July 10, 1962 I. PAGE 3,043,936

THERMOSTAT-TIMER MECHANISM

Filed May 23, 1960 2 Sheets-Sheet 1

Fig. 1.

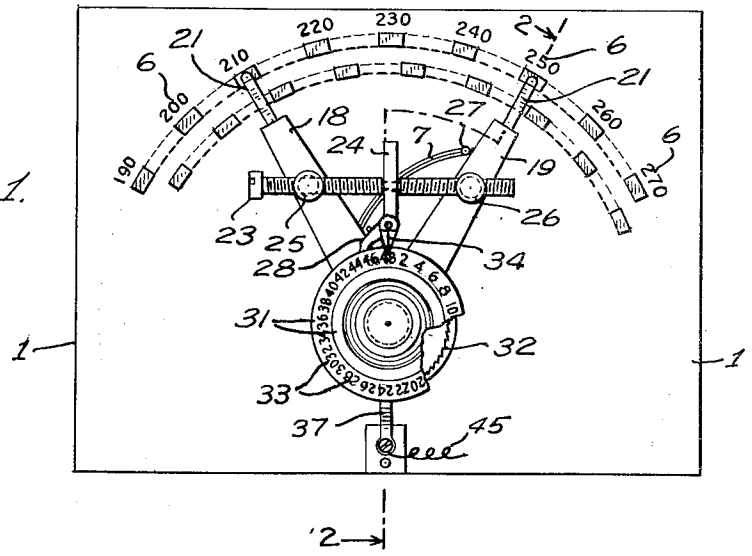
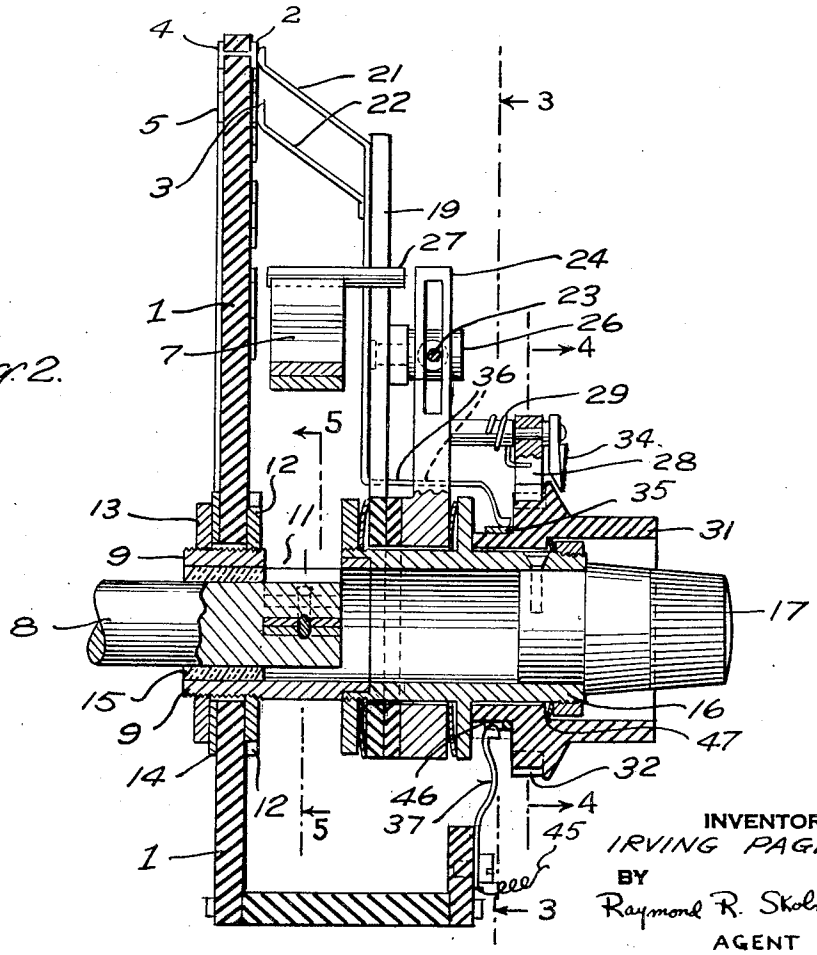


Fig. 2.



