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H. E. LINDEMANN

2,216,748

THERMAL ELECTRIC SWITCH

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Fig:1

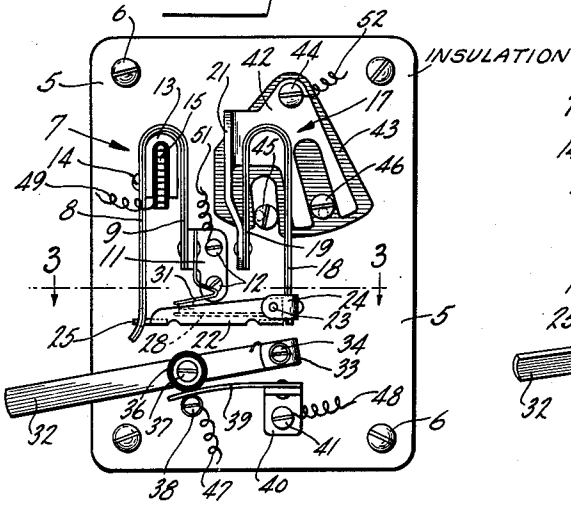


Fig:2

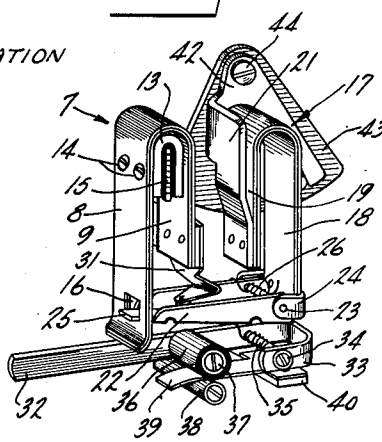


Fig:3

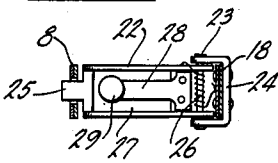


Fig:4

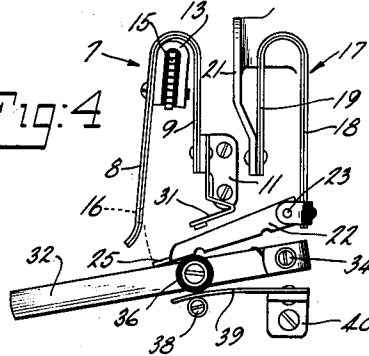
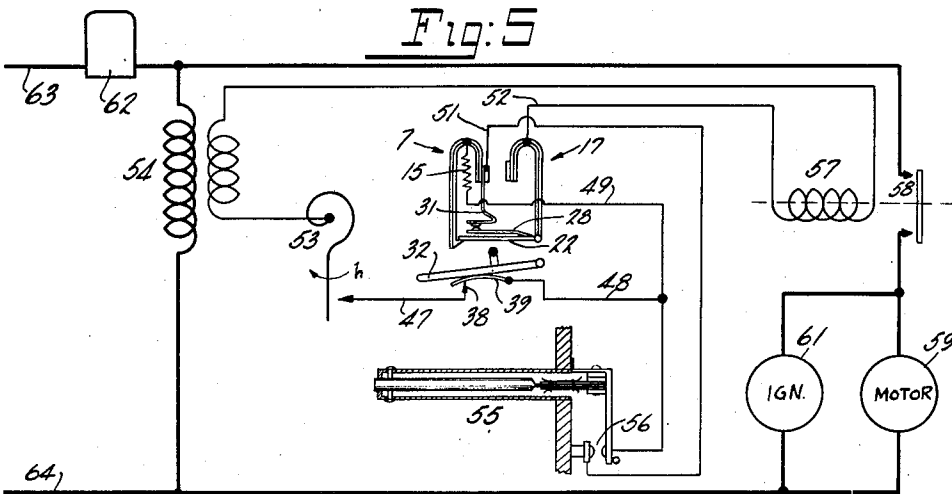


Fig:5



INVENTOR.
Herbert E. Lindemann
BY *MP* ATTORNEY.

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THERMAL ELECTRIC SWITCH

Herbert E. Lindemann, Milwaukee, Wis., assignor
to Perfex Corporation, Milwaukee, Wis., a cor-
poration of Wisconsin

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22 Claims. (Cl. 200—122)

This invention relates in general to thermal electric switches or warp switches and more particularly to manual reset warp switches or lock-out devices.

Lockout devices of this general type are often used as safety devices in automatic control systems for heating plants and usually include a piece of bimetal which is arranged to trip a switch after being heated for a predetermined period of time and for this reason is often referred to as a time delay device.

