

April 6, 1948.

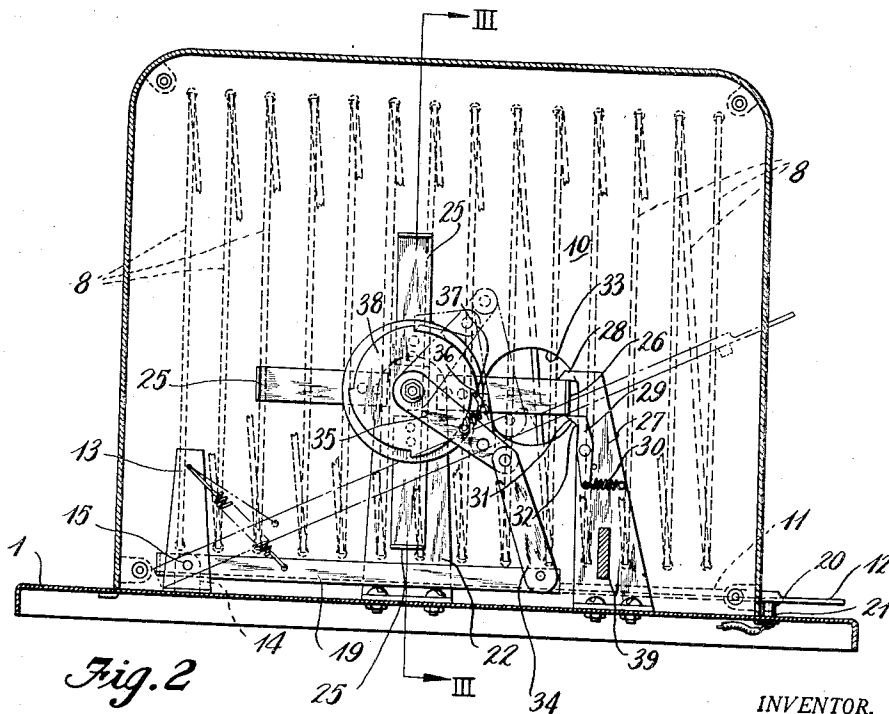
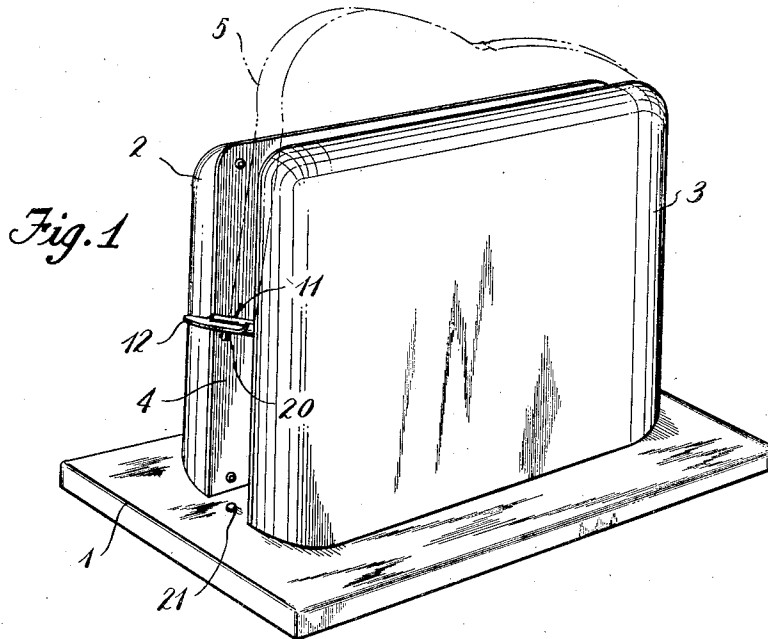
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2,439,017

