July 29, 1941. N. MILLER 2,250,997

TIMING DEVICE

Filed Dec. 14, 1937

Fig. 1.

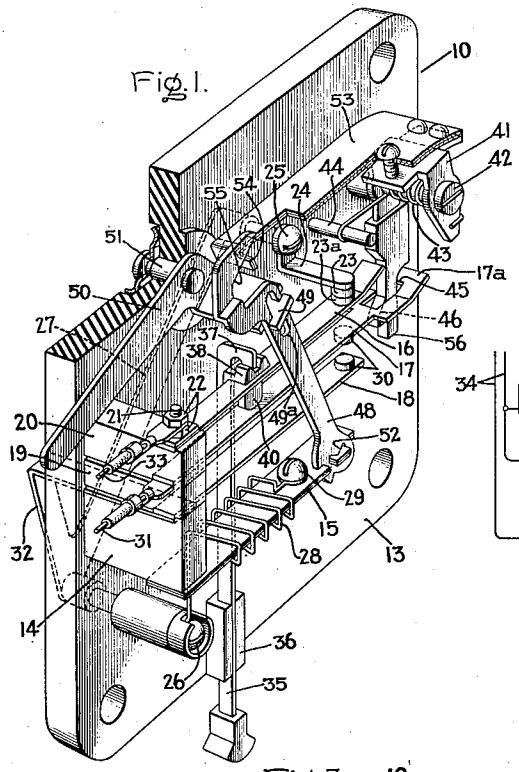


Fig. 2.

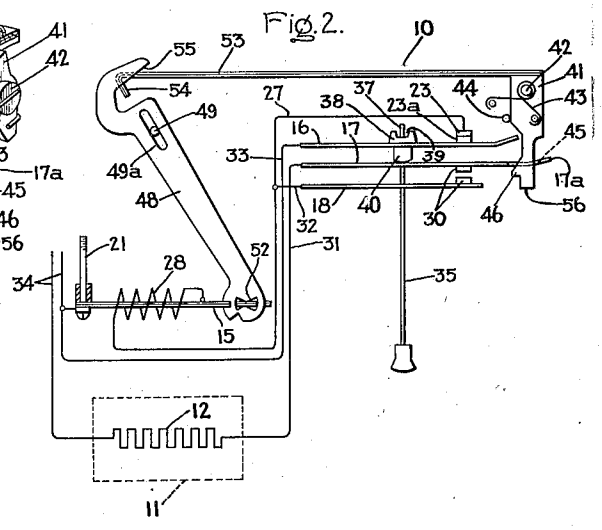


Fig. 3.

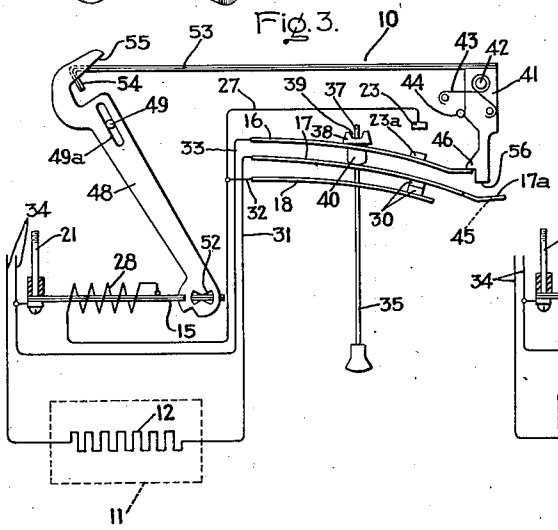
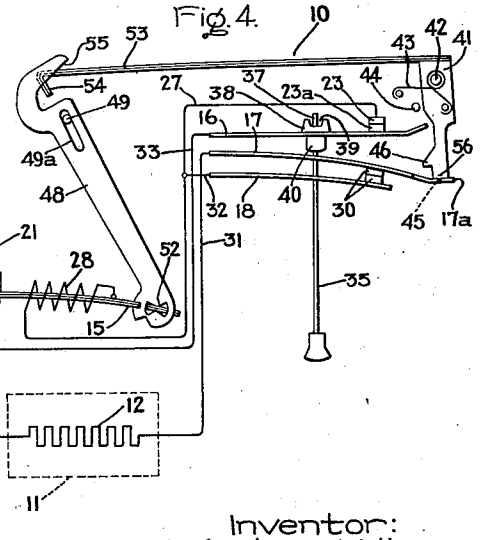


Fig. 4.