One of the objects of this invention is to provide a warp switch which will operate on a minimum of electrical power.

Another object of this invention is to provide an improved lockout device which will be uniformly compensated for ambient temperature over a wide range.

Another object is to provide an improved warp switch in which the electrical heat is more efficiently transmitted to the bimetal.

A further object is to provide an improved lockout device in which an electric circuit is broken while the device is being manually reset and which is arranged so that the user cannot manually hold the circuit closed.

An additional object of this invention is to provide an improved lockout device or safety switch for an automatic heating plant which can be mounted in any desired position.

Another object is to provide an improved safety control system for automatic heating plants.

Another object of this invention is to provide an improved warp switch of the manual reset type which is simple and dependable in operation and which can be easily adjusted for various timings.

Other objects and advantages reside in certain novel features of construction, arrangement, cooperation and combination of the various parts and elements which will be hereinafter more fully described and particularly pointed out in the appended claims and of which a preferred embodiment thereof is illustrated in the accompanying drawing forming a part thereof. In the drawing:

Fig. 1 is a full plan view of the thermal electric switch of the invention;

Fig. 2 is a perspective view;

Fig. 3 is a cross-section taken along the line 3—3 of Fig. 1;

Fig. 4 is a view of the switch in its operated position, while;

Fig. 5 is a schematic circuit arrangement showing the electrical connections of the thermal

switch as applied in combination with a heating control system.

The thermal electric or safety switch as shown in Fig. 1 is preferably mounted on an insulating base 5 which in turn is fastened in position by means of screws 6. The active portion of the switch comprises a first bimetallic element indicated generally at 7. It is formed into a U-shape with the expanding portion of the metal on the inside and has one long leg 8 and a relatively shorter leg 9 extending parallel thereto. The short leg 9 is suitably secured as by riveting as shown to an angular bracket 11 fastened to the base 5 by screws 12, so that the bimetal element 7 is supported solely from the end of the short leg 9. Nesting within the U-bend of the bimetal element is a U-shaped metal block 13, one leg of which is fastened to the long bimetal leg 8 by screws 14. The legs of the block 13 extend parallel to, and are laterally coextensive with the legs of bimetal element 7, and the right hand leg of the block is positioned slightly apart from the short bimetal leg 9. Clamped between the legs of the block 13 and suitably insulated therefrom is an electric heater 15 comprising several turns of resistor wire wound upon an insulated core. The heater 15 is positioned so as to effect the heating of the bimetal element 7 at the most advantageous point to effect a movement of the free end of leg 8 as will be pointed out. A slot 16 is cut near the free end of the long leg 8.

A second bimetallic element generally indicated at 17 is also formed into a U-shape and has a long leg 18 and a relatively short leg 19 arranged parallel thereto. The short leg 19 is riveted at its end to a bracket member 21 which serves to support the bimetal element 17. Both short bimetal supporting legs 9 and 19 are arranged on the base adjacent one another and the long legs 8 and 18 are arranged on the outside of the short legs. All of the bimetal legs are also arranged with their flat sides parallel to one another and their ends extending downward and vertically of the base from their U-bent portions. Extending across the free ends of long legs 8 and 18 is a latch member 22 one end of which is hinged or pivoted as by pin 23 to a bracket 24 which in turn is riveted as shown to the free end of long leg 18. The other end of latch 22 is provided with a tongue portion 25 which extends through the slot 16 of leg 8 into latching engagement therewith. A coiled spring 26 wound around pivot pin 23 normally tends to urge the end of the latch downward about its pivot 23 when the tongue 25 is unlatched from slot 16. The latch 22 is formed

with an opening 27 in its bottom (see Fig. 3) within which is arranged a leaf spring 28 having a contact point 29 at one end thereof and being secured at its other end near the pivoted end of the latch by means of rivets as shown. The spring 28 is free to flex within the opening 27 of the latch. A second leaf spring 31 is secured to the bracket 11 and has its free end provided with a contact point which is in engagement with contact 29 when the latch is in its normal position as shown in Fig. 1.

In order to reset the latch 22 when it is unlatched a pivoted reset lever 32 is provided which is arranged with a return bent portion 33 at one end having a pivot pin 34 screwed into the base 5. A coiled tension spring 35 around the pivot pin 34 normally urges the lever 32 downward away from the latch. The other end of the lever provides a handle for manually moving the lever upwards. An insulating roller member 36 is fastened at a point between the ends of the lever as by screw 37 and is arranged to engage the bottom of the latch when the lever is moved upward. A stop pin 38 is screwed to the base 5 below roller 36 and serves to limit the downward motion of the lever. Arranged with its free end normally between the roller 36 and stop pin 38 is a leaf spring 39, the other end of which is riveted to a bracket 40 which in turn is supported on the base 5 by a screw 41.