INVENTOR
IRVING PAGE
BY
Raymond R. Skolnick
AGENT

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Fig. 3.

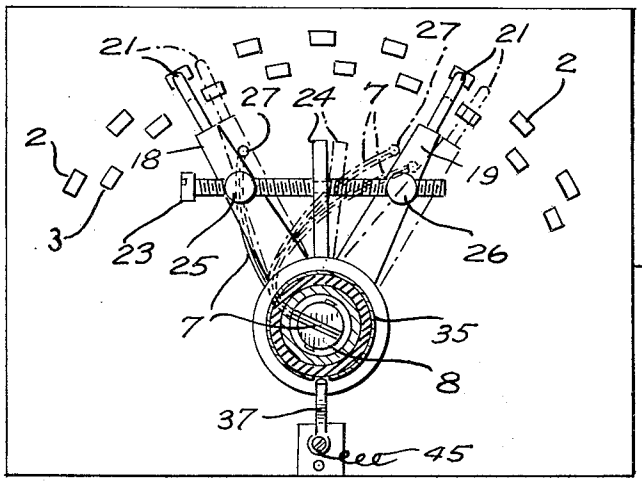


Fig. 4.

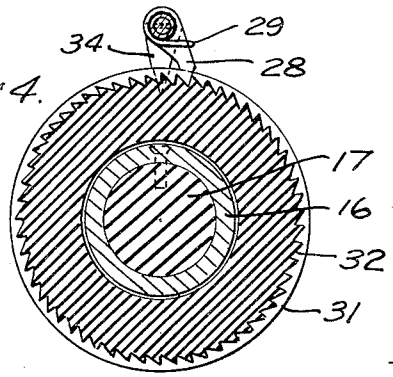


Fig. 5.

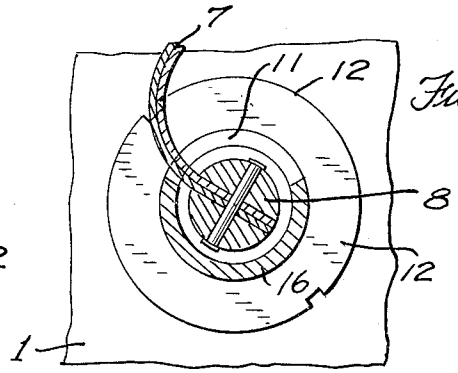
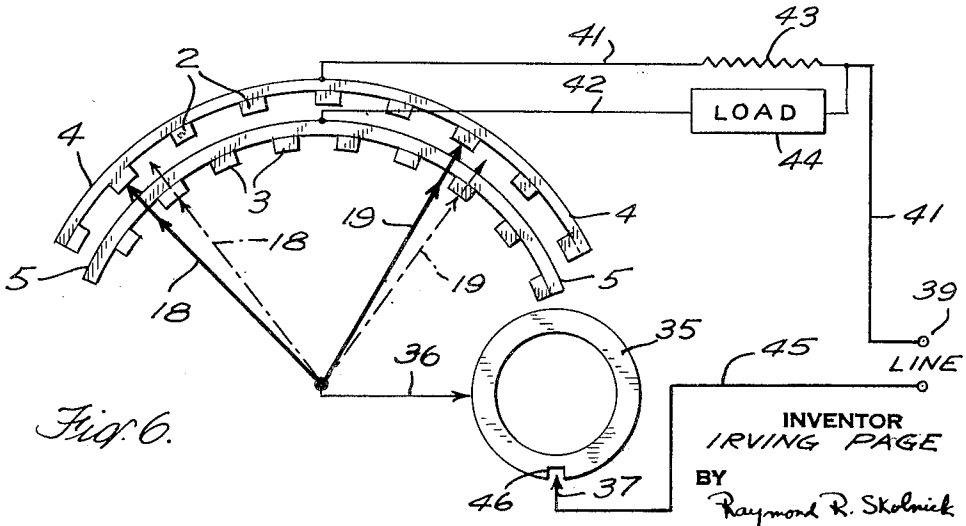


Fig. 6.