THERMAL TIMER FOR HEATING APPARATUS

Filed Nov. 19, 1945

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3

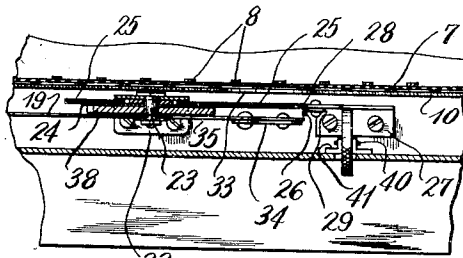
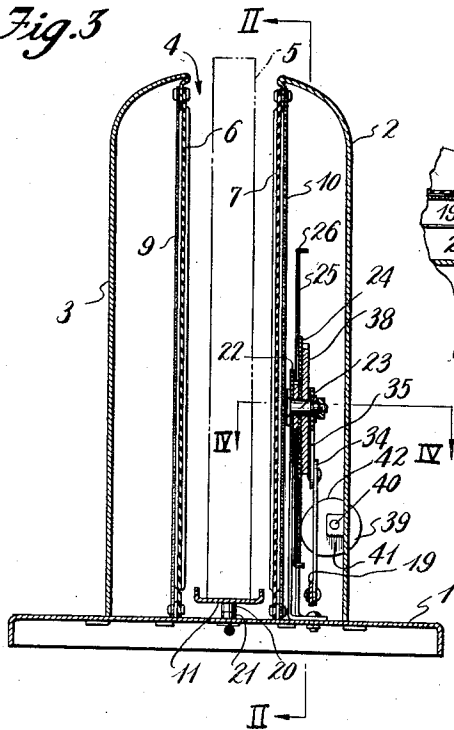


Fig. 4

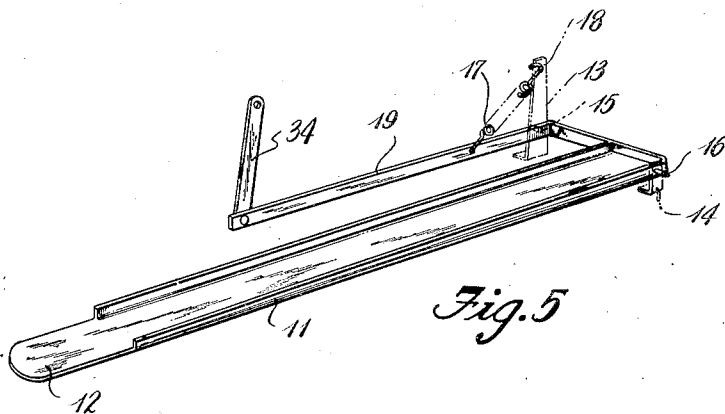


Fig. 5

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THERMAL TIMER FOR HEATING APPARATUS

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11 Claims. (Cl. 219—20)

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My invention relates to time controllers and has particular reference to a novel thermostatic time controller which finds particular utility when used to control cyclically operating apparatus, such as bread toasters, waffle bakers and the like.

In certain types of appliances, such as bread toasters, waffle bakers and the like, use is made of a simple and inexpensive time controller for controlling the duration of operation of the appliance in an attempt to automatically produce a product of uniform quality. Usually these time controllers constitute bimetallic thermostatic strips which produce a motion in response to a rise in temperature. This motion is used to terminate the operation of the appliance after the passage of such a time period as may be required to heat the bimetallic element to a tripping temperature.

Prior to my invention considerable difficulty has been encountered in the use of thermostatic timing elements of this character because the appliances are usually subjected to repeated operations, with the result that on ensuing operations the bimetallic strip is heated from an initial temperature higher than that obtaining at the beginning of the previous cycle of operations so that the time period controlled becomes progressively shorter as the device is repeatedly used. This results in an undesired lack of uniformity in the product produced, requiring either a continuous adjustment of the mechanism during operation or, alternatively, requiring the automatic control to be superseded by a manual control.

It is, therefore, an object of my invention to provide a time controller which overcomes the above noted disadvantages by providing controlled time periods of uniform duration regardless of the frequency of successive operations.

It is also an object of my invention to provide a time controller of the character set forth in the preceding paragraph which employs a temperature responsive element for determining the duration of the controlled time period, and in which a plurality of such elements are used successively.

It is an additional object of my invention to provide a time controller of the character set forth hereinbefore which includes a means operable once each time period to transfer the time control to a long idle control element.

It is a still further object of my invention to provide a time controller of the character set forth in the preceding paragraphs in which a

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plurality of control elements are mounted for movement successively to controlling positions and in which movement of said element results from each operation of the time controller.

It is additionally an object of my invention to provide a controller of the character set forth hereinbefore which includes a single timing adjustment for regulating the duration of the time period controlled by each of the control elements.

Other objects and advantages of my invention will be apparent from a study of the following specifications, read in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view illustrating as one embodiment of my invention an electric bread toaster;

Fig. 2 is a longitudinal sectional view taken substantially along the line II—II of Fig. 3 and illustrating the details of interior construction;

Fig. 3 is a cross-sectional view taken along the line III—III of Fig. 2 and illustrating additional details of construction;

Fig. 4 is a fragmentary plan view of the time controlling mechanism and illustrating the relationship of the parts to a time period adjusting means; and

Fig. 5 is a fragmentary perspective view illustrating the construction and arrangement of a part of the mechanism.