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2,250,997

TIMING DEVICE

Nicholas Miller, Berwyn, Ill., assignor to Edison General Electric Appliance Company, Inc., Chicago, Ill., a corporation of New York

Application December 14, 1937, Serial No. 179,716

12 Claims. (Cl. 161—16)

This invention relates to timing devices, more particularly to devices for timing the heating interval of a heating operation, and it has for its object the provision of an improved device of this character.

More specifically, this invention relates to timing devices of the thermal type, and while it is not limited thereto, it is particularly applicable to timing devices of this character for use with electrically heated devices that are intermittently operated, such as heating appliances like toasters, waffle irons and the like; and it contemplates an improved timing device which measures the cooking period, and which also compensates for variations in the ambient temperature of the timing device. In other words, it contemplates a thermal timing device which measures substantially the same cooking interval for successive cooking operations, irrespective of variations in the ambient temperature of the timing device.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a perspective view of a timing device arranged in accordance with this invention, parts being shown in section so as to illustrate certain details of construction; and Figs. 2, 3 and 4 are diagrammatic representations of the timing device of Fig. 1 showing various elements of the timing device in different operative conditions.

Referring to the drawing, this invention has been shown in one form as applied to a timing device 10 which is intended to control the energization of an electrically heated device 11, shown diagrammatically as an electric toaster. The heating device or toaster 11 is provided with a resistance heating element 12.

The timing device 10 for controlling the toaster 11 comprises a base 13 formed of a suitable electrically insulating material, such as a phenol condensation product. Provided on the base is an upright support 14 also formed of a suitable electrically insulating material, such as the material of which the base 13 is made.

Mounted on one end of the member 14, the lower end, as viewed in Fig. 1, is a temperature responsive element 15 shown as a bimetallic bar. The bimetal bar 15 is formed of two metals having dissimilar coefficients of expansion, and secured together lengthwise in any suitable manner, as by welding. The two metals may be Invar and steel, for example. The thermostatic bar 15 has one end, its left-hand end as viewed in the figures, rigidly secured to the supporting member 14, while its opposite end is free to move in response to changes in temperature.

Also mounted on the support 14 are three resilient switch blades 16, 17 and 18 arranged in superimposed relation as shown, and having their left-hand ends, as viewed in the figures, rigidly secured to the support 14, and their opposite ends free to move. The switch arms 16, 17 and 18 are separated from each other by insulating blocks 19 and 20. The thermostatic element 15, the switch arms 16, 17 and 18, and the supporting blocks 14, 19 and 20 are all rigidly secured together by means of an elongated screw 21, which passes through apertures (not shown) provided for it in all of these members. Nuts 22 are threaded on the rod to clamp these members together. The head of the screw, shown diagrammatically in Figs. 2, 3 and 4, is in direct mechanical and electrical contact with the bimetallic bar 15, and as shown in Fig. 1 the nuts 22 on its opposite end are in direct mechanical and electrical engagement with the upper switch arm 16. The screw, however, is electrically insulated from the switch arms 17 and 18 in any suitable manner, as by means of insulating sleeves (not shown) surrounding the sections of the screw that pass through the apertures in these members.

The upper switch arm 16 cooperates with a fixed contact 23 which is mounted on a bracket 24 that in turn is secured directly to the base 13 as by means of a screw 25. The contact 23 and bracket 24 are electrically connected to a binding post 26 mounted in base 13 by means of a jumper 27. The jumper 27 preferably is mounted on the rear side of the base 13 and is connected at its opposite ends to the screw 25 and the binding post 26.

The binding post 26 is electrically connected to one end of a resistance heater 28 which is in direct thermal relation with the bimetallic bar 15. For example, the heater may be, and as shown is, formed in a series of turns which are wound about the bimetallic bar. The opposite end of the heater 28 is secured directly to the bimetallic bar 15 by means of a screw 29, and hence, this end is connected through the bimetallic bar with the screw 21 and the upper switch blade 16. This upper switch blade carries a contact 23a which it biases into engagement with the fixed contact 23 due to the inherent resiliency of the switch arm.