INVENTOR
IRVING PAGE
BY
Raymond R. Skolnick
AGENT

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3,043,936

THERMOSTAT-TIMER MECHANISM

Irving Page, Brooklyn, N.Y., assignor to Irropa Incorporated, New York, N.Y.

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15 Claims. (Cl. 200—136.3)

This invention relates in general to timing mechanism and more particularly to timing mechanisms employing thermostatic means for the timing control as well as the maintenance of a heating cycle.

Heretofore timing mechanisms have employed numerous gears in forming gear trains, various escapement mechanisms, clocks and in some instances relay circuits. Thermostats have been used to control and maintain heating cycles but where both the timing and heating cycle were to be controlled two separate mechanisms had to be employed. This required intricate as well as bulky mechanisms as well as difficulty in miniature packaging.

It is therefore an object of this invention to provide an improved means for timing a heating cycle.

Another object of this invention is to provide a device for timing that employs a thermostatic means for control.

A still further object of this invention is to provide an improved means for maintaining a heating cycle.

A still further object of this invention is to provide a device for timing and controlling a heat cycle which is small, compact and endurable.

To these ends the invention contemplates the use of a bimetallic strip which is attached to a heat transfer rod, the rod being in contact with a heat source (not shown) to be controlled. The bimetallic strip is captured between a pair of pointers which have been set for the desired low and high temperatures within which the heat source is to be controlled. A pawl and ratchet are arranged in a definite relationship to the pointers so that the movement of the pointers will move the ratchet one notch through the motion of the pawl. The movement of the pointers, operating as a unit, after the initial setting by the operator, is controlled by the bimetallic strip which is actuated by the heat transfer rod.

The invention has other objects and advantages which will appear from the following description of a particular embodiment of the invention in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view of the invention showing the pointers in a particular operating position;

FIG. 2 is an enlarged longitudinal section on line 2—2 of FIG. 1 of the invention;

FIG. 3 is a front sectional view taken along lines 3—3 of FIG. 2 showing, by dotted lines, the movement of the pointers by the bimetallic element;

FIG. 4 is a fragmentary sectional view taken along lines 4—4 of FIG. 2 showing the pawl and ratchet arrangement;

FIG. 5 is a fragmentary sectional view taken along lines 5—5 of FIG. 2 showing the bimetallic strip contacting the heat transfer rod; and

FIG. 6 is a schematic representation of a particular means for the electrical circuitry.

With reference to FIGS. 1 and 2 the particular embodiment shown there of the invention comprises, in general, a plate 1 which has a partial circular row of contacts 2 and a second partial circular row of concentric contacts 3 protruding from the face thereof. Both rows of contacts extend through the plate 1 and connect with an upper and a lower contacts sector 4 and 5, respectively. There are numerals 6 engraved or stamped on the plate face to indicate temperature. The positions of the numerals are calibrated with a bimetallic strip 7 which is fixed to a heat transfer rod 8. The heat transfer rod 8 extends from the bimetallic strip 7 through the plate 1

for a definite distance so as to allow contact with the surface (not shown) being heated and controlled.

About the heat transfer rod 8 is a sleeve 9 which has a slot 11 machined therein to allow the bimetallic strip 7 freedom to move. The sleeve 9 is secured to the plate 1 by means of nuts 12 and 13, a washer 14 being under nut 13. Since the bimetallic strip 7 extends through the slot 11 of the sleeve 9 the heat transfer rod 8 is captured so as to prevent axial movement. A spacer 15, which is made from a non-heat conductive material, is fitted about the heat transfer rod 8 so as to prevent the heat travelling up the rod from being dissipated through the sleeve 9.