Referring to the drawings, I have chosen an electric bread toaster for illustration in Fig. 1 as exemplary of the uses to which the time controller of my invention may be put. As is illustrated in Figs. 1, 2 and 3, the bread toaster may include a suitable base member 1 upon which is suitably mounted upright housing and supporting members 2 and 3. These members are disposed in parallel relation to each other and spaced apart so as to define an interior space shown at 4 into which a slice of bread, represented by the dotted outline 5, may be placed.

Upon the inner face of each of the supports 2 and 3 there are mounted sheets 6 and 7 of heat-resistant electrical insulating material, such as sheet mica, upon which are mounted electrical heating elements 8. The heat produced by these elements is excluded from the spaces within the individual housings 2 and 3 by means of heat insulating shields 9 and 10 positioned immediately behind each of the heating element supports 6 and 7.

Within the slot or space 4 there is mounted a bread supporting member 11 which serves also as a starting or control lever. The member 11 is

illustrated in Fig. 5 as comprising a shallow channel-shaped member including a projecting handle or tongue portion 12 which may be grasped with the fingers for placing the device in operation. The opposite end of the member 11 is mounted for pivotal movement as by means of supporting brackets 13 and 14 secured to the base 1 and engaged by pivot pins 15 and 16 which are mounted on the end of the tray 11.

The tray 11 is normally urged to a normal non-operating position, such as is shown in Fig. 1, by means of a tension spring 17 connected between an upwardly extending portion 18 of the bracket 13 and an arm 19 which is secured to or formed integrally with the tray 11 and extended parallel thereto in a position to lie within the space enclosed within the housing 2.

Near the fingerpiece 12 there may be mounted an electrical contact 20 disposed in a position to engage another electrical contact 21 mounted upon the base member 1 to thereby complete the electrical circuit through the heating elements 8 when the tray 11 is depressed to an operating position, such as that shown in full lines in Fig. 2.

Within the interior of the housing 2 there is mounted an upwardly extending support or post 22 to which is secured a horizontally extending stub shaft 23 upon which is journaled for rotation a control element carrier 24. Upon the carrier 24 there are mounted a plurality of temperature responsive control elements 25. In the drawings I have illustrated four of such control elements as being spaced equally about the circumference of the carrier 24.

According to the preferred embodiment of my invention these control elements comprise bi-metallic strips, the outer ends of which are turned laterally as indicated at 26 in Fig. 3. The elements 25 are so constructed that when heated, they deflect laterally; i. e., in a direction normal to the plane of the strips 25.

Near the circumference of the circle described by rotation of the control elements 25 there is placed a tripping member or latch 27 which includes a laterally extending hook or projection 28 positioned at its upper end in such location as to normally be engaged by the laterally turned portions 26 of the control elements 25 so that, as is shown in Fig. 2, counter-clockwise rotation of the element carrier 24 and the elements 25 is prevented by engagement of the portion 26 with the latch 28. Rotation in the opposite direction may be prevented by means of a pawl 29 pivotally mounted upon the support 27 and normally urged as by means of a spring 30 to a position such as is shown in Fig. 2 in which the tip 31 of the pawl 29 engages the under side of the laterally turned portion 26 of the control element 25.

The tip portion 31 of the pawl 29 defines a sloping surface 32 adapted to be engaged by counterclockwise rotation of the control elements and be displaced to a position allowing the portion 26 to be moved into engagement with the latch or hook 28, at which time the spring 30 returns the pawl 29 to the normal position illustrated in Fig. 2 in which the control elements 25 are held against rotation.

To provide for heating the one control element 25 which is engaged with the trip 28 there is provided in the heat shield 10 an aperture 33 disposed in a position to permit radiant heat energy from the heating element 8 to fall upon the one control element 25 which is engaged with the latch 28. The heat shield 10 effectively heat insulates those of the control elements 25 which are

disposed in locations away from the trip means 28.

It will be appreciated that when the one of the elements 25 which is engaged with the latch 28 is heated to a sufficiently high temperature, the resulting lateral displacement of the tip 26 will move that portion out of engagement with the latch 28 to thereby release the control element assembly to permit that assembly to be rotated 90° in a counter-clockwise direction, at which time rotation is arrested by engagement of the portion 26 of another control element with the latch 28.

The above described rotation of the assembly of control elements 25 is, in the construction illustrated herein, made an incident to the movement of the control lever or bread tray 11 from the operating position shown in full lines in Fig. 2 to the normal or non-operating position shown by dotted lines in that figure. This is accomplished by pivotally mounting upon the end of the arm 19 a link 34 which is pivotally attached to a crank 35 journaled for rotation upon the stub shaft 23. The crank 35 supports a pawl 36, the nose 37 of which rides the periphery of a four notch ratchet 38.

