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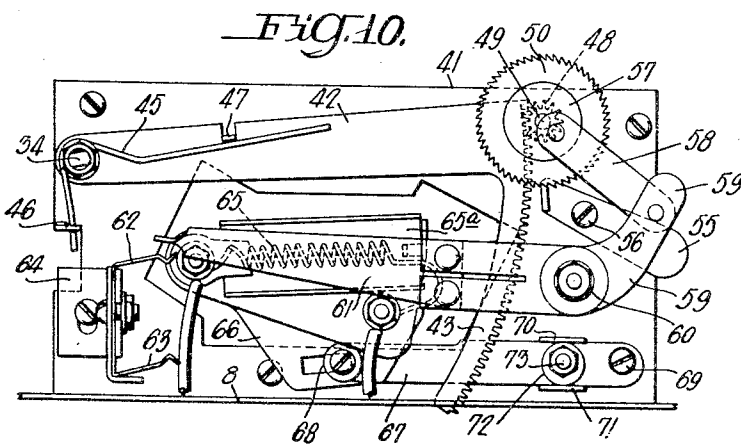
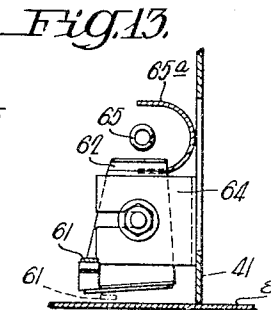
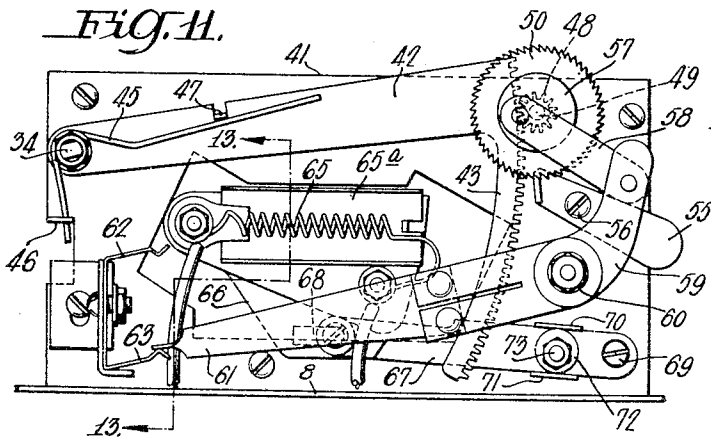
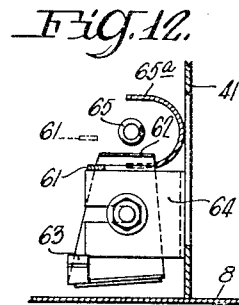
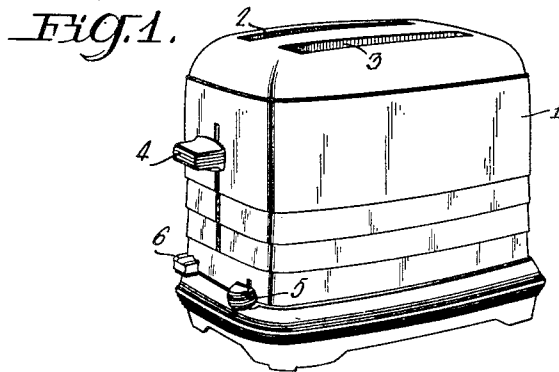
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2,436,735

THERMAL TIMER FOR TOASTERS

Filed March 14, 1941

6 Sheets-Sheet 1



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FIG. 3.