Mounted on the movable ends of the switch arms 17 and 18 are cooperating contacts 30 which are normally biased apart by the inherent resiliency of the two switch arms. The switch arm 17 is connected to a lead 31 which, as shown diagrammatically in Figs. 2 to 4, is connected to one side of the toaster heating element 12. The lower switch arm 18 is electrically connected with the binding post 26 by means of a jumper 32. The screw 21 and the elements electrically connected with it is connected to a lead 33 which, as shown diagrammatically in Figs. 2-4, is connected to one side of an electrical supply source 34. As shown diagrammatically in these figures,

the opposite side of this supply source is connected to the other side of the heating element 12.

In view of the foregoing description of the thermostat bar, switch parts and other connections wtih the toaster and the supply source, it will be observed that if when the elements are in their normal positions shown in Fig. 2 the toaster be connected with the supply source 34, it will not be energized because the switch contacts 30 are opened. Moreover, it will be observed that the heater 28 is deenergized. However, if all three switch arms 16, 17 and 18 are moved downwardly, as viewed in the figures, from their positions of Fig. 2 to their positions of Fig. 3, the contacts 23 and 23*a* will be opened and the contacts 30 will be moved into engagement with each other. Under these conditions, it will be observed that the heating element 12 of the toaster is connected to the supply source 34 in series with the heating element 28 of the thermostat member 15, and hence, the toaster will be energized, and the heating element 28 will be energized to apply heat to the thermostatic bar 15.

The switch elements 16, 17 and 18 are moved from their positions of Fig. 2 to their positions of Fig. 3 by means of a slide member 35 mounted to slide in a guideway 36 on the base 13, and having at its upper end, as viewed in Fig. 1, an overhanging hook-like member 37 which is arranged to act on the switch arm 16. Preferably, a saddle 38 made of some suitable insulating material, will be mounted on this switch arm having a recessed section 39 that receives the overhanging end 37 of the slide member 35. This saddle also has a spacer block 40 interposed between the switch arms 16 and 17. It will be observed, therefore, that when the slide bar 35 is pulled downwardly, it will separate the contacts 23 and 23*a*, and move the two upper switch arms 16 and 17 downwardly until the contact 30 on switch arm 17 engages the corresponding contact 30 on the switch arm 18, and that further downward movement of the slide 35 will move all three switch arms downwardly together.

The switch arms are held in their position of Fig. 3 against their normal tendency to move upwardly by means of a latch 41 made of insulating material such as Bakelite, and is pivotally mounted on a pin 42 which in turn is mounted in the base 13. The latch 41 is biased in a clockwise direction, as viewed in the figures, against a stop 44 by means of a torsion spring 43. The stop 44 is mounted on the base 13, as shown. The lower end of the latch is received in an elongated aperture 45 provided for it in the free end of the switch arm 17, and it carries an abutment 46, which when the switch arms are moved to their positions shown in Fig. 3, engages the free end of the switch arm 16 to hold the switch arms in their positions of this figure.

The latch 41 is controlled by the bimetallic thermostat bar 15 to release the upper switch arm 16 when the bimetallic bar has been heated to substantially a preselected high temperature by the heating element 28 to permit the switch arm 16 to move to its initial position of Fig. 2 and as shown in Fig. 4, while the switch arms 17 and 18 retain their contacts closed, as shown in Fig. 4. When the arm 16 is released, it will be observed that the heating element 28 will be shorted out of the toaster energizing circuit. For the purpose of controlling the latch 41 in this manner, a lever 48 is mounted on a fulcrum 49 which in turn is mounted on a lever 50 pivoted on a pin 51 secured to the base 13. The lever 48 at its lower end has a loose pivotal connection 52 with the thermostatic bar 15, and at its upper end is arranged to engage an elongated strip-like arm 53. This arm is rigidly secured at its right-hand end to the latch 41 and its opposite end carries a lateral extension 54 which cooperates with an inclined surface 55 provided on the upper end of the lever 48. As shown, the lever 48 has an elongated slot 49*a* fitted to the fulcrum so that the lever can move upwardly and downwardly on the fulcrum as well as rotate about it.