The ratchet 38 is secured to the control element carrier 24 and is so positioned that when the control lever 11 is moved to an operating position such as is shown in solid lines in Fig. 2, the nose 37 of the pawl 36 will engage one of the notches of the ratchet 38. The spring 17 which normally urges the control lever 11 toward its normal position thus applies through the arm 19, link 34, crank 35 and pawl 36 a torque to the assembly of control elements tending to rotate those elements in a counter-clockwise direction. Accordingly when the one control element which is positioned under the latch 28 is heated sufficiently to disengage the portion 26 from the latch 28, the spring 17 will lift the control 11 to its normal position and at the same time rotate the assembly of control elements through an angle of 90° to position another control element in engagement with the latch 28. This upward movement of the control lever or bread tray 11 will lift the slice of bread 5 to a position such as is represented by the dotted outline in Fig. 1, permitting ready removal of a slice of toast from the device.

When the device is placed in operation a second time by moving the control lever 11 from its normal position to its operating position, the pawl 29 holds the control element assembly against rotation so that the pawl 36 is moved over the peripheral surface of the ratchet 38 to a position engaging the nose 37 of the pawl with another notch of the ratchet. At the end of the time required to heat the control element sufficiently to disengage the portion 26 thereof from the latch 28, the control lever 11 will return to its initial position and the assembly of control elements 25 will be rotated through another 90°.

It will be noted that by this construction three of the four control elements are shielded from the heat generated by the heating element 8 and that each element is employed to regulate the duration of the time of operation of the device only once out of each four operations so that each of the time periods of operation is controlled by a control element which has been allowed sufficient time to cool to a substantially uniform initial temperature. By this means I have assured that the time periods which are determined

by the heating of the control elements will all be of uniform duration.

I have included also in the device of my invention a means for adjusting the length of the controlled time periods. This means preferably comprises a cam wheel 39 which is mounted for rotation as by means of a shaft 40 carried in supporting brackets 41 secured to the inner surface of the outer wall of the housing 2. The cam 39 presents a spiral or eccentric surface 42 which engages the side of the post 27 so that by pivotally moving the cam 39, the post 27 may be flexed to move the latch portion 28 thereof in the same direction as the tip 26 of the control element 25 is moved by a change in temperature of the control element. Therefore, rotation of the adjustment means 39 regulates the distance through which the tip 26 of the control elements 25 must move in order to disengage the control element assembly from the latch 28. Thus the adjustment means 39 operates to adjust the duration of the time period controlled by the controller, and it is pointed out that this one adjustment means serves to adjust the operating time of all of the plurality of controlling elements 25.

While I have described the device of my invention as forming an integral part of a controlled device which has been illustrated herein as comprising a bread toaster, it will be appreciated that the device may be used for the control of any electrical apparatus merely by connecting that apparatus in parallel with the heating elements 8.

It will also be appreciated that the mechanism is suitable for use on other types of appliances, such as waffle bakers, electric stoves and similar devices.

Attention is directed particularly to the fact that I obtain a uniform measured time interval by providing a plurality of time controlling elements which are operated in succession so that each element is allowed a sufficient time to cool to a uniform initial temperature before that element is again used to control the operation of the device.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details of construction shown or described herein, except as defined in the appended claims.

I claim:

1. A time controlled device comprising: the combination of: means for initiating an operation; a plurality of temperature responsive control elements; means for exposing said elements successively to an operating location; a heater for applying heat to said location; means controlled by the one element at said location for terminating said operation upon a rise in temperature of said one element to a predetermined value; and a connection with said controlled device for automatically moving said elements upon operation of the device, whereby unused control elements will be permitted to cool before again being subjected to heat.

2. In a time controlled device employing thermally responsive elements capable of reproducing calibrated time periods, the combination of: means for initiating an operation; a plurality of temperature responsive control elements; a mounting for said elements for effecting movement successively to an operating location; a heater for applying heat to said location; a cut-off controlled by one element at said location for terminating said operation upon a rise in

temperature of said one element to a predetermined value; and a mechanism responsive to termination of said operation for moving said elements.

3. In a time controlled device employing thermally responsive elements capable of reproducing calibrated time periods, the combination of: means for initiating an operation; means for applying heat to an operating location; a plurality of temperature responsive control elements; means controllable by a control element at said operating location for terminating said operation upon a rise in temperature of said element to a predetermined value; means mounting said elements for movement successively to said operating location; and means operable alternately with said controlled device for moving said elements to shift said one element away from said operating location and move another element to said location.