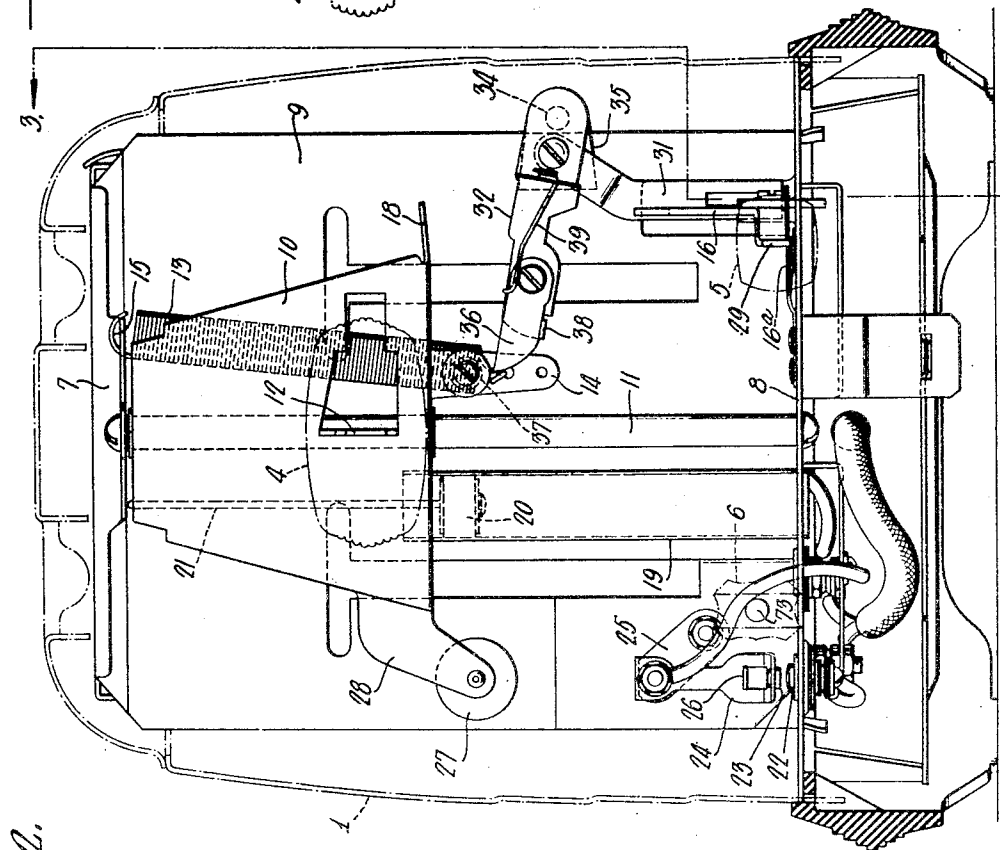
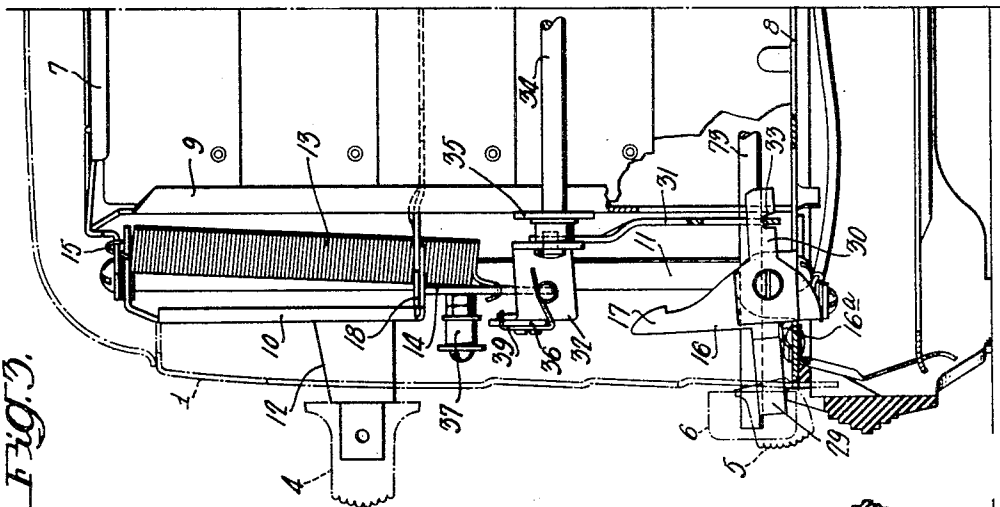


FIG. 2.

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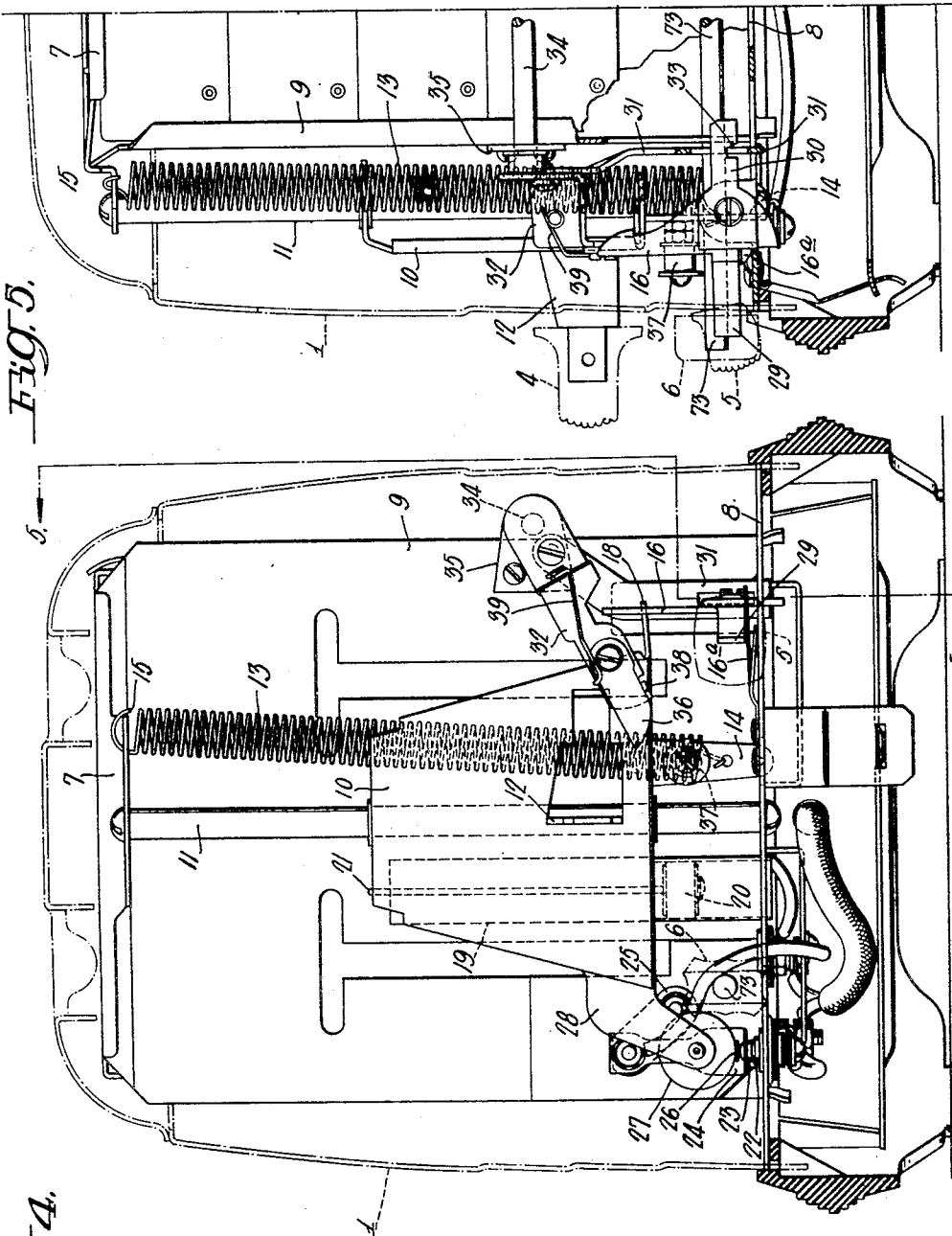
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THERMAL TIMER FOR TOASTERS

