of an electric toaster.

SUMMARY OF THE INVENTION

In accordance with one of the aspects of this invention, an electric toaster includes an electric resistance wire heater for toasting a slice of bread or other food. The electric resistance wire heater is placed in an electric circuit including a pair of switch contacts. The toaster also includes a heat up, cool down bimetal, a second electric circuit which includes an electric resistance wire for heating the bimetal, and a second pair of switch contacts. One of the electric contacts in the electric circuit which includes the resistance wire for toasting the bread is mounted on a switch blade which is attached to the bimetal for movement with the bimetal. The switch blade is positioned with respect to the other pair of contacts so that while the bimetal is being heated by the bimetal heater, the bimetal moves the switch blade to close the first pair of contacts in the toasting circuit and opens the second pair of contacts in the bimetal heater circuit to thereby terminate the bimetal heat up cycle.

With this construction, a readily formed switch blade attached to a bimetal for movement therewith is utilized for opening the bimetal heater circuit to permit the bimetal to cool down and to continue energization of the electric heater for toasting a slice of bread. This is accomplished without the use of a massive bimetal and also without the use of a complex latching arrangement. Thus, an exceedingly simple unique toaster bimetal timer construction has been achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and attendant advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing in which:

FIG. 1 is a perspective view of an electric toaster construction embodying my improved heat up, cool down bimetal timer partly broken away to show details in construction;

FIG. 2 is a front elevational view with portions cut away for the sake of clarity, of the toaster shown in FIG. 1;

FIG. 3 is a circuit diagram and partial schematic of the electric toaster illustrated in FIG. 1 showing the positions of the parts before the commencement of a toasting cycle;

FIG. 4 is a circuit diagram similar to FIG. 3 showing the positions of the parts at the commencement of a toasting cycle; i.e., toaster carriage down, both pairs of main switch contacts closed, bimetal heater switch closed;

FIG. 5 is a circuit diagram similar to FIG. 3 showing the positions of the parts in the bimetal cool down cycle, i.e., bimetal heater switch open;

FIG. 6 is a circuit diagram and schematic view similar to FIG. 4 with the parts shown at the instant that the bimetal cool down cycle is terminated, i.e., solenoid circuit closed to unlatch the toaster carriage;

FIG. 7 is a schematic perspective view of the electric toaster illustrated in FIG. 1 showing the positions of the parts at the termination of a toasting cycle, i.e., after the toaster carriage has been returned to its upper position illustrated in FIG. 1 and the electric resistance wire heater for toasting the bread or other food has been de-energized;

FIG. 8 is a perspective view of the bimetal timer illustrated in FIG. 1 showing the positions of the parts at the commencement of a toasting cycle as also illustrated in FIG. 4, i.e., bimetal heater switch closed;

FIG. 9 is a perspective view of the bimetal timer illustrated in FIG. 1 showing the positions of the parts in the bimetal cool down cycle, as also shown in FIG. 5, i.e., bimetal heater switch open;

FIG. 10 is a perspective view of the bimetal timer illustrated in FIG. 1 showing the positions of the parts at the instant that the bimetal cool down cycle is terminated, i.e., solenoid circuit closed to unlatch the toaster carriage; and

FIG. 11 is a top plan view of the unique bimetal and switch blades shown in FIGS. 8, 9 and 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing and first particularly to FIG. 1, there is shown an electric toaster 2 which includes an inner supporting structure 3, and an outer cover 4. Bread receiving slots 10 and 12 are formed in a top wall 14 of the outer casing.

Toasting chambers 16 and 17 are generally defined by opposed bread guard and heater card subassemblies 18—19 and 20—21, respectively, which guide and toast slices of bread or other food. The heater cards 22, 23, 24 may be formed of sheet mica or other suitable insulating material, and as illustrated in FIGS. 1 and 7, suitable notches 25 are formed at the edges of the heater cards for enabling electric resistance toast heater wires 26, 27 and 29 to be easily wound on the cards 22, 23 and 24, respectively.