Nested about sleeve 9 is another sleeve 16 which has a knob 17 pinned thereto. A pair of pointers 18 and 19, respectively, are rotatably mounted about sleeve 16. One pointer 18 is for indicating the low limit and the other pointer 19 is for indicating the high limit of the temperature range of the heat source which is to be controlled. On the tip of each pointer is a pair of contact arms 21 and 22, respectively. Contact arm 21 connects with the upper row of contacts 2 and contact arm 22 connects with the lower row of contacts 3. The sector angle defined by the pointers is adjustable by means of differential screw 23 which is anchored in a yoke 24. The screw 23 passes through the tapped holes of a pair of studs 25 and 26 which are fastened to pointers 18 and 19, respectively. The bimetallic strip 7 has an arm 27 protruding from the uppermost section of the strip 7. This arm 27 is captured between the pointers 18 and 19.

The yoke 24 is rotatably mounted about sleeve 16 and has a pawl 28, which is biased by a spring 29, mounted thereto. A ratchet knob 31 which is rotatably mounted about sleeve 16 concentric with knob 17 has ratchet teeth 32 which are in engagement with the pawl 28. Knob 31 is rotatably biased by a Bellesville spring 47. On the front face of the ratchet knob are numerals 33 which are indicative of the number of cycles that the heating cycle has gone through, which is more fully explained hereinafter. Attached to the front of the pawl 28 is a pointer 34 which points to the numerals 33 of the ratchet knob 31. At the rear of the knob 31 is a collector ring 35 which connects to the contact arms 21 and 22 by means of contact finger 36. The collector ring 35 has a slot 46 which is cut halfway through the ring at a point corresponding to the numeral 0 on the face of knob 31.

A second contact finger 37 which is attached to a mounting block 38 connects with collector ring 35. The mounting block 38 is attached to the bottom of plate 1 and has means for receiving electric current.

Referring to the schematic circuit shown in FIG. 6 it is seen that there is a source of electric current 39 one side of which connects to the contacts sector 4 and 5 by means of leads 41 and 42, respectively. A heater 43 is placed in lead 41 and a load 44 is placed in lead 42. The other side of the electric current 39 is connected to the collector ring 35 by means of lead 45 and contact finger 37. This side of the line is also brought up to the contact arms 21 and 22 by means of contact finger 36 which connects the collector ring 35 in the contact arms.

The operation of the invention will now be explained to indicate how the parts enumerated above operate together to perform a useful function in a new and novel manner.

A cooking utensil or other object that is desired to be heated to a certain temperature and maintained at that temperature within a specific temperature range for a definite period of time is placed in contact with the heater 43. The heat transfer rod 8 is placed so as to be in contact with the utensil or object which is to be heated. Suppose the heating range desired is to be between 210° and 240° and the time for maintaining the heat is 20

minutes then knob 17 is turned which turns sleeve 16. The pointers 18 and 19, the yoke 24 and the ratchet knob 31 will all rotate with sleeve 16 since they are all rotatably locked together through a suitable slip means which allows them to rotate independently from each other whenever there is sufficient pressure placed on any one of them in the proper direction. The knob 17 is turned until pointer 18 is on the contact under the numeral 210. The differential screw 23 is then adjusted until the second pointer 19 is placed on the contact under the numeral 250. Now knob 17 is held while knob 31 is turned until the pointer 34 is over the numeral 20 which is engraved on the face of ratchet knob 31. The moment that knob 31 is turned to any position other than 0 the electric circuit is completed providing the pointers are on a contact.