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THERMAL TIMER FOR TOASTERS

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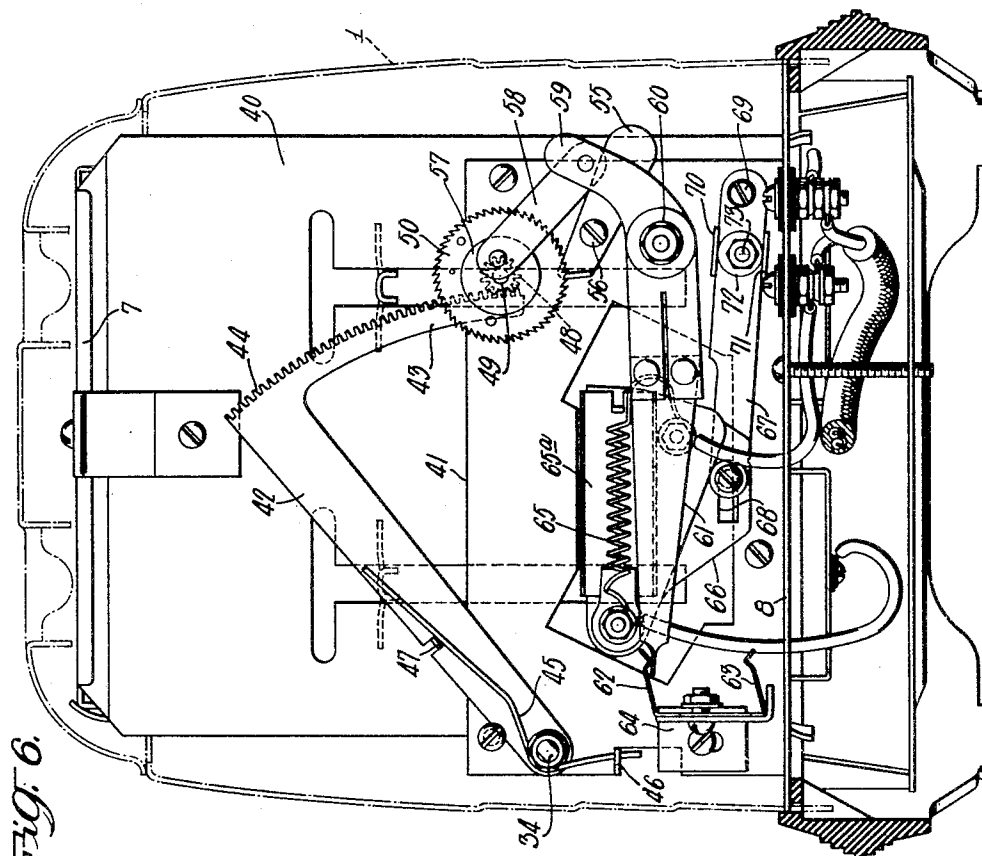


Fig. 6.

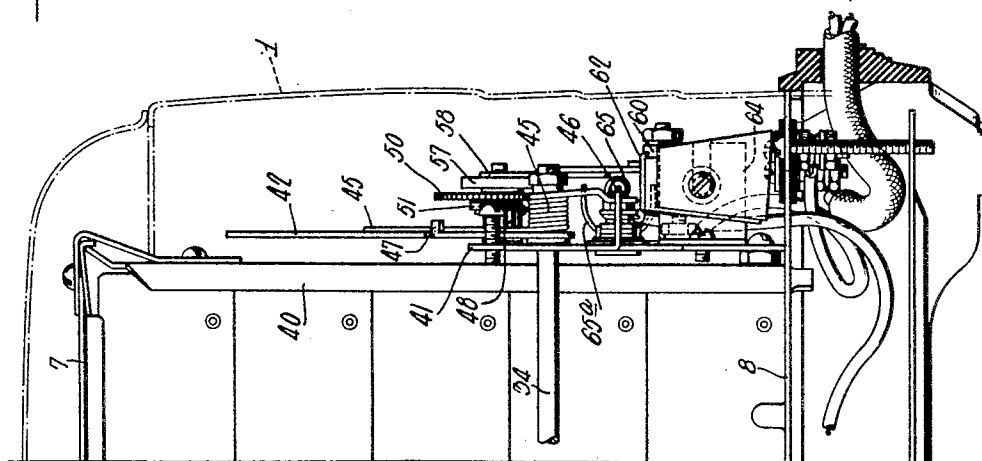


Fig. 7.