As shown more particularly in FIGS. 1 and 2, a bread carriage 28 is movable vertically in the toasting chambers 16 and 17 as is conventional in pop up style toasters. The bread carrier 28 may be readily and inexpensively formed from three wires 30, 32 and 34 and two sheet metal plates 36 and 38. The central portions 40 and 42 of the wires are bent back and forth for providing a platform to support a slice of bread or other food while it is being toasted. A single wire 34 is connected to the ends of wires 30 and 32 for connecting the wires to each other to form a rigid assembly. At the left side of the toaster as shown in FIG. 1, both of the wires 30 and 32 extend upwardly and then inwardly and the two sheet metal plates 36 and 38 are connected to generally horizontal portions 44 and 46 of the wires.

A carriage slide rod 48 is provided for guiding the toaster carriage 28 as it is manually lowered by the operator, and as it is raised by a spring 50 at the end of the toasting cycle. The carriage slide rod 48 is securely held on the toaster by being positioned between an aperture 52 which is formed in the base plate 54 of the toaster and a bracket 56 which is connected to the upper portion of heater frame modules 58 and 60.

When it is desired to toast a slice of bread or other food, the toaster, carriage 28 is manually depressed from the position illustrated in FIG. 1 to the position illustrated in FIG. 2 thereby lowering the carriage 28 against the force of spring 50; and when the carriage reaches the position illustrated in FIG. 2, a latch mechanism 62 holds the carriage in its lower toasting position.

As shown more particularly in FIGS. 1 and 7, the latch mechanism 62 includes a sheet metal leaf spring 64 which is riveted or otherwise secured to the base plate 54 of the toaster. The leaf spring 64 includes a generally horizontal arm 66 which is riveted to the base plate, a generally vertical portion 68, and an inwardly extending latch projection 70 for cooperating with the toaster carriage plate 36.

In order to provide a smooth guiding surface for the latch projection 70, a piece of insulating material 74 is riveted to the metal plate 36. As shown more particularly in FIG. 1, the piece of insulation 74 is generally L-shaped and includes an angular guide portion 76. With this construction, when the toaster bread carriage has been moved to its lower position illustrated in FIG. 2, the natural bias of latch spring 64 causes the latch projection 70 of the spring to move on top of the insulated piece 74 thereby holding the carriage in its lower toasting position.

In the embodiment illustrated, my unique toaster timer 76 (to be more fully described hereinafter) energizes a solenoid 78 at the end of the toasting cycle to release the latch 70 to thereby permit the toaster carriage 28 to be moved upwardly to its bread removal position illustrated in FIG. 1. As shown in FIG. 7, an "L" shaped piece of sheet metal 80 is welded to the spring latch 64, and at the end of the toasting cycle when the solenoid 78 is energized, the metal 80 is pulled down on top of the solenoid 78 to move the latch to the position illustrated in FIG. 7 thereby permitting the carriage 28 to move to its upper position under the force of spring 50.

The electric toaster includes a main switch 81 which is provided for energizing the toasting heating elements 26, 27 and 29. As shown more particularly in FIG. 7, the toaster main switch 81 is located at the left side of the toaster and includes two fixed contacts 82 and 84 which are mounted on relatively rigid angle brackets 86 and 88, respectively. As illustrated in FIG. 7, brackets 86 and 88 are fixed to an insulated housing member 90 by means of rivets 92 and 94 or other suitable securing means. The housing member 90 is preferably molded from phenolic plastic or other suitable insulating material, and includes suitable recesses 96 and 98 for receiving relatively flexible switch blades 100 and 102 which hold movable contacts 104 and 106. An actuating cam lever 108 is integrally formed with a shaft member 110 which is mounted for rotation within recesses 112 and 114 which are also formed in the plastic housing member. The cam member 108 also includes an integrally formed actuating arm 116 extending upwardly therefrom for receiving a wire actuating lever 118.