With the circuit completed the heater 43 gives off heat. As the utensil being heated gets warm the heat from the utensil is transferred to the heat transfer rod 8 which in turn transfers the heat to the bimetallic strip 7. As the temperature of the utensil goes above 210° the bimetallic strip 7 moves away from the pointer 18 towards the pointer 19. When the temperature of the utensil reaches 250° the bimetallic strip 7 reaches pointer 19 and as the temperature continues to go higher the strip 7 pushes against the pointer 19 moving it off the contact 2. With the pointers off of contacts 2 the circuit through the heater 43 is broken and the heater goes off. Concurrently with the heater circuit being broken by the pointers moving off of contacts 2 a circuit through the load 44 is made by means of contacts 3 coming into contact with the pointers 18 and 19. The load 44 may be a fan to be used for cooling off the surrounding area or it may be another heater to be used for heating another utensil.

With the heater 43 off the utensil being heated starts to cool. This coolness is transferred to the heat transfer rod 8 which in turn transmits this to the bimetallic strip 7. The bimetallic strip now moves towards the pointer 18 and as the temperature of the utensil drops to 210° the bimetallic strip 7 pushes against the pointer 18 moving it back on to contact 2 and off of contact 3. The pointer 18 cannot move past contact 2 since the pointers are indirectly connected to knob 31 which is rotatably biased by means of spring 47 so as to offer more resistance to turning than the turning movement of the bimetallic strip 7 against the pointer 18. This breaks the circuit through the load 44 and completes the circuit through the heater 43.

As the pointers 18 and 19 are rocked back and forth by the movement of the bimetallic strip 7 they move the yoke 24 with them. The movement of the yoke in turn moves the pawl 28 which engages the ratchet 32 and rotates it. Each back and forth movement of the pointers therefore moves the ratchet by one tooth. It is readily seen that if each back and forth movement takes one minute then twenty back and forth movements of the pointers will rotate the ratchet twenty teeth.

At the completion of the twentieth movement of the pointers the knob 31 indicates zero. The collector ring 35 at a position corresponding to the zero is now coincidental with the position of contact finger 37. Since the collector ring 35 has a slot 46 at this point the electric circuit is broken and the heater and load are both shut off.

The typical operation discussed above indicates the simplicity of the invention in controlling a heating cycle or the deheat cycle since it takes longer for the bimetallic strip 7 to cool off than to heat up. Therefore, it is readily seen that knob 17 controls the lower range heat pointer 18, the differential screw 23 controls the upper heat range pointer 19 and that knob 31 controls the time that the heater 43 or the load 44 remains on.

Although I have described particular embodiments of the invention, it is understood that the present disclosure has been made by way of example and that numerous

changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A thermostat-timer mechanism comprising a plate, a partial circular row of contacts protruding from the face of said plate and extending through said plate, a contacts sector connecting with the extended portions of said contacts at the back of said plate, a sleeve mounted to and extending from the face of said plate in a fixed relationship to said row of contacts, a pair of pointers in a fixed angular relationship to each other and rotatably mounted on said sleeve, a contact arm mounted on the tip of one of said pointers so as to connect said pointer with said contacts, a heat transfer rod mounted within said sleeve, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which is captured between said pointers for moving the pointers back and forth and a source of electric current one side of which is connected to said contact arm and the other side of which is connected to said contacts sector.

2. A thermostat-timer mechanism as claimed in claim 1 in which a means for counting the back and forth movements of said pointers is connected to said pointers and interposed in one of said electric current sides so that the current is interrupted by said counting means after a predetermined number of movements.

3. A thermostat-timer mechanism as claimed in claim 2 in which a means for adjusting the angular position of the pointers in relation to each other is provided for the pointers and connected thereto.