In the normal operation of the foregoing elements as an electrical thermal switch the bimetal element 7 serves as the active element while the bimetal 17 is the compensating element. The element 17 being constructed in exactly the same shape as element 7, and having its expandable metal arranged reversed from that of the element 7, both will be effective to move the ends of their long legs 8 and 18 respectively in the same direction and for exactly the same distance when both are subject to ambient temperatures. The latch 22 is therefore always maintained with its tongue 25 in the same relative latching engagement with the element 7 when both are affected by the external or ambient temperatures. Since the leaf spring 31 is fixed relative to the leaf spring 28 a sliding or wiping action will take place between their contact points, without, however, opening them, whenever the bimetal elements 7 and 17 move together in the same direction. When the heater 15 is traversed by electric current it generates heat which is absorbed and conducted through the metal block 13. The metal block 13 has substantial mass and serves as loading means whereby it requires the lapse of a predetermined time interval of for example, 90 seconds, before bimetal 7 warps sufficiently to release latch 22. Since the heat is transmitted to the element 7 at its U-bent portion both legs as well as the bend are effective to produce a warping or bending action to move the free end of leg 8 outward. By constructing the element 7 into a U-shape and nesting the heater in the bend of the element a greater portion of the element is simultaneously affected by the heat than would be the case, where for example, the heater is placed against the flat side of a straight piece of bimetal. A much greater and more reliable movement of the free end of the bimetal is brought about by this arrangement. In addition a minimum amount of electrical power is required to heat the bimetal and a substantial reduction in the load or work imposed upon the bimetal in its operations is also accomplished. Conversely when the heater is

disconnected the heat in the bimetal 7 is dissipated more rapidly to restore the element to normal position. Another advantage of forming the bimetal elements 7 and 17 into a U-shape is that considerable less space is required for mounting the elements upon the base 5. In addition, a more compact and easily accessible arrangement is provided for adjusting, servicing, and observing the operation of the device.

After the lapse of a predetermined time interval during which the bimetal 7 is being heated, the tongue 25 of latch 22 slips out of the opening 16 and the latch, urged by spring 26, snaps downward against roller 36 where it is stopped as seen in Fig. 4. The contact springs 28 and 31 accordingly are separated to open a circuit connection between them for a purpose to be pointed out. After the heater is disconnected and the element 7 has cooled so that the long leg 8 is again in its normal position the latch 22 may be reset. This is accomplished by manually moving the free end of reset lever 32 upward which causes the roller 36 to force the latch 22 upward until its tongue 25 snaps into the opening 16. This action likewise closes the contacts of leaf springs 28 and 31. In its upward movement the roller 36 permits the leaf spring 39 to straighten itself and thereby move away from in contact with the stop post 38 to break the electrical contact therewith. When the reset lever is released and restored by the tension of spring 35 the spring leaf 39 is again forced into contact with stop post 38 by the roller 36. The purpose of the foregoing arrangement is to prevent the reset lever 32 from being blocked in its upward position to hold the latch contacts closed regardless of the fact that the heater may be still maintaining the element 7 in warped condition. If this abnormal action is attempted the broken electrical connection between stop post 38 and leaf spring 39 maintains a controlling circuit path disabled as will hereinafter be pointed out. Since the reset lever 32 and latch 22 are both provided with coiled springs 35 and 26 respectively, to operate them in one direction, the safety device can be mounted upside down or in any other desired position.

The extent of movement of the long leg 8, before it releases the latch tongue 25, is predicated upon the lapse of a predetermined time interval during which the element 7 is being subjected to heat from the heater 15. To provide for factory and field adjustments to vary the time of operation a pair of flat adjusting plates 42 and 43 are provided which are pivoted at their top ends for movement about a screw 44 threaded into the base 5. The plate 43 which constitutes the factory adjusting plate is provided with a slot the sides of which are engaged by an adjusting screw 45 having an eccentric shank bolted onto the base 5. The plate 42 is used for field adjustments and is also provided with a slotted portion engaged by an adjusting screw 46, having an eccentric shank riveted to the plate 43. The supporting bracket 21 carrying bimetal element 17 is formed integral with the plate 42 and it is seen that turning the adjusting screw 46 with a screw driver shifts the plate 42 about the pivot screw 44 thereby causing the free end of leg 18 to laterally shift the latch 22 so that its tongue 25 will be moved a distance more or less into latching engagement with long leg 8. Turning the screw 45 accomplishes the same result but carries plate 42 along with it to give a rough factory adjustment for the device. With the foregoing

adjusting arrangement a simple and easily adjustable timing period is provided for the thermal switch. For practical purposes in different installations this timing period varies and is usually between 60 and 90 seconds after which the latch is tripped.