As shown more particularly in FIG. 2, the main switch sub-assembly 90 may be readily connected to the toaster by simply inserting it within a generally rectangular opening 120 which is formed in the base plate 54 of the toaster. With this construction, it can be appreciated that upon downward movement of the toaster carriage 28, the left end of the toaster carriage wire 30 will move into contact with wire actuating lever 118 and further downward movement will cause integral cam member 110, 108, 116 to rotate within recesses 112 and 114 thereby causing the cam member 108 to lift switch blades 100, 102 until contacts 104 and 106 abut contacts 82 and 84 to thereby close the main switch 81. When the carriage 28 reaches the position illustrated in FIG. 2 and latch mechanism

62 holds the carriage in its lower toasting position, the right end of the toaster carriage wire 30, as shown in FIG. 2, continues to exert a downward force on the actuating wire lever 118 to hold the main switch contacts 82, 104, 92, 106 in a closed position.

When the main toaster heater switches 82, 104 and 84, 106 are in their closed position and switches 122 and 124 in my unique timer mechanism 76 have been placed in either the position illustrated in FIG. 4 or the position illustrated in FIG. 5 to energize the main electric resistance wires 26, 27 and 29 for toasting a slice of bread, current may flow from a 120 v. source to terminals 88 and 86 of the main switch through switch contacts 82, 84, 104, 106 to buses 101 and 103. With this construction, the voltage across heater wire 27 is 120 volts while the voltage across each individual outside heater wire 26 and 29 is 60 v. since they are electrically in series.

When the main toaster heater switches 82, 104, 84 and 106 are in their closed positions as illustrated in the circuit diagram of FIG. 4, a switch 122 which controls energization of a bimetal electric resistance wire heater 126 is also closed. Thus, in this position, a bimetal 128 of my unique bimetal timer mechanism is in its heat up cycle. It can be seen that current flows through the main switches 84, 106, electric toaster heating element 29, bimetal heater wire 126, bimetal heater switch 122, toaster heater wire 26 and switch contacts 82 and 104.

The relative positions of the switches during the bimetal cool down cycle are illustrated in FIG. 5. During this cycle, the toaster heating elements are energized to continue toasting the bread or other food. As shown in FIG. 5, the circuit includes closed switch contacts 124, the bimetal 128, electric toaster heating element 29, switch contacts 84, 106, 82 and 104 and toaster heating element 26.

My unique bimetal timer 76 for controlling the operation of bimetal heater switch 122, switch 124 in one of the toaster heater element circuits, and a switch 130 in a circuit for energizing the solenoid 78 will now be more particularly described. As shown in FIG. 7, the bimetal timer supporting structure includes a generally "L" shaped piece of phenolic 132 or other suitable insulating material. As illustrated, the phenolic support consists of a generally flat bottom wall portion 134, and a generally vertical wall portion 136. As shown in FIG. 7, the vertical wall portion 136 includes an outwardly extending projection 137 having a groove 138 formed in its vertical wall for mounting bimetal 128.

As shown more particularly in FIGS. 7 and 11, a uniquely formed switch blade and supporting member 140 is provided for connecting bimetal 128 to a bracket 141 and for mounting a contact 142 of switch 124. As illustrated in FIG. 10, the switch blade and mounting member 140 includes a generally vertical wall portion 144 for uniquely pivoting the bimetal and may be spot welded at 139 to the bracket 141 which is riveted or otherwise secured to insulated projection 137, a portion 146 extending outwardly away from wall 137 and a leaf spring member 148 integrally connected to the top of outwardly extending portion 146. The bimetal 128 includes a leg 150 arranged generally perpendicular to the major portion of the bimetal for connecting the bimetal to outwardly extending wall portion 146. As illustrated, the bimetal 128 is arranged generally parallel to vertical wall 136 and is spaced a short distance from it by the outwardly extending phenolic projection 137. Leaf spring member 148 is arranged generally perpendicular to the plane of bimetal 128 and is spring biased inwardly toward vertical wall 136 and upwardly away from bimetal 128. The leaf spring switch blade member 148 also includes a downwardly turned flange portion 152 for cooperation with a stepped cam member.