4. A thermostat-timer mechanism comprising, a plate, a partial circular row of contacts protruding from the face of said plate and extending through said plate, a contacts sector connecting with the extended portions of said contacts at the back of said plate, a sleeve mounted to and extending from the face of said plate in a fixed relationship to said row of contacts, a pair of pointers in a fixed angular relationship to each other and rotatably mounted on said sleeve, a contact arm mounted on the tip of one of said pointers so as to connect said pointer with said contacts, a heat transfer rod mounted within said sleeve, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which is captured between said pointers for moving the pointers back and forth, a yoke rotatably mounted on said sleeve and fixed to said pointers so as to move therewith, a ratchet rotatably mounted about said sleeve whereby the rotation of said ratchet is biased so as to be greater than the force exerted by the said bimetallic strip against said pointers, a pawl mounted on said yoke and in engagement with said ratchet, a collector ring fixed to said ratchet, said collector ring having a radial slot therein extending halfway through said collector ring, a mounting block mounted at the base of said plate, a contact finger mounted on said mounting block and in engagement with said collector ring whereby said contact finger does not extend more than half the width of said collector ring, a second contact finger connected between said contact arm and said collector ring and fastened to the pointer having the contact arm and a source of electric current one side of which is connected to the said first contact finger the other side of which is connected to said contacts sector.

5. A thermostat-timer mechanism as claimed in claim 4 in which a pair of tapped studs are fastened one on each pointer and a screw captured by said yoke and screwed in each of said studs whereby the turning of said screw rotates said pointers so as to change their angular relationship with each other.

6. A thermostat-timer mechanism comprising, a plate, a partial circular upper row of contacts protruding from the face of said plate and extending through said plate,

a contacts sector connecting with the extended portions of said contacts at the back of said plate, a second partial circular lower row of contacts protruding from the face of said plate concentric with said first circular row of contacts, a second contacts sector connecting with the extended portions of said second row of contacts at the back of said plate, a sleeve mounted to and extending from the face of said plate in a fixed relationship to said rows of contacts, a pair of pointers in a fixed angular relationship to each other and rotatably mounted on said sleeve, a pair of contact arms mounted on one of said pointers so as to connect said pointer with each row of said contacts, a heat transfer rod mounted within said sleeve, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which is captured between said pointers for moving the pointers back and forth and a source of electric current one side of which is connected to said contact arms and the other side of which is connected to said contacts sectors.

7. A thermostat-timer mechanism as claimed in claim 6 in which a means for counting the back and forth movements of said pointers is connected to said pointers and interposed in one of said electric current sides so that the current is interrupted by said counting means after a predetermined number of movements.

8. A thermostat-timer mechanism as claimed in claim 7 in which a means for adjusting the angular position of the pointers in relation to each other is provided for the pointers and connected thereto.

9. A thermostat-timer mechanism comprising, a plate, a partial circular upper row of contacts protruding from the face of said plate and extending through said plate, a contacts sector connecting with the extended portions of said contacts at the back of said plate, a second partial circular lower row of contacts protruding from the face of said plate concentric with said first circular row of contacts and extending through said plate, a second contacts sector connecting with the extended portions of said second row of contacts at the back of said plate, a sleeve mounted to and extending from the face of said plate in a fixed relationship to said rows of contacts, a pair of pointers in a fixed angular relationship to each other and rotatably mounted on said sleeve, a pair of contact arms mounted on one of said pointers so as to connect said pointer with each row of said contacts, a heat transfer rod mounted within said sleeve, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which is captured between said pointers for moving the pointers back and forth, a yoke rotatably mounted on said sleeve and fixed to said pointers so as to move therewith, a ratchet rotatably mounted about said sleeve whereby the rotation of said ratchet is biased so as to be greater than the force exerted by the said bimetallic strip against said pointers, a pawl mounted on said yoke and in engagement with said ratchet, a collector ring fixed to said ratchet, said collector ring having a radial slot therein extending halfway through said collector ring, a mounting block mounted at the base of said plate, a contact finger mounted on said mounting block and in engagement with said collector ring whereby said contact finger does not extend more than half the width of said collector ring, a second contact finger connected between said contact arm and said collector ring and fastened to the pointer having the contact arm and a source of electric current one side of which is connected to the said first contact finger the other side of which is connected to said contacts sectors.

10. A thermostat-timer mechanism as claimed in claim 9 in which a pair of tapped studs are fastened one on each pointer and a screw captured by said yoke and screwed in each of said studs whereby the turning of said screw rotates said pointers so as to change their angular relationship with each other.