Electrical control wires are attached to the thermal electrical switch as shown. One wire 47 is connected to stop post 38 and another wire 48 to bracket screw 41 so that the leaf spring 39 controls the circuit therebetween. A wire 49 is also connected to one end of the heater resistor 15, the other end of which is suitably connected as by soldering to the leg 8, so that a current path extends through leg 8 to bracket 11 where it branches into either of two paths. One path extends to a wire 51 attached to mounting screw 12 and the other path through contact springs 28 and 31, the legs of bimetal element 17, supporting bracket 21, adjusting plate 42, and to pivot screw 44 where the wire 52 is attached.

The circuit arrangement depicted in Fig. 5 discloses a practical embodiment of the thermal electric switch in which it serves the purpose of a safety switch in an oil burner circuit for a heating system, for example. As diagrammatically illustrated in conventional form the installation comprises the usual room thermostat 53, step down transformer 54, a slip friction combustion responsive or stack switch 55 having an arm controlling a pair of normally open contacts 56, electromagnet 57 having contacts 58 for controlling the circuit to the burner motor 59, and an ignition means 61 to ignite the fuel projected into the furnace by the motor 59. It is also desirable that a limit control 62 of well known form be provided to guard against excessive or abnormal heat generation. A suitable source of current is connected to the incoming wires 63 and 64, the wire 63 being the "hot" side of the line while wire 64 is the "grounded" side.

In the normal operation of the circuit assume that the thermostat 53 closes its contacts in response to a call for heat in the space in which it is located. A low voltage circuit path is thereby established extending from the secondary winding of transformer 54, closed contacts of thermostat 53, wire 47, contact post 38, leaf spring 39, wires 48 and 49, the resistor winding of heater 15 and the bimetal element 7, contact springs 31 and 28, bimetal element 17, wire 52, winding of electromagnet 57 and back to the other side of the secondary transformer winding. A certain portion of the current may flow through the long leg 8 to the tongue 25 and latch 22, but the contactual relation between these elements is uncertain and not reliable and therefore the contact springs 28 and 31 are provided to insure a perfect current path at all times.

As a result of the circuit path the heater element 15 is caused to generate heat which slowly permeates the block 13 and gradually affects the bimetal element 7 so that its long leg 8 slowly starts to move outward from its latching engagement with the tongue 25. The electromagnet 57 also immediately energizes and closes its contacts 58 thereby establishing a high voltage circuit path for the burner motor 59 in series with the line conductors 63 and 64. The ignition means 61 is also activated in parallel with the burner motor 59. The motor 59 projects fuel into the combustion chamber of the furnace where the ignition means 61 causes it to ignite. If combustion is established the combustion or stack switch 55 which has relative expansible and contractable thermo-

static elements extending into the path of the combustion gases, causes its contacts 56 to close upon initial movement of the elements thereby establishing a shunt circuit around the heater element 15 over wires 48 and 51. The heater 15 is thereby effectively deenergized while the electromagnet 57 remains energized. The unlatching movement of the bimetal element 7 is accordingly arrested and the circuit path extending over contact springs 28 and 31 remains intact. As long as the burner motor continues to operate satisfactorily and the ignition means functions properly the combustion switch 55 will continue to prevent the operation of the heater 15 and consequently release of the latch 22. After the operation of the heating plant has progressed to a degree sufficient to comfortably heat the space occupied by the thermostat 53 and thereby satisfy it, its contacts are opened. This interrupts the circuit of electromagnet 57 which upon deenergizing opens the circuit of the burner 59 and ignition means 61 to terminate the generation of heat. Upon the initial drop in temperature in the combustion chamber the combustion switch 55 opens its contacts 56 to remove the shunt circuit from around the heater. The operating cycle of the heating plant has now been completed and it is ready to repeat when the thermostat 53 again closes its contacts.