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FIG. 9.

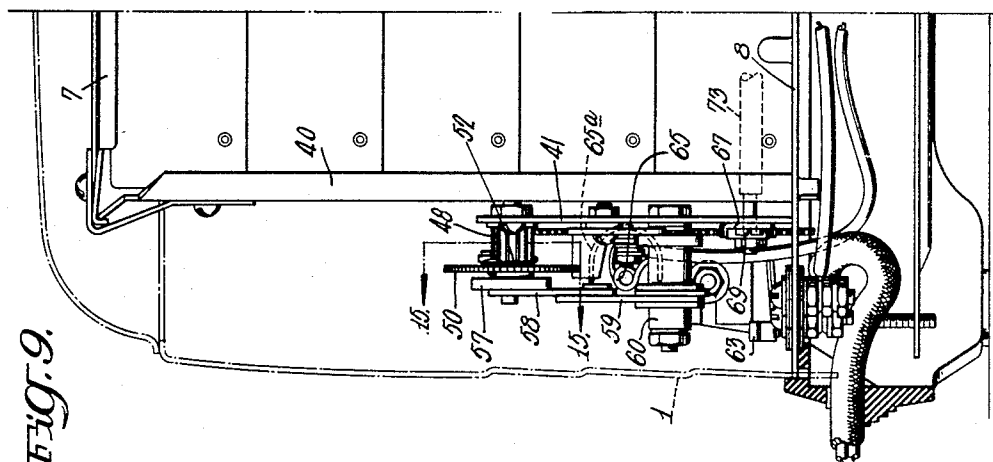
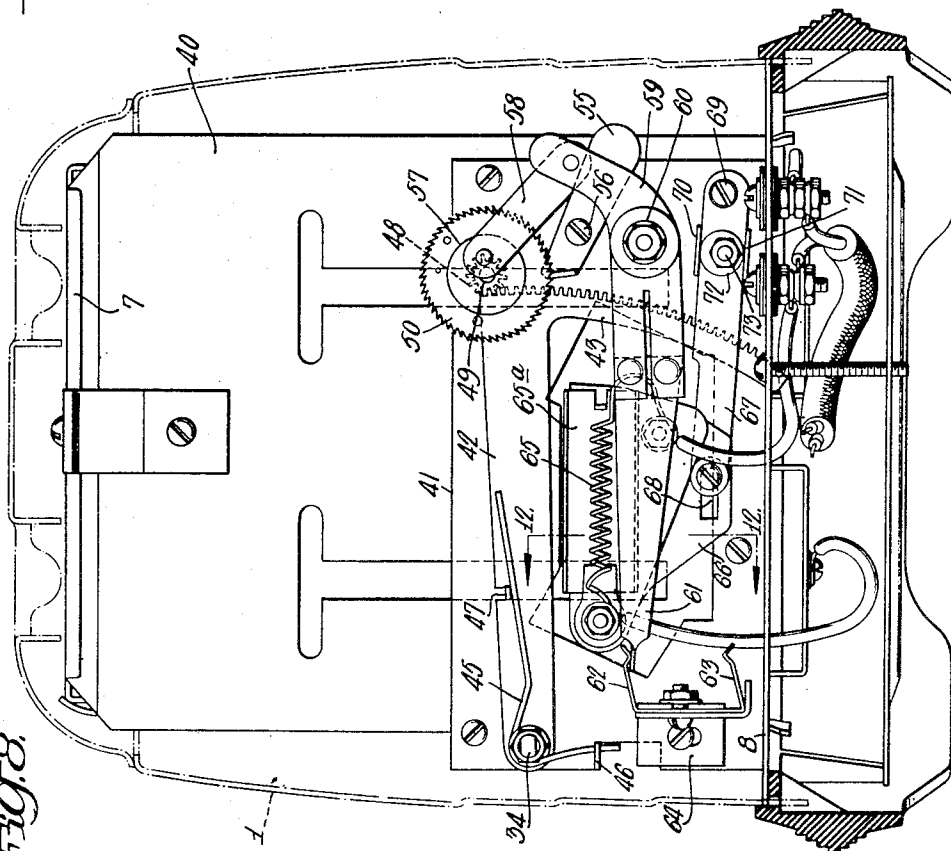


FIG. 8.



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FIG. 14.

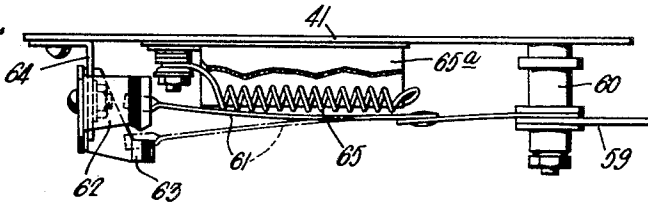


FIG. 15.