When the slide 35 is drawn downwardly to move the parts to their positions of Fig. 3 to thereby energize the toaster and the heating element 28, heat will be applied to the thermostatic bar 15 directly from the element 28 at the same time that the toaster is heating. The thermostatic bar 15 is arranged to move downwardly responsively to its increase in temperature due to the heat imparted to it, and as it moves downwardly, it causes the inclined edge 55 to move the lefthand end of bar 53 downwardly; this operation rotates the latch 41 in a counter-clockwise direction, and when the thermostat 15 has been heated to substantially a predetermined high temperature, it will have moved the latch sufficiently to cause the abutment 46 to release the switch arm 16, which thereupon is permitted to return to its initial position shown in Figs. 2 and 4. This operation, as pointed out previously, shorts the heater 28 out of the toaster energizing circuit. The switch arms 17 and 18, however, are not permitted to move to their original positions, because the lower end 56 of the latch engages the free end 17*a* of the switch arm 17 to prevent the return of these members. The parts now occupy their positions shown in Fig. 4, and even though the heating element 28 is deenergized, the toaster 11 remains energized through the switch contacts 30. However, due to the fact that heat has been removed from the bimetal bar 15, it begins to cool and to return toward its initial position of Fig. 2. As it moves toward this position, it moves the inclined edge 55 of the lever 48 upwardly so as to permit the arm 53 and latch 41 to move toward their positions of Fig. 2 under the influence of the torsion spring 43. When the latch has been moved inwardly sufficiently to cause the opening 45 in switch arm 17 to register with the lower end 56 of the latch, the switch arms are released to return to their initial positions of Fig. 2. This opens contacts 30 to break the energizing circuit for the heating unit 12 of the toaster 11.

In the operation of the device thus far described, it will be understood, therefore, that when it is desired to toast a slice of bread, the slide 35 is operated to move the switch arms from their positions of Fig. 2 to their positions of Fig. 3 where they are latched by the member 41. This energizes the toaster and also the heating element 28. As the temperature of the thermostatic bar 15 rises due to the heat imparted to it, it operates the lever 48 to release the latch 41 at a predetermined high temperature in so far as the switch arm 16 is concerned which arm thereupon closes the contacts 23 and 23*a* to short-circuit the heater 28. The thermostatic bar thereupon begins to cool and when it cools to such an extent that the latch 41 registers with the opening 45 in the switch arm 17, the arms 17 and 18 are permitted to move to their positions of Fig. 2 to deenergize the toaster.

It will be observed that the heating period

of the toaster is measured by the heating and cooling periods of the thermostat 15, and that when the thermostat has cut off the heat to the toaster responsively to its cooling, it is in condition for an immediate successive operation of the heating device 11.

The basic time interval of the toaster is adjusted by changing the position of the fulcrum 49 by operating the lever 50. When this is done, it will be observed that the position of the inclined surface 55 relative to the extension 54 on the arm 53 is varied. This, of course, varies the intervals of time that the switch parts are held in their respective positons of Figs. 3 and 4. In other words, it varies the heating and cooling intervals of the thermostatic bar 15, and hence, it varies the total toasting time interval.

The strip 53 is formed as a bimetallic element and constitutes a second thermostat. This thermostat, like the thermostat 15, preferably is formed of two strips of Invar and steel welded together lengthwise. The thermostat 53 compensates for ambient temperature variations. Thus, as the ambient temperature varies, the position of the thermostatic bar 15 is affected. The effect of the ambient temperature on the bar 15 is compensated in the member 53. Thus, if the ambient temperature increases so as to move the bar 15 downwardly, the member 53 likewise moves downwardly to maintain the same relationship between the elements 54 and 55. Conversely, if the ambient temperature is reduced the two elements move upwardly to maintain this same relationship.