4. In a time controlled device employing thermally responsive elements capable of reproducing calibrated time periods, the combination of: means for initiating an operation; a heater for applying heat to an operating location; a plurality of temperature responsive control elements; means controllable by a control element at said operating location for terminating said operation upon a rise in temperature of said element to a predetermined value; means mounting said elements for movement successively to said operating location; and a mechanism responsive to termination of said operation for moving said elements to shift said one element away from said operating location and move another element to said location.

5. In a time controlled device including a heat producing member, the combination of: means for initiating operation of said device; trip means for terminating said operation; a plurality of temperature responsive control elements each including a portion movable from a normal position in response to a rise in temperature of said elements; means mounting said elements for movement successively to a position normally engaging said portion with said tripping means; means for directing heat from said member upon the one element engaging said trip means and for heat shielding all other control elements; and means operable alternately with said member for moving said elements to shift said one element away from said trip means and move another element into engagement therewith.

6. In a time controlled device including a heat producing member, the combination of: means for initiating operation of said device; trip means for terminating said operation; a plurality of bimetallic control elements each including a portion movable from a normal position in response to a rise in temperature of said elements; means mounting said elements for movement successively to a position normally engaging said portion with said trip means; means for directing heat from said member upon the one element engaging said trip means and for heat shielding all other control elements; and means operable alternately with said member for moving said elements to shift said one element away from said trip means and move another element into engagement therewith.

7. In a time controlled device including a heat producing member, the combination of: means for initiating operation of said device; trip means for terminating said operation; a plurality of bimetallic control elements each including a por-

tion movable from a normal position in response to a rise in temperature of said elements; means mounting said elements for movement successively to a position normally engaging said portion with said trip means; heat shield means disposed between said heat producing member and all of said control elements, said shield having an aperture therein in a position to direct heat from said member upon the one element engaging said trip means; and means operable alternately with said member for moving said elements to shift said one element away from said trip means and move another element into engagement therewith.

8. In a time controlled device including a heat producing member, the combination of: means for initiating operation of said device; trip means for terminating said operation; a plurality of bimetallic control elements each including a portion movable from a normal position in response to a rise in temperature of said element; a rotatable element carrier; means mounting said elements in uniform angular spaced relation from each other upon said carrier for movement successively to a position normally engaging said portion with said trip means; heat shield means disposed between said heat producing member and all of said control elements, said heat shield means having an aperture therein disposed in a position to direct heat from said member upon the one element engaging said trip means; and means operable alternately with said member for rotating said element carrier to shift said one element away from said trip means and move another element into engagement therewith.

9. In a time controlled device including a heat producing member, the combination of: starting means movable from a normal position to an operating position for initiating operation of said device; trip means for terminating said operation; a plurality of bimetallic control elements each including a portion movable from a normal position in response to a rise in temperature of said element; a rotatable element carrier; means mounting said elements in uniform angular spaced relation from each other upon said carrier for movement successively to a position normally engaging said portion with said trip means; heat shield means disposed between said heat producing member and all of said control elements, said heat shield means having an aperture therein disposed in a position to direct heat from said member upon the one element engaging said trip means; and means responsive to movement in one direction of said starting means for rotating said element carrier to shift said one

element away from said trip means and move another element into engagement therewith.

10. In a time controlled device including a heat producing member, the combination of: starting means movable from a normal position to an operating position for initiating operation of said device; trip means for terminating said operation; a plurality of bimetallic control elements each including a portion movable from a normal position in response to a rise in temperature of said element; a rotatable element carrier; means mounting said elements in uniform angular spaced relation from each other upon said carrier for movement successively to a position normally engaging said portion with said trip means; heat shield means disposed between said heat producing member and all of said control elements, said heat shield means having an aperture therein disposed in a position to direct heat from said member upon the one element engaging said trip means; and pawl and ratchet means interconnecting said starting means with said element carrier for rotating said carrier in response to movement in one direction of said starting means to thereby shift said one element out of engagement with said trip means and move another element into engagement therewith.

11. In a time controlled device including a heat producing member, the combination of: means for initiating operation of said device; trip means for terminating said operation; a plurality of bimetallic control elements each including a portion movable from a normal position in response to a rise in temperature of said elements; means mounting said elements for movement successively to a position normally engaging said portion with said trip means; adjustment means for varying the extent of the normal engagement of said portion with said trip means; means for directing heat from said member upon the one element engaging said trip means and for heat shielding all other control elements; and means operable alternately with said member for moving said elements to shift said one element away from said trip means and move another element into engagement therewith.

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The following references are of record in the file of this patent:

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