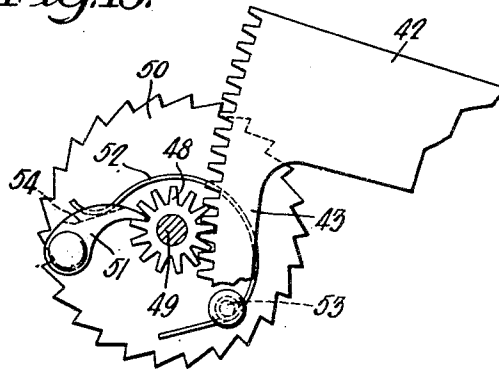
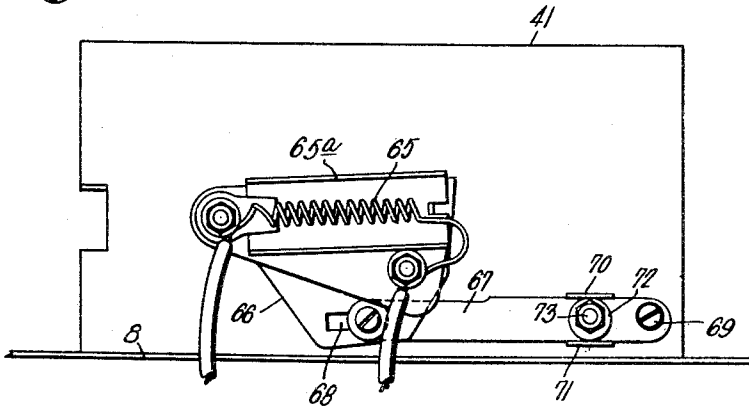


FIG. 16.



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THERMAL TIMER FOR TOASTERS

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Application March 14, 1941, Serial No. 383,406

4 Claims. (Cl. 161—1)

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This invention relates to automatic electrical devices and, more particularly, to a novel automatic bread toaster, and has for its principal object to provide an improved device of this general character embodying novel means for timing its operation.

A more specific object of the invention is to provide an improved device of this character whose operation is automatically terminated after a predetermined time interval.

Another object of the invention is to provide a novel device whose operation is controlled by a thermal-timing mechanism comprising a thermal-responsive element arranged for alternate and repeated heating and cooling to control the said mechanism.

A further object of the invention is to provide a novel device whose operation is controlled by a member movable to a position at which it terminates said operation, and the movement of said member to said position is timed by the alternate and repeated heating and cooling of a thermal-responsive element.

A further object of the invention is to provide a novel device of this character wherein the thermal-responsive element is arranged to move between a pair of spaced detents or stops in response to the heating and cooling action.

Still another object of the invention is to provide an adjustable heating means for the thermal-responsive element whereby the period of heating the said element may be varied to thereby vary the timing action of the control mechanism and thus vary the time of operation of the device being controlled.

A further object of the invention is to provide a novel timing mechanism for controlling the operation of an electrical device, such as a bread toaster.

While the invention is particularly directed to automatic toasters, and such adaptation is illustrated in the drawings and will be particularly described, it will be obvious that the invention is applicable to other uses.

In the accompanying drawings:

Fig. 1 is a perspective view of a toaster embodying the invention;

Fig. 2 is an end view of the toaster with the cover shown only in outline and with the parts in inoperative position;

Fig. 3 is a fragmentary view of the device taken from the right-hand side of Fig. 2 along line 3—3;

Fig. 4 is an end view of the device similar to

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Fig. 2 but showing the parts in operative position;

Fig. 5 is a fragmentary view taken from the right-hand side of Fig. 4 along line 5—5;

Fig. 6 is an elevational view of the opposite end of the toaster showing the thermal-timing mechanism with the parts in inoperative position;

Fig. 7 is a partial side view taken from the left-hand side of Fig. 6;

Fig. 8 is an end view similar to Fig. 6 but showing the parts of the timing mechanism in operative position;

Fig. 9 is a partial side view taken from the right-hand side of Fig. 8;

Figs. 10 and 11 are detail views of the thermal-timing mechanism alone showing the parts in different operating positions;

Figs. 12 and 13 are detail views taken respectively along the section lines 12—12 of Fig. 8 and 13—13 of Fig. 11 and further illustrating the operation of the mechanism;

Fig. 14 is a plan view of the thermostatic control device;

Fig. 15 is an enlarged detail view taken along line 15—15 of Fig. 9 and illustrating certain parts of the timing mechanism; and

Fig. 16 is a detail view of the adjustable heater for the thermostatic control element of the timing mechanism.

Referring to Fig. 1, there is shown a toaster of the two-well type designated generally by reference character 1, the bread wells being shown at 2 and 3. The controls extend from one end of the device as illustrated. At 4, there is shown a depressible knob, by means of which the bread carriage is moved to its toasting position and the toasting operation is initiated. At 5, there is shown a depressible knob by means of which the latch for the bread carriage may be released at will. Normally, this knob will not be utilized since the toaster will function automatically by means of the mechanism hereinafter described. At 6, there is shown a rotatable knob by means of which the toaster is adjusted to effect different degrees of toasting of the bread.

The interior well structure of the toaster, including the heating elements arranged in cooperative relation with the well spaces, has not been illustrated since it forms no part of the present invention. The interior structure may be of any suitable form, such as employed in commercial toasters of this general type having a movable bread carriage to support the bread slices.