Thus, whether the timing device be mounted in the cord away from the toaster, or in the toaster where its ambient temperature is materially higher and varied by the widely varying temperatures in the toaster, the thermostat 53 compensates for the variations so that the timing interval measured by the timing device remains unchanged. It is only when the lever 50 is adjusted that the basic time intervals is varied.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to obtain by Letters Patent of the United States is:

1. A timing device comprising a thermostatic element, means for heating said thermostatic element, a plurality of switch members for controlling a controlled circuit and said heating means movable to first respective predetermined positions in which they energize both said controlled circuit and said heating means, and said members biased to second respective positions in which said circuit and heating means are deenergized, a latch constructed and arranged to hold said switch members in said first position when said latch is in a first position, and when moved to a second position to release one switch member to permit it to move to its second respective position to deenergize said heating means, and the latch thereafter when returned to said first position operating to release the other switch members to permit them to return to their said first positions to deenergize said controlled circuit, a second thermostatic element connecting said first thermostatic element with said latch so as to move said latch to said second position due to the heating and consequent movement of said first thermostatic element in one direction, and to return it to said first position due to the cooling and consequent movement of said first thermostatic element in the opposite direction, said second thermostatic element controlling the action of said first thermostatic element on said latch so as to compensate for changes in ambient temperature.

2. A timing device for electric toasters and like heating appliances comprising a switch arranged when in a first position to close an energizing circuit for said toaster and when in a second to deenergize said toaster, and said switch biased to the second position, a thermostatic element, a second switch operable between first and second controlling positions and biased to the second position, means controlled by said second switch when operated to said first position for applying heat to said thermostatic element and when operated to said second position to shut off heat from said thermostatic element, a movable latch having a pair of surfaces arranged to engage said switches respectively so as to hold them in their first controlling positions, said latch constructed and arranged when moved to one position to remove one surface from engagement with said second switch to release it while the other surface remains in engagement with the first switch to hold it in its said first controlling position, and when moved to a second position to remove said surface from engagement with said first switch to release it, operable connections between said thermostatic element and said latch for moving said latch to said first position to release the second switch to move to its first position responsive to movement of said thermostatic element when heated whereby heat is shut off from said thermostatic element, and for operating said latch to said second position to release said first switch to move to its second controlling position to deenergize said toaster responsively to movement of said thermostatic element when it cools.

3. A timing device for electric toasters and like heating appliances comprising a switch arranged when in a first position to close an energizing circuit for said toaster and when in a second to deenergize said toaster, and said switch biased to said second position, a thermostatic element, a second switch operable between first and second controlling positions and biased to the second, means controlled by said second switch when operable to said first position for applying heat to said thermostatic element and when operable to said second position to shut off heat from said thermostatic element, a latch for holding said switches in their first controlling positions constructed and arranged when moved to one position to release the second switch while still latching the first switch, and when moved to a second position to release the first switch, operable connections between said thermostatic element and said latch for moving said latch to said one position to release the second switch to move to its first position responsive to movement of said thermostatic element when heated so that heat is cut off from said thermostatic element, and for moving said latch to said second position to release said first switch to move to its second controlling position to deenergize said toaster responsively to movement of said thermostatic element when it cools, said operable connections including a second thermostatic element modifying the action of said first thermostatic element in moving said latch to said positions so

as to compensate for the effects of variations in the ambient temperature on said first thermostatic element.

4. A timing device comprising a thermostatic element, first and second switches, each operable between first and second controlling positions, the first switch when operated to its first controlling position closing an energizing circuit for a controlled device and when operated to its second for deenergizing said circuit, a heater for applying heat to said thermostatic element energized responsively to operation of said second switch to its first controlling position and deenergized responsively to operation of said latter switch to its second controlling position, means biasing said switches to their second controlling positions, means for manually moving said switches to their first controlling positions against the force of said biasing means, a latch constructed and arranged so that when it is in one position it holds said switches in said first controlling positions, and a second thermostatic element connected to said first thermostatic element and to said latch so as to control the movement of the latch responsively to movement of said first thermostatic element as it heats and cools, the latch controlled to move to a second position to release said second switch to move to its second controlling position to deenergize said heater as said first thermostatic element moves when heated, and to a third position to release said first switch to move to its second position to deenergize said energizing circuit when said first thermostatic element moves while cooling, the second thermostatic element modifying the action of the first on said latch in accordance with variations in ambient temperature.