With particular reference to FIGS. 5, 8 and 9, contact 142 which forms one of the contacts of switch 124 is mounted on the upper surface of switch blade 148. The other contact 156 of switch 124 is mounted on a uniquely positioned switch blade 158. As shown in FIG. 9, the switch blade 158 is generally "L" shaped and is sandwiched to the generally verti-

cal wall 136 of the phenolic insulator by means of an "L" shaped piece of sheet metal 160. The switch blade 158 extends outwardly from the rear vertical wall 136 and, thus, it is arranged at an angle which is perpendicular to both the bimetal 128 and the switch blade 148. As shown more particularly in FIGS. 4 and 9, switch blade 158 includes a contact 162 which constitutes the upper contact of switch 122 and as shown, the contact 162 is formed on the lower surface of the switch blade 158.

A lower contact 164 of switch 122 is connected to the upper surface of a relatively rigid "L" shaped sheet metal bracket member 166. As shown, one of the legs 168 of the bracket is suitably riveted or otherwise secured to the generally vertical wall 136 of the phenolic insulating member. One end 170 of the bimetal heater wire 126 is welded or otherwise fixed to the upper surface of the sheet metal bracket member 166. A sheet of insulating material 167 is wrapped around the bimetal, the heater wire 126 is wrapped around the insulating material, and the other end 171 of the resistance wire 126 is welded or otherwise suitably connected to the bimetal. Thus, the bimetal itself is electrically hot and functions as a terminal for one end of the bimetal heater wire 126.

As shown more particularly in FIG. 7, an integrally formed stepped cam reset lever 172 is pivoted to the generally vertical wall 136 of my unique bimetal timer for actuating the switches 122 and 124 to the positions illustrated in FIGS. 3, 4 and 8 to close the circuit through the bimetal heater 126 and for holding switch blade 148 in the positions illustrated in FIGS. 9 and 5 for interrupting the circuit through heater 126. The stepped cam member 172 is preferably integrally molded of phenolic or other insulating material and includes a generally vertically arranged central portion 174, two outwardly extending shaft portions 176 and 178, a circular portion 180 for receiving a spring 182, an upwardly extending cam portion 184 for cooperation with a cross member 36 on the toaster carriage 28, and steps 186 and 188 for cooperation with an end portion of switch blade 148.

In order to pivot the stepped cam lever 172 illustrated in FIG. 7, a pair of recesses 190 and 192 are provided within the generally vertical wall 136 of the phenolic insulating member for receiving outwardly extending pivot shaft portions 176 and 178 of the stepped cam lever 172, and suitable arms 194 and 196 are formed on sheet metal members 195 and 197 for holding the shafts 176 and 178 for pivotal movement within the recesses 190 and 192.

In order to resiliently urge the stepped reset lever 172 to the position shown in FIG. 2, a spring 182 is positioned between the lever 172 and upwardly extending vertical wall 136. As shown in FIG. 8, one end of the spring 182 is seated within a recess 200 formed in the generally vertical wall 136 and the other end of the spring is seated in a recess 202 formed in a circular wall portion 180 of the stepped cam 172. With this arrangement, the upper portion of the stepped cam 172 is urged outwardly by the spring 182 and the lower portion of the stepped cam reset lever 172 is resiliently urged inwardly to the position illustrated in FIG. 2 wherein the lower innermost portion of the reset lever 172 abuts vertical wall 136.

A sloping upper surface 204 of the stepped cam 172 is arranged for actuation by the lower sheet metal cross member 36 of the toaster carriage 28 whenever the toaster carriage is raised or lowered with respect to cam surface 204 to thereby close the bimetal heater contacts 162 and 164. It can be appreciated that inward movement of the upper portion 184 of the stepped reset cam 172 will cause step 186 to move outwardly and upwardly. After step 186 has been moved upwardly beyond the uppermost position of switch blade 148 which is self biased upwardly and inwardly, the switch blade 148 drops off the step and moves inwardly along a generally horizontal wall 187 between steps 186 and 188. Upon release of the stepped cam lever 172 by the toaster carriage cross member 36, spring 182 pivots the stepped cam 172 so that the horizontal wall 187 between steps 186 and 188 moves the end of switch blade 148 downwardly thereby opening contacts 142

and 156. When the switch blade 148 is held in this position by the horizontal wall 187 and step 188, switch blade 158 which is biased downwardly closes contacts 162 and 164 in the bimetal heater circuit.