Referring now to Figs. 2 to 5, the framework

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of the toaster includes a top member 7, a bottom or base plate 8, and an end plate 9 with which the mechanism now to be described is associated. The end plate 9 is at the end of the toaster adjacent the control knobs. The bread carriage includes as a part thereof a plate 10 which is slidable along a vertical support and guide post 11. The knob 4, previously mentioned, is carried by an extension 12 turned out from the body of plate 10. A spring 13 has its lower end secured to an extension 14 on plate 10 while the upper end of the spring is anchored to the top plate 7 at 15. This spring urges the bread carriage upward to its discharge position, as shown in Figs. 2 and 3. By means of knob 4, the carriage may be moved downward against the action of spring 13 to its toasting position, as shown in Figs. 4 and 5. The carriage is held in its toasting position by means of a pivoted latch 16, the hooked end 17 of which is adapted to engage a cooperating latch element 18 extending from the plate 10, as shown in Figs. 4 and 5. The latch 16 is urged toward latching position by a leaf spring 16a mounted on base plate 8. When the latch 16 is tripped either manually or automatically, the bread carriage rises to its bread-discharge position under the action of spring 13. Preferably, a dashpot 19 is employed to retard the upward motion of the bread carriage. The dashpot may comprise a hollow cylinder mounted on the base plate 8 and a piston 20 (see Fig. 2) whose rod or stem 21 is attached to the plate 10.

The electrical circuit of the toaster is controlled by a switch which is operated by the bread carriage. This switch comprises a stationary contact 22 mounted on the base plate 8 and insulated therefrom, and a movable contact element 23 carried by a resilient arm 24 which is mounted upon an insulating terminal block 25 secured to the end plate 9. A finger 26 is turned out from the resilient arm 24 and is adapted to be engaged by a disk 27 carried by an arm 28 formed on the plate 10. The disk 27 is formed of insulating material. When the parts are in inoperative position, as shown in Fig. 2, the contacts 22 and 23 are maintained open by the resilience of arm 24. When the bread carriage is lowered by means of knob 4 to initiate the toasting operation, disk 27 engages arm 26, thereby causing contact 23 to engage contact 22. When the toasting operation is terminated and the bread carriage moves to its upper position, the switch elements 22 and 23 are opened.

The details of construction of the bread carriage other than those above described form no part of the invention and may take the usual form found in prior toasters of this general type.

Returning now to the latch member 16, this member has a projecting arm 29 on which the knob 5 is mounted and it also has a projecting arm 30 by means of which the latch member is adapted to be operated. The arm 30 extends through a slotted tripping arm 31 whose upper end is pivotally attached to an associated arm 32. The arm 30 has a notch 33 cut therein to accommodate the lower portion of arm 31 with which the arm 30 is thus interlockingly engaged. The arm 32 is attached to one end of a rod or shaft 34 which extends lengthwise of the toaster along one side thereof and is rotatably carried by support elements secured to the framework of the toaster. One such element is shown at 35.

The arm 32 carries a pivoted member 36 which is adapted to be engaged by a roller 37 carried

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by the projection 14 of plate 10 (see Figs. 2 and 3). The member 36 is normally held against a stop 38 on arm 32 by a spring 39 also carried by arm 32. When the bread carriage is lowered to initiate the toasting operation, the roller 37 engages the end of member 36 and rotates the arm 32 counter-clockwise, as viewed in Fig. 2. This lowers the latch-tripping arm 31 from its tripping position of Figs. 2 and 3 to its inoperative position of Figs. 4 and 5. The rotation of arm 32 effects rotation of shaft 34 to thereby set the timing mechanism for operation, as will be presently described. The latch member 16 engages the associated latch element 18 and holds the bread carriage in its toasting position. The timing mechanism to be described hereinafter effects a gradual rotation of shaft 34 in a direction to raise the latch-tripping arm 31 until it finally reaches its tripping position, at which time the latch member 16 is actuated, thereby releasing the bread carriage. As the roller 37 is carried upward, it deflects the pivoted member 36 from its path, the pivotal mounting of the latter permitting this without affecting arm 32.

Referring now to Figs. 6 to 9, the thermal-timing mechanism provided by this invention and which controls the operation of the latch-tripping arm 31 is disposed at the opposite end of the toaster adjacent the end plate 40 of the toaster framework. The timing mechanism is supported by a plate 41 secured to the end plate 40. As shown in Fig. 7, the rotatable shaft 34 is supported at one end by the plate 41. An arm 42 is attached at one end to the rotatable shaft 34 and at its free end this arm has an arcuate extension 43 with gear teeth 44 thereon, thus providing a gear sector. The arm 42 is urged counter-clockwise, as viewed in Figs. 6 and 8, by a spring 45 coiled about the end of rod 34 and having one end anchored by an extending lug 46 on plate 41, while the opposite end of the spring engages a turned lug 47 on arm 42. The gear sector 43 meshes with a small pinion 48 which is loosely carried by a pin 49 rotatably mounted on the plate 41. A ratchet wheel 50 is fixedly mounted on pin 49 adjacent pinion 48 and pivotally carries a pawl 51 (see Fig. 15) which engages the pinion 48. A spring 52 is secured to a small pin 53 on ratchet wheel 50, and the free end of the spring is seated in a slot in pawl 51, as shown at 54, and serves to maintain the pawl in engagement with the pinion 48. A pawl 55 (see Figs. 6 and 8) is pivotally mounted on plate 41 at 56 and is so arranged that it is urged by gravity into engagement with the ratchet wheel 50. This pawl and the associated ratchet wheel are so designed that the ratchet wheel is permitted to move clockwise, as viewed in Figs. 6 and 8, but is prevented from moving counter-clockwise.