5. A timing device comprising a thermostatic element, first and second switches, each operable between first and second controlling positions, the first switch when operated to its first controlling position closing an energizing circuit for a controlled device and when operated to its second for deenergizing said circuit, a heater for applying heat to said thermostatic element energized responsively to operation of said second switch to its first controlling position and deenergized responsively to operation of said latter switch to its second controlling position, means biasing said switches to their second controlling positions, means for manually moving said switches to their first controlling positions against the force of said biasing means, a latch constructed and arranged when in one position to hold said switches in said first controlling positions, a lever controlling said latch operated responsively to movement of said thermostatic element when heated to move the latch to a second position to release said second switch to move to its second controlling position to deenergize said heater, and responsively to movement of said thermostatic element when cooling after said heater has been deenergized to move the latch to a third position to release said first switch to move to its second controlling position to deenergize said energizing circuit, and means for shifting the fulcrum of said lever to vary the basic time setting of said timing device.

6. A timing device comprising a thermostatic element, first and second switches, each operable between first and second controlling positions, the first switch when operated to its first controlling position closing an energizing circuit for a controlled device and when operated to its second for deenergizing said circuit, a heater for applying heat to said thermostatic element energized responsively to operation of said second switch to its first controlling position and deenergized responsively to operation of said latter switch to its second controlling position, means biasing said switches to their second controlling positions, means for manually moving said switches to their first controlling positions against the force of said biasing means, a latch constructed and arranged when in one position to hold said switches in said first controlling positions, a second thermostatic element connected to said first thermostatic element and to said latch so as to control the movement of the latch responsively to movement of said first thermostatic element as it heats and cools, the latch controlled to move to a second position to release said second switch to move to its second controlling position to deenergize said heater when said first thermostatic element moves when heated, and to a third position to release said first switch to move to its second position to deenergize said energizing circuit when said first thermostatic element moves while cooling, the second thermostatic element modifying the action of the first on said latch in accordance with variations in ambient temperature, and means for adjusting the connection between said first and second thermostatic elements to vary the basic time setting of said timing device.

7. A timing device for controlling the energizing circuit of an electrically heated device comprising a bimetallic thermostat bar, a heater for applying heat to said bar, a switch mechanism controlling said energizing circuit and heater to energize them and deenergize them, a pivoted latch associated with said switch mechanism to control its operation to latch it in its operative position to energize said circuit and said heater, a lever controlled to said bimetallic bar and said latch so that when the bar is heated it moves the lever to operate the latch to effect an operation of said switch mechanism to deenergize the heater, whereupon said thermostat bar cools, and when it moves responsively to cooling the lever is moved thereby to operate the latch to effect an operation of the switch mechanism to deenergize said circuit, a fulcrum for said lever, and means for adjusting the position of said fulcrum to vary the basic time setting of said timing device.

8. In an electric toaster and like appliance, a thermostatic timing device comprising an energizing circuit for the toaster, a bimetallic thermostat, means for applying heat locally to the thermostat, three substantially parallel resilient switch arms, the first biased into engagement with a fixed contact and the other two carrying cooperating contacts and biased apart, the arms arranged so that when the three arms are moved in a respective predetermined direction to predetermined positions, the fixed contact is broken by the first arm and the two contacts on the other two arms are moved into engagement, connections between said fixed contact, switch arms and energizing circuit and heating means arranged so that when said arms are moved to said predetermined positions, said energizing circuit for the toaster and said heating means are energized, a latch for holding said arms in said predetermined positions, a lever connected to said latch and said bimetallic thermostat controlling the movement of said latch so that when the thermostat has been

heated to substantially a predetermined high temperature the latch releases said first arm to close said fixed contact, said electrical connections arranged to deenergize said heating means when said contact is closed, and the lever operating to release said other switch arms to permit them to open their contacts to deenergize said energizing circuit of said toaster when said thermostat has cooled substantially to a predetermined low temperature.