With this construction, it can be appreciated that the natural upward bias force on leaf spring 148 is greater than the downward spring bias of leaf spring 158. Accordingly, when both spring blades are free to move under their built in spring bias, lower contact 142 on switch blade 148 abuts contact 156 to lift switch blade 158 against its natural downward bias to open contacts 162 and 164 and close contacts 142 and 156. It can also be appreciated that when the horizontal surface 187 between vertical steps 186 and 188 holds switch blade 148 downwardly against the force of its natural bias, switch blade 158 which is constructed with a natural downward bias is permitted to move downwardly to close switch contacts 162 and 164.

A switch blade member 208 is connected to the free end of bimetal 128 for supporting a contact 130 for energizing the solenoid 78 to release the toaster carriage 28 at the end of the cool down cycle. As shown, the blade 208 includes an offset portion 212 for connecting it to the bimetal 128 and a threaded portion 214 for receiving a screw 216. It can be seen that the switch blade 208 is arranged generally contiguous with the bimetal 128 so that it may flex in the same plane as the direction of flexure of the bimetal.

A screw 218 constitutes the other contact of the switch for energizing solenoid 78. As shown in FIG. 10, the screw 218 is threaded into one of the legs of an "L" shaped bracket 220 which is connected to the phenolic bimetal timer support. As shown, the bracket 220 includes a generally outwardly extending horizontal portion 222 which is fixed to the generally vertical wall of the phenolic member, and a downwardly extending generally vertical portion 224 which is fixed to the generally horizontal flat wall 134 of the phenolic support member. It can be appreciated that the screw 218 may be threaded into or out of the generally horizontal arm 224 for adjusting the time of solenoid energization.

A readily formed lever construction is provided for adjusting the toasting time interval. This construction includes a cam follower plate 226 and an adjusting screw 216. These parts determine the pivot point of the left end of the bimetal and thereby cooperate to set the time when switch blade 148 moves onto step 186 to de-energize bimetal heater 126 to thereby determine the time interval of the heat up cool down bimetal and the toasting cycle. A manufacturing adjustment in the length of this cycle is initially made by adjusting the position of screw 216 with respect to followup plate 226. It can be seen that the screw 216 is merely rotated within the threaded portion 214 of blade 208 to initially adjust the relative position of the end of the screw 216 to the surface of the cam follower plate 226. As shown more particularly in FIG. 7, the cam follower plate 226 is generally "L" shaped. It includes a generally vertical portion 228 which extends downwardly from the top portion of vertical wall 136 to a position below the bimetal blade 128, a generally U-shaped horizontal portion 230 which extends outwardly from the generally vertical wall 136 of the phenolic support, and a generally horizontal cam contacting portion 232 which is connected to one of the ends of the U-shaped portion and arranged generally perpendicular to the U-shaped portion and generally parallel to the bimetal 128. As shown more particularly in FIG. 7, the top end of the generally vertical portion 228 is affixed to the leaf spring bracket 195 which is riveted or otherwise secured to the vertical wall 136 of the phenolic support.

As shown more particularly in FIG. 7, a slide cam member 236 is provided for moving the outwardly extending end portion 232 upwardly to move the vertical arm 228 of the cam follower plate 226 toward adjusting screw 216 thereby decreasing the toasting interval. Movement of the slide cam 236 in the opposite direction allows the cam follower vertical wall 228 to move toward the vertical wall 136 of the phenolic control body and away from adjusting screw 216 thereby in-

creasing the toasting time interval. A suitable control knob 240 may be attached to the slide cam 236 to enable an operator to slide the cam 236 to control the position of the cam follower vertical wall 228 with respect to adjusting screw 216 to thereby control the length of the toasting cycle. It can be appreciated that when the slide cam 236 is moved to the left as viewed in FIG. 2, the length of the toasting cycle is decreased, and when the cam is moved to the right as viewed in FIG. 2, the length of the toasting cycle is increased.