Should it occur that the ignition means 61 fails to ignite the fuel in the combustion chamber when the circuit is closed, or there is an absence of fuel, the combustion switch 55 will not function to close its contacts 56 and the heater 15 will not be shunted out of the circuit. Accordingly, the heater is energized for the full timing period and the bimetal element 7 is warped to its full extent as shown in Fig. 4 and subsequently releases the latch 22. The timing period ordinarily set for 90 seconds is sufficiently long enough to insure the establishment of flame conditions by the ignition means if it is possible to do so, but is short enough to prevent the charging of the combustion chamber with an explosive mixture or dangerous amount of unignited fuel by the fuel motor 59. The release of the latch 22 opens the circuit path extending between contact springs 28 and 31 thereby deenergizing the electromagnet 57 and disconnecting the heater 15. The electromagnet interrupts the circuit of the motor 59 and ignition means 61 to stop their further operation. The safety switch has now locked the burner in safety position irrespective of the call for heat by the thermostat. The cause for the failure must now be determined and corrected if possible after which the movable end of reset lever 32 may be manually moved upward to place the latch 22 again in latching engagement with the bimetal element 7 and at the same time close the contact springs 28 and 31. Since the movement of the reset lever 32 also permits the leaf spring 39 to move out of contact with contact post 38 the main controlling circuit is maintained open until the reset lever is again restored to normal. The purpose of this arrangement is to prevent the user from locking or plugging up the reset lever in its upward position to hold the latch and contacts 28 and 31 closed in the event he fails to correct the trouble. When the reset lever is restored the elements and circuits are in their normal starting condition again and if combustion conditions are established the same sequence of events will transpire as has been pointed out.

In the case where flame failure occurs while the burner is running the stack or combustion

temperature will immediately drop and as a result the combustion switch will cool and open its contacts 56. The heater 15 being no longer shunted is effective to heat the bimetal element 8 to bring about the tripping of the latch 22 and stop the burner as has been described. It will be seen from the foregoing circuit description that the thermal switch provides a reliable and effective safety means for guarding the operation 10 of the heating plant from abnormal operating conditions until the hazardous conditions are corrected. The novel features and advantages of the safety switch render it ideally suited for the above purpose and results in improved burner operation.

While a specific embodiment of the invention has been disclosed and described, it will be apparent that many changes in the specific details of the elements can be made without departing 20 from the spirit of the invention, and it is therefore desired that the invention be limited only by the scope of the appended claims.

What is claimed is:

1. A warp switch of the class described comprising a base, two U-shaped bimetal elements, 25 means for mounting one leg of each element on the base, a latch pivoted to the free end of one element and releasably engaging the free end of the other element, an electrical circuit controlled by the latch, and a heater positioned within the 30 U-bend of one of the elements whereby the latch will be released a predetermined time after the heater is energized.

2. A warp switch of the class described comprising a pair of bimetal structures of generally U-shaped configuration and arranged with their 35 legs extending in the same direction, means for supporting each bimetal structure from one of its legs with the other leg free to move, latching means connecting the free legs of the bimetal 40 structures, means arranged between the legs of one of the bimetal structures for causing its free leg to warp and release the latching means, said other bimetal structure arranged to compensate 45 for ambient temperatures, and means for manually resetting the latching means.

3. A warp switch of the class described comprising a bimetal structure of generally U-shaped configuration with the legs thereof arranged parallel 50 to one another, means for supporting the element from one of its legs so the other is free to move, an electrical heater supported between the legs of the bimetal structure for causing the free leg to warp, latching means arranged to be 55 released when the free leg is warped, means for resetting the latching means, and means connected to the latching means for compensating for temperatures other than that caused by the heater.

4. A safety mechanism for a burner comprising 60 a base, two U-shaped bimetal elements, means for mounting one leg of each element on the base, a latch pivoted to the free end of one element and releasably engaging the free end of the other 65 element, an electrical circuit for the burner controlled by the latch, a heater positioned within the U-bend of one of the elements for releasing the latch after a predetermined time, and burner 70 responsive means for effectively deenergizing the heater upon successful burner operation.

5. A device of the class described comprising a supporting base, a pair of bimetal structures of generally U-shaped configuration, means for supporting 75 said structures from one of their legs so the other legs are free to move, latching means

including a latch member attached to one of the free legs and being arranged for release upon relative movement between the free ends of said structures, said bimetal structures being arranged to maintain said latch member in constant latching engagement in response to ambient temperatures, means on one of said bimetal structures for heating the same to move its free leg to release the latch member, normally closed first contacts controlled by the latch member, a reset lever pivoted to the base, normally closed second contacts controlled by the reset lever, whereby upon manual operation of the reset lever the second contacts are opened then the first contacts are closed and the latch member reset and finally the second contacts are reclosed.