9. In an electric toaster and like heating appliance having an energizing circuit, a thermostatic timing device comprising a bimetallic thermostat bar, a heater for applying heat to said thermostat bar connected in the energizing circuit, a switch mechanism controlling the energizing circuit of said toaster and said heater having three superimposed flexible switch arms, the first switch arm having a contact engageable with a fixed contact and biased into engagement with said fixed contact so as to deenergize said heater, and when opened to connect said heater in the energizing circuit of said toaster, and the second and third switch arms carrying cooperating contacts biased apart by the arms and when closed energizing said energizing circuit of said toaster and when opened deenergizing it, a spacer between said first and second switch arms, manually operable means acting on said first switch arm to move all of said switch arms simultaneously to move the first away from its fixed contact and to move the other two together to close their contacts, a pivoted latch engageable with said first switch arm to hold it and the other two in said predetermined positions, means connecting said latch with said thermostat bar so that when the bar moves responsively to the application of heat to it by said heater, said latch is operated to release said first switch arm to close its contact and thereby deenergize said heater, the latch thereupon engaging an extension on the second switch arm to hold the second and third in their contact closing positions, and the thermostat bar when cooling in response to the deenergization of its heater moving said latch away from said extension to release said second and third switch arms and thereby permit them to open and deenergize said toaster.

10. A thermostatic timing device for controlling the energizing circuit of an electric heater comprising a bimetallic thermostat, heating means for applying heat locally to the thermostat, a fixed contact, three substantially parallel resilient switch arms, the first biased into engagement with said fixed contact and the other two carrying cooperating contacts and biased apart, the arms arranged so that when the three arms are moved in a predetermined direction to respective predetermined positions, the fixed contact is broken by the first arm and the two contacts on the other two arms are moved into engagement, connections between said fixed contact, switch arms and energizing circuit and heating means arranged so that when said arms are moved to said predetermined positions, said energizing circuit and said heating means are energized, a latch for holding said arms in said predetermined positions, means connecting said latch and said bimetallic thermostat controlling the movement of said latch so that when the thermostat has been heated to substantially a predetermined high temperature the latch releases said first arm to close said fixed contact, said electrical connections arranged to deenergize said heating means when said contact is closed, and said last named means operating the latch to release said other two switch arms to permit them to open their contacts to deenergize said energizing circuit when said thermostat has cooled substantially to a predetermined low temperature.

11. A thermostatic timing device for an electric heater having an energizing circuit comprising, a thermostat, heating means for applying heat locally to the thermostat, a fixed contact, three substantially parallel resilient switch arms, the first biased into engagement with said fixed contact and the other two carrying cooperating contacts and biased apart, the arms arranged so that when the three arms are moved in a predetermined direction to respective predetermined positions, the fixed contact is broken by the first arm and the two contacts on the other two arms are moved into engagement, connections between said fixed contact, switch arms and energizing circuit and heating means arranged so that when said arms are moved to said predetermined positions, said energizing circuit and said heating means are energized, a latch engaging said first switch arm to hold it in its said predetermined position, and said first switch arm engaging one of the other two switch arms and holding them in their said predetermined positions, a lever connected to said latch and said bimetallic thermostat controlling the movement of said latch so that when the thermostat has been heated to substantially a predetermined high temperature the latch releases said first arm to close said fixed contact, said electrical connections arranged to deenergize said heating means when said contact is closed, the latch thereupon engaging said one of said other two switch arms to hold them in their said other positions, and said latch operated by said thermostat when it has cooled substantially to a predetermined low temperature to a position wherein it is received in an aperture provided for it in said one of said other two switch arms to release them to permit them to open their contacts to deenergize said circuit.

12. A timing device for controlling the energizing circuit of an electrically heated device comprising a thermostat, a heater for applying heat to said thermostat, a switch mechanism controlling said energizing circuit and heater to energize them and deenergize them, a pivoted latch associated with said switch mechanism to control its operation to latch it in its operative position to energize said circuit and said heater, an arm connected to said latch, a lever having one end connected to said thermostat and carrying on its other end a surface engaging said arm so that when the thermostat is heated it moves the lever to operate the arm and the latch to effect an operation of said switch mechanism to deenergize the heater, whereupon said thermostat cools, and when it moves responsively to cooling the lever is moved thereby to operate the arm and latch to effect an operation of the switch mechanism to deenergize said circuit, and means for varying the position of said lever to vary the relation of its surface to said arm.

NICHOLAS MILLER.

CERTIFICATE OF CORRECTION.

Patent No. 2,250,997. July 29, 1941.

NICHOLAS MILLER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 5, for "wtih" read --with--; page 3, first column, line 43, for "intervals" read --interval--; page 4, second column, line 62, claim 8, strike out the word "respective" and insert the same before "predetermined" in line 63, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of September, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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