OPERATION

In operation, slices of bread or other food is inserted in slots 10 and 12 until the bread rests on the carriage wires 30 and 32. Then, the carriage 28 is depressed by the operator from the position illustrated in FIG. 1 to the position illustrated in FIG. 2. In the FIG. 2 position, latch 70 cooperates with the top of insulated piece 74 to hold the carriage in its lower position.

BIMETAL HEATUP

During this manual movement from the position illustrated in FIG. 1 to the position illustrated in FIG. 2, the right side of sheet metal carriage plate 36 abuts the sloping cam surface 204 of stepped cam member 172 to pivot the cam member thereby insuring that the leaf spring switch blade 148 has been moved from step 186 to lower step 188. In this position, as illustrated in FIGS. 4 and 8, the natural bias of switch blade 158 holds contact 162 in engagement with contact 164 to close switch 122.

With reference to FIGS. 1 and 2, it can also be appreciated that when the toaster carriage 28 is moved from the position illustrated in FIG. 1 to the position illustrated in FIG. 2, the left end of the toaster carriage wire 30 as shown in FIG. 7 exerts a downward force on actuating wire lever 118 to pivot cam 108 to thereby move main switch contacts 104 and 106 upwardly to close switches 82, 104 and 84, 106, respectively. With reference to FIG. 4, it can be seen that when the switches and other parts are in this bimetal heatup position, main switch contacts 84—106, 82—104 and bimetal heater contacts 162 and 164 are closed, solenoid energization switch 130 is open, and the switch 124 for completing the main heater circuit during cool down is open. As the bimetal 128 is heated by the bimetal heater 126, the bimetal itself bows away from the vertical wall 136 of the phenolic insulating plate, i.e., the central portion of the bimetal tends to move outwardly and the end portions of the bimetal are forced inwardly. Inward movement of the free end portion 171 of the bimetal is limited by the engagement of the end of screw 216 with cam follower plate 226. The other end of the bimetal is fixed to resilient supporting member 140 and thus its movement is limited; however, the entire assembly tends to pivot about the point of connection 139 of the supporting member 140 with the bracket 141. This pivotal movement of the bimetal 128 along with its sheet metal support 140 and the switch blade 148 which is integrally connected thereto causes the sheet metal switch blade 148 to move outwardly away from vertical wall 136 until it reaches top step 186. At this time, the natural upward bias of switch blade 148 permits it to slide upwardly on upper step 186 thereby closing contacts 142 and 156. As shown in FIGS. 5 and 9, this movement also opens contacts 162 and 164 since the natural upward bias of switch blade 148 is greater than the downward bias of switch blade 158.

BIMETAL COOLDOWN

The switches are now in the positions illustrated in FIG. 5. In particular, the switch contacts 162 and 164 which control energization of the bimetal heater 126 have been opened so that the bimetal may cool down, and the switch contacts 142 and 156 are closed to continue to complete the circuit through the electric toaster heater elements 26, 27 and 29. During this bimetal cooldown cycle, the main switch contacts 84, 106 and 82, 104 are closed and the solenoid switch 130 is open. As the

tions which had been urged toward the vertical wall member 136 now move away from the vertical wall member 136. Particularly, the free end portion 171 of the bimetal and the switch blade 208 which is attached thereto moves away from the vertical wall member 136. Upon continued movement in this direction, switch contact 130 will abut the end of screw 218 to close the solenoid switch 130, 218.