A crank wheel 57 is also fixedly mounted on pin 49 adjacent the ratchet wheel 50, as shown in Figs. 7 and 9. A link 58 is connected between the crank wheel 57 and one end of a rocker arm 59 which is pivotally mounted on a post 60 carried by the plate 41. The opposite end of the arm 59 carries a bimetallic strip 61 which constitutes a thermostatic element. The free end of strip 61 is arranged to cooperate with upper and lower spaced stops 62 and 63 carried by a bracket 64 secured to the plate 41. The stops may be formed as integral parts of a resilient sheet which is bent and cut to form the desired arrangement of the stops, as illustrated in Figs. 10 to 14. It will be noted that the effective portions of the stops 62 and 63 are arranged in horizontally offset

relation with respect to one another for a purpose which will be apparent later.

Adjacent the thermostatic strip 61, there is provided an electrical heater element 65 which is included in the electrical circuit of the toaster. This heating element is carried by a bracket 66 (see Fig. 16) which is adjustably carried at the end of an adjustable arm 67. A heat reflector 65a is also mounted on bracket 66 adjacent the heater. The adjustable mounting of bracket 66 on arm 67 may take the form of a simple slot and screw mounting 68. The arm 67 is pivotally attached to plate 41 at 69. This arm has a pair of turned-out flanges 70 and 71 between which there is disposed a cam 72 mounted on the end of a rotatable shaft 73 which extends lengthwise of the toaster and is journaled in plates 9 and 41. The opposite end of the shaft 73 carries the knob 6 previously referred to. By rotating this knob and thereby rotating the cam 72, the arm 67 may be rotated slightly to vary the position of the heater element 65 with respect to the thermostatic strip 61. The purpose of this will be fully understood later.

When the thermostatic strip 61 is cold, its end is aligned with the effective portion of the upper stop 62, as shown in the solid-line illustration of Fig. 14. When the thermostatic strip is heated by the heater 65, it flexes outward to the broken-line position of Fig. 14 so that the end of the strip is no longer aligned with the upper stop 62 but is then aligned with the effective portion of the lower stop 63. The operation of the timing mechanism and the control thereof by the thermostatic element and its associated stops may be clearly understood by considering the operation of the toaster as a whole.

When the toaster is cold and the parts thereof are in inoperative position, the various elements are disposed as shown in Figs. 2, 3, 6 and 7. At this time, the arm 42, which carries the gear sector 43, is disposed in its uppermost position and is thus maintained by its associated spring 45, while the latch-tripping arm 31 at the opposite end of the toaster is likewise disposed in its uppermost or tripping position. When it is desired to operate the toaster, the knob 4 is depressed, thereby lowering the bread carriage and effecting closure of the switch 22-23, as above described. During this lowering movement of the bread carriage, the roller 37 engages member 36 to lower the latch-tripping arm 31 and at the same time lower the arm 42 through the medium of the rotatable rod or shaft 34. The parts are then in the positions shown in Figs. 4, 5, 8 and 9. During the lowering of arm 42, the gear sector 43 rotates the pinion 48 while the associated parts remain stationary, and the pawl 51 simply rides over the teeth of the pinion. This rotation of the pinion 48 is clockwise as viewed in Fig. 15, and it will be seen that the pawl 51 permits such rotation of the pinion relative to the ratchet wheel 50 which is held against rotation by pawl 55. However, the pawl 51 prevents free rotation of the pinion 48 in the opposite direction and serves to interlock the pinion with the ratchet wheel and hence with the crank wheel 57. Due to this interlocking of these parts and due to the engagement of the thermostatic element 61 with the stop 62, the arm 42 is held in its lowermost position, and, consequently, the latch-tripping arm 31 is held in its lowermost position.

Initially, therefore, the parts of the thermal-timing mechanism are disposed as shown in Fig. 8. At this time, the thermostatic element 61 is cold

and its free end is aligned with the upper stop 62 which serves to retain the parts in the condition of Fig. 8. It will be noted that the link 58 and the crank wheel 57 are slightly removed from dead center position. The heater element 65, being disposed adjacent the thermostatic strip 61 in its uppermost position, effects a gradual heating of the thermostatic element causing it to flex outward, as shown in Fig. 14 until the end of the thermostatic element frees itself from the stop 62. This permits the arm 42 to rotate counter-clockwise, as viewed in Fig. 8, under the influence of spring 45 and, at the same time, the pinion 48 and ratchet wheel 50 rotate clockwise (counterclockwise in Fig. 15). The initial movement causes the arm structure 59 to rock slightly in a clockwise direction about its pivotal mounting 60, thereby causing the end of the thermostatic strip 61 to rise slightly above the level of stop 62, as indicated by the illustrations of Figs. 10 and 12. However, when the link 58 and crank wheel 57 reach dead center position, the arm structure 59 is rocked in the opposite direction and, since the end of the heated thermostatic strip 61 is now aligned with the lower stop 63, as shown in Fig. 14, the downward movement of the thermostatic element is interrupted when its end abuts against the lower stop, as shown in Figs. 11 and 13. At this time, the movement of the arm 42 is interrupted in the position of Fig. 11. Thus, the arm 42 has been moved through a certain increment and the latch-tripping member 31 has been moved upward accordingly.