11. A thermostat-timer mechanism comprising, a plate, a partial circular upper row of contacts protruding from the face of said plate and extending through said plate, numerals indicated on the face of said plate above said contacts for indicating temperature, a contacts sector connecting with the extended portions of said contacts at the back of said plate, a second partial circular lower row of contacts protruding from the face of said plate concentric with said first circular row of contacts, a second contacts sector connecting with the extended portions of said second row of contacts at the back of said plate, a sleeve mounted to and extending from the face of said plate in a fixed relationship to said rows of contacts, said sleeve having a circumferential slot therein, a second sleeve made of heat insulating material mounted within said first sleeve, a heat transfer rod mounted within said second sleeve, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which has a protruding arm, said bimetallic strip passing through said circumferential slot, a third sleeve rotatably nested about said first sleeve and concentric therewith so as to make an extension thereof, a knob fixedly secured to said third sleeve, a first pointer rotatably mounted about said third sleeve, a second pointer rotatably mounted about said third sleeve, said protruding arm of said bimetallic strip being captured between said first and said second pointers, a second knob rotatably mounted about said third sleeve and concentric with said first knob, said second knob being rotatably biased so as to offer turning resistance, a gear having ratchet teeth rigidly affixed about said second knob in the central portion thereof, numerals indicated on said second knob corresponding to the number of ratchet teeth and readible from the front of said knob, a collector ring rigidly secured about said second knob at the rear thereof, said ring having a radial slot therein extending at least halfway through said collector ring, a yoke rotatably mounted about said third sleeve between said pointers and said second knob, a pawl mounted on said yoke whereby said pawl is in engagement with said ratchet teeth, a spring connected between said yoke and said pawl so as to bias said pawl into engagement with said teeth, a third pointer mounted to said yoke and over said second knob in a position to indicate the numerals thereon, a pair of tapped studs mounted one on each of said first and second pointers, a screw captured by said yoke and screwed into said studs, said studs being positioned one on each side of said yoke, a pair of upper contact arms one on each of said first and second pointers so as to connect said pointers with said first contacts, a pair of lower contact arms one on each of said first and second pointers so as to connect said pointers with said second contacts, a mounting block mounted at the bottom of the face of said plate, a first contact finger mounted on said block so as to contact said collector ring, said contact finger never contacting said collector ring more than half its width, a second contact finger connecting said contact arms of said first pointer with said collector ring, a third contact finger connecting said contact arms of said second pointer with said collector ring, a source of electric current, a lead connecting one side of said current to said upper contacts sector, a second lead connecting the same side of said current to said second contacts sector and a third lead connecting the other side of said current to said first contact finger.

12. A thermostat-timer mechanism comprising, a pair of contacts, means for holding said contacts in a fixed relationship to each other, a pair of contact arms, means for holding said contact arms whereby said arms can contact said contacts, a heat transfer rod, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which is captured between said contact arms and an electric current source one side of which is connected to said contacts and the other side of which is connected to said contact arms.

13. A thermostat-timer mechanism as claimed in claim 12 wherein a means for counting the movement of said bimetallic strip is interposed in one side of said electric

current source whereby said current source is interrupted after a predetermined number of bimetallic strip movements.

14. A thermostat-timer mechanism comprising, a plurality of contacts, means for holding said contacts in a fixed relationship to each other, a pair of contact arms each arm having a plurality of contact points, means for holding said contact arms whereby said arms can contact said contacts, a heat transfer rod, a bimetallic strip one end of which is connected to said heat transfer rod and the other end of which is captured between said contact arms and an electric current source one side of which is connected to said contacts and the other side of which is connected to said contact points.

15. A thermostat-timer mechanism as claimed in claim 14 wherein a means for counting the movement of said bimetallic strip is interposed in one side of said electric current source whereby said current source is interrupted after a predetermined number of bimetallic strip movements.

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