SOLENOID ACTUATION—CARRIAGE RELEASE

At the instant of solenoid switch closure, the switch contacts are in the positions illustrated in FIGS. 6 and 10. The solenoid switch 130 is closed, the main switches 84, 106 and 82, 104 are closed, and the switch 124 for energizing the main heaters 26, 27 and 29 during cooldown are closed. Switch 122 for energizing the bimetal heater 126 is open. When the solenoid 78 is energized, the metal leg 80 is pulled down on top of the solenoid to move the latch 70 to the position illustrated in FIG. 1 thereby permitting the carriage 28 to move upwardly under the force of spring 50. As the carriage moves upwardly, the right side of the metal carriage plate 36 abuts the sloping upper surface 204 of stepped cam 172 to move the upper portion of the cam inwardly against the force of spring 182. At this time, the lower end portion of the stepped cam 172 is moved outwardly and upwardly thereby forcing switch blade 148 off step 186 and onto step 188. As the carriage moves past cam 172, spring 182 moves the upper portion of the cam outwardly and the lower portion of the cam lever inwardly and downwardly. The end of switch blade 148 is held on the horizontal wall 187 between the vertical wall of step 186 and the vertical wall of step 188. With this arrangement, as shown in FIG. 8, spring 182 forces horizontal wall 187 downwardly thereby moving the end of switch blade 148 downwardly. In this position, with the switch blade 148 held in its lower position, contacts 142 and 156 are opened, as shown in FIG. 3, and the contacts 122 which control the bimetal heater 126 are closed; however, the bimetal heater 126 is not energized since the toaster carriage is moving from its lower position to its upper position has opened main switch contacts 84, 106 and 82, 104. The parts are now in the positions illustrated in FIG. 3 and FIG. 1, and the toaster is ready to be operated to toast additional slices of bread.

From the foregoing description, it will be appreciated that my improved heat up cool down bimetal timer is achieved with the use of a minimum number of parts which permits miniaturization of the control so that it will fit in a smaller space. It can be seen that this control does not include a complex array of levers, cams and latches and that the only latch is the unique integrally formed cam lever 172 which includes integrally formed steps 186 and 188. An inexpensive, readily formed member 140 functions as a support and pivot for the bimetal 128 and as a switch blade 148 for controlling the bimetal heat up and cool down cycles. The bimetal 128 and the switch blades 148 and 208 which are directly attached thereto form a multiplicity of functions without the use of intermediate cams and latches. During bimetal heatup, the bimetal moves the switch blade 148 from step 188 to step 186 to close contacts 142 and 156. The bimetal itself is arranged to be electrically hot and the switch blade 208 is directly connected to the bimetal for signalling the end of the cool down cycle. It can also be appreciated that the complete bimetal timer is conveniently supported on a relatively small piece of phenolic insulating material 136.

Accordingly, it will be appreciated that my unique heat up cool down bimetal timer includes a minimum number of relatively easily manufactured switch blades which are readily connected to each other and to the phenolic supporting member. Thus, an exceedingly simple, yet reliable bimetal toaster timer has been achieved.

I claim:

1. An electric toaster construction comprising:

a. an electric resistance wire heater for toasting a slice of bread;