The thermostatic strip 61 now commences to cool and returns to its inner position. When it has moved sufficiently to release its end from the lower stop 63, the arm 42 is again permitted to rotate counter-clockwise, as viewed in Figs. 8, 10 and 11. Since the link 58 and the crank wheel 57 were slightly off dead center position, as shown in Fig. 11, the initial movement of the parts causes the arm structure 59 to rock slightly counter-clockwise about its pivotal mounting 60, causing the end of the thermostatic element to move below the level of stop 63, as shown in the broken-line representation of Fig. 13. However, when the link 58 and the crank wheel 57 reach dead center position, the arm structure 59 is rocked clockwise and, since the end of the thermostatic element is now aligned with the upper stop 62, the movement of arm 42 is interrupted when the said end engages the upper stop. Thus, the arm 42 and the latch-tripping member 31 have been moved through a further increment.

The thermostatic element being again positioned in proximity to the heater element 65 commences to heat and the cycle is repeated. This cyclic action continues until the latch-tripping member 31 has moved upward sufficiently to trip the latch 16 and release the bread carriage, thereby interrupting the toasting operation.

Thus, it will be seen that the toasting operation is controlled by a thermal-timing mechanism which is conditioned for operation when the bread carriage is lowered to initiate the toasting operation and which is controlled by the repeated and alternate heating and cooling of a thermostatic element. Since the link 58 and the crank wheel 57 always stop in a position removed from the dead center position when the thermostatic element engages one or the other of its associated stops, there is no possibility of the mechanism becoming jammed.

It will be noted that the thermostatic element is mounted for rocking movement about the pivot

60, and such movement is effected by the mechanism as the arm 42 and tripping member move upward, and the rocking movement is controlled by the stops and the heater so as to control the movement of the tripping member toward its tripping position.

It is important to note that the thermostatically-controlled timing mechanism controls the toasting operation according to the general heat condition of the toaster. When the toaster is cold, it takes longer for the toasting of a bread slice to a given degree than it does when the toaster is heated to its normal operating temperature. Since the thermostatic control element is subjected to the general heat of the toaster and follows the heat condition of the toaster, it provides the necessary compensation to prevent non-uniformity of toasting during the heating-up period. In other words, the thermostatic element 61 will take longer to heat from its cold condition when the entire toaster is cold than it will after the heating-up period has taken place and, as a result, the toasting of the first slice of bread will be of the necessary long duration to toast such slice to the desired degree.

As previously indicated, the degree of toasting may be varied by adjusting the position of the heater element 65 through the manual rotation of knob 6. The effect of this is to vary the position of the heater element with respect to the thermostatic strip 61 and thereby vary the heating period of the cyclic operation above described. Obviously, the variation of the heating period varies the over-all timing period of the mechanism and gives different degrees of toasting of the bread slices.

Broadly speaking, the illustrated toaster is representative of any electrical device whose operation it is desired to control; and the switch 22-23, the latching means, and the latch-tripping member 31 are broadly representative of a means for interrupting the operation of any such device. Therefore, the invention, in its broad aspect, provides a novel mechanism for controlling any electrical device.

It will also be apparent that the invention is not limited to the specific structural details of the embodiment illustrated and described but is capable of various modifications while retaining the general principles of operation. Therefore, it will be understood that the invention is not limited by the present disclosure but only by the scope of the appended claims.

We claim:

1. A timing mechanism comprising a movable member whose movement in one direction effects a timing operation, means for actuating said member in said direction, a pivoted thermal-responsive element, means interconnecting said element with said member so as to rock said element back and forth about its pivot during the movement of said member, a first stop constructed and arranged to detain said element in one position when the element is cold, a second stop constructed and arranged to detain said element in another position when the element is heated, and heating means continuously energized during the timing operation and positioned so as to affect said element only when the latter is in said one position, whereby the rocking motion of said element is controlled so as to control the movement of said member accordingly.

2. A timing mechanism comprising a movable member whose movement effects a timing opera-

tion, means for actuating said member, a pivoted thermal-responsive element, rotatable means operatively connected to said member, means operable by said rotatable means to rock said element back and forth about its pivot during the movement of said member, a first stop constructed and arranged to detain said element in one position when the element is cold, a second stop constructed and arranged to detain said element in another position when the element is heated, and heating means positioned so as to be adjacent said element when the latter is in said one position, whereby the rocking motion of said element is controlled so as to control the movement of said member accordingly.

3. A timing mechanism comprising a movable member whose movement effects a timing operation, means for actuating said member, a pivoted thermal-responsive element, means for rocking said element back and forth about its pivot during the movement of said member, a first stop constructed and arranged to detain said element in one position when the element is cold, a second stop constructed and arranged to detain said element in another position when the element is heated, heating means positioned so as to be adjacent said element when the latter is in said one position, whereby the rocking motion of said element is controlled so as to control the movement of said member accordingly, and means for adjusting the position of said heating means to thereby vary the period of heating said element.

4. A timing mechanism comprising a movable member whose movement in one direction through a predetermined range determines the length of a timing cycle, spring means for urging said member in said direction, manually-operable means for moving said member in the opposite direction to initiate a timing cycle, a pivoted thermal-responsive element, rotatable means operatively connected to said member during the first-mentioned movement thereof, means operable by said rotatable means to rock said element back and forth about its pivot, a first stop constructed and arranged to detain said element in one position when the element is cold, heating means at said position, means for energizing said heating means when a timing cycle is initiated, a second stop constructed and arranged to detain said element in another position when the element is heated, and means for deenergizing said heating means at the end of a timing cycle.

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