- b. a first electric circuit including said electric resistance wire for toasting a slice of bread;
 - c. a heat up, cool down bimetal for controlling said toaster;
 - d. a second electric circuit including an electric resistance wire for heating said bimetal and said electric resistance wire for toasting a slice of bread;
 - e. a first pair of switch contacts in said first electric circuit, one of said contacts in said first electric circuit being connected to a switch blade which is attached to said bimetal for movement therewith; and
 - f. a second pair of switch contacts in said second electric circuit, said bimetal while it is being heated by said bimetal heater moving said switch blade to close said first pair of contacts and open said second pair of contacts at the termination of the bimetal heat up cycle.
2. An electric toaster construction as defined in claim 1 wherein a resilient member is provided for supporting said bimetal and said switch blade is integrally formed with said resilient supporting member.
3. An electric toaster construction as defined in claim 2 wherein said switch blade is arranged in a plane generally perpendicular to said bimetal so that it may readily flex in a direction generally perpendicular to the direction of movement of said bimetal.
4. An electric toaster construction comprising:
- a. a toaster carriage for carrying a slice of bread movable toward and away from a toasting position;
 - b. a mechanism for holding said toaster carriage in said toasting position;
 - c. an electric resistance wire heater for toasting a slice of bread;
 - d. a heat up, cool down bimetal for controlling said toaster, said bimetal having a free end and a mounting end;
 - e. a first electric circuit including said electric resistance wire for toasting a slice of bread;
 - f. a first pair of switch contacts in said first electric circuit, one of said contacts in said first electric circuit being connected to a switch blade which is attached to said bimetal for movement therewith;
 - g. a second electric circuit including an electric resistance wire for heating said bimetal and said electric resistance wire heater for toasting a slice of bread;
 - h. a second pair of switch contacts in said second electric circuit;
 - i. a third electric circuit including a solenoid for releasing the mechanism for holding the toaster carriage in its toasting position; and
 - j. a third pair of switch contacts in said third electric circuit, one of said switch contacts being connected to said bimetal for movement therewith, said bimetal moving said one of said third pair of contacts toward the other one of said third pair of contacts as said bimetal cools down so that said contacts will abut each other to close said third circuit to thereby release the mechanism for holding the toaster carriage in the toasting position at the end of the bimetal cool down cycle.
5. An electric toaster construction as defined in claim 4 wherein said one of said third pair of switch contacts is connected to the free end of said bimetal, and said switch blade having said one of said contacts in said first electric circuit being connected to the mounting end of said bimetal.
6. An electric toaster construction as defined in claim 5 wherein said one of said contacts in said third electric circuit is mounted on a switch blade which is arranged generally contiguous with said bimetal so that it may flex in the same plane as the direction of flexure of said bimetal.

7. An electric toaster construction comprising:
- a. a toaster carriage for carrying a slice of bread movable toward and away from a toasting position;
 - b. a latch for holding said toaster carriage in said toasting position;
 - c. an electric resistance wire heater for toasting a slice of bread;
 - d. a main switch for controlling energization of said electric resistance wire heater, said main switch including a contact which is spring biased to an open position away from a fixed contact;
 - e. said toaster carriage including a member for moving said movable contact of said main switch to a closed position when said toaster carriage is moved to its toasting position;
 - f. an electric solenoid for releasing said latch at the end of the toasting cycle to permit said carriage to be moved upwardly to its toast removal position; and
 - g. a timer for energizing said solenoid to release said latch at the end of the toasting cycle, said timer including:
 - 1. a heat up, cool down bimetal having an electric resistance wire heater wound thereon;
 - 2. a first pair of switch contacts in said electric toaster heater circuit for controlling energization of said electric toaster heater and said bimetal heater;
 - 3. a second pair of contacts outside of said bimetal heater circuit for controlling energization of said main electric toaster heater circuit;
 - 4. a pair of contacts for energizing said solenoid at the termination of said toasting cycle for causing said latch to release said toaster carriage to thereby permit said spring biased main contact to move to its open position;
 - 5. one of said contacts of said first pair of contacts being mounted on a first resilient switch blade and one of said contacts of said second pair of contacts being also mounted on said first resilient switch blade; and
 - 6. said second pair of contacts including a contact which is mounted on a resilient switch blade which is connected to and arranged for movement with said bimetal so that as said bimetal heater heats said bimetal, the second contact of said second pair of contacts abuts said first contact of said second pair of contacts to move said first resilient switch blade to thereby open said first pair of contacts to thereby de-energize said bimetal heater.
8. An electric toaster construction as defined in claim 7 wherein a stepped cam is positioned adjacent to said second movable switch blade and includes a step for holding said second movable switch blade so that said second pair of contacts are held in a closed position and said first pair of contacts are held in an open position.
9. An electric toaster construction as defined in claim 8 wherein said stepped cam is positioned in the path of said toaster carriage so that whenever said toaster carriage moves past said cam, it abuts said stepped cam to remove said second switch blade from said step.
10. An electric toaster construction as defined in claim 9 wherein one of said third pair of contacts is fixed to a resilient switch blade which is fixed to one end of said bimetal so that as said bimetal cools down, said movable one of said third pair of switch contacts moves toward the fixed contact of said third pair of switch contacts until it contacts said fixed contact at the end of the cool down cycle thereby energizing said solenoid to release said toaster carriage at the end of said cool down cycle.