6. A device of the class described comprising a supporting base, first and second bimetallic structures of generally U-shaped configuration, means for supporting each of said bimetal structures at one of its ends from the base so the other end is free to move, all of the ends of said structures extending in the same direction, latching means including a latch member attached to the free end of one of the bimetal structures and arranged for release upon relative movement between the free ends of said structures, said bimetal structures being subjected to the same ambient temperature so as to be effective in maintaining the latch member in latching engagement 30 irrespective of ambient temperature changes, an electric heater arranged between the legs of one bimetal structure for causing the free end thereof to release the latch member after a predetermined time interval, means for varying the predetermined time interval at which the latch member is released, a first contact member, a second flexible contact member secured to the latch member and having slidable contact relationship with said first contact member to permit movement of the latch member and the bimetal structure to which it is attached when the contact members are in engagement, said contact members being held in engagement when the latch member is in latching engagement and being separated when the latch member is released.

7. A device of the class described comprising a first and a second U-shaped bimetal strip with one short and one long leg, said strips having their flat sides arranged in spaced parallel relationship and the legs extending in the same direction with the shorter legs positioned adjacent one another, means for supporting said bimetal strips from their short legs, a biased latch member extending between the ends of both long legs, said latch being pivoted to the second bimetal long leg and having a tongue releasably engaging a slot in the first bimetal long leg, said bimetal strips effective to maintain the latch tongue in the same relative position in the slot in responsive to ambient temperature changes, said latch having an elongated opening therein, a flexible contact spring positioned in the latch opening and secured to the pivoted end of the latch, a second contact spring secured to the first bimetal short leg and having contactual relationship with the first flexible contact spring, a heater nested in the bend of the first bimetal strip and secured to one leg thereof for heating the bimetal strip and releasing the latch and separating the contact springs, and means for resetting said latch and closing the contact springs.

8. A device of the class described comprising a supporting base, a pair of U-shaped bimetallic elements supported from one of their legs upon 75

the base and having their other legs free to move, a latch member pivoted to one of the free legs and having latching engagement with the other free leg, both of said bimetallic elements arranged to move in response to ambient temperature changes to maintain the latch in the same relative latched position, means on one of the bimetal elements for heating the same to move its free leg to release the latch after the lapse of a predetermined time interval, means on one of the bimetal elements for adjusting the latch member to release after the lapse of any desired predetermined time interval, a set of contacts opened by the release of the latch, a reset lever pivoted to the base and operative to reset the latch and to close the set of contacts, and a second set of contacts opened by the operation of the reset lever and closed by the restoration of the same.

9. A device of the class described comprising a supporting base, a safety switch including a bimetal element supported on the base, an electrical heater for heating said bimetal element to effect a movement thereof, a compensating bimetal arranged on the base and movable only in response to ambient temperatures, a latch member hinged to said compensating element and latched in engagement with said first bimetal element, said latch released responsive to the movement of said first bimetal element after a predetermined time lapse during which it is heated, means for adjustably supporting said compensating bimetal element on the base to vary the time lapse for the release of the latch, a set of normally closed contacts opened by the release of the latch, a manual reset lever pivoted to the base and operative to reset the latch in position on the first bimetal element and at the same time to close the set of contacts, and a second set of contacts normally closed and only opened during the time the reset lever is operated to reset the latch.

10. A device of the class described comprising a supporting base, a U-shaped bimetallic element supported from one of its legs on the base and having its other leg free to move, a latching member having latching engagement with the free leg, a U-shaped metal block having substantial mass nesting within the U-shaped bend of the bimetal element and having its legs arranged co-extensive therewith, means for securing the metal block to one of the element legs, the other element leg being spaced apart from the metal block, an electric heater arranged between the legs of the metal block through which the heat is conducted to the free leg of the bimetallic element whereby the free leg is caused to move and release the latching member, means for restoring said latching member into latching engagement when the heater is cool, and means connected to said latching member for maintaining the latching member in engagement with the free element leg when the element is subjected to ambient temperatures.

11. A device of the class described comprising a supporting base, a first and second U-shaped bimetal element, means for supporting the first element upon the base from one of its legs, an adjusting plate pivoted to the base, means for supporting the second element upon the adjusting plate from one of its legs, the other legs of both elements being free to move, a latch member pivoted to the free leg of one element and having latching engagement with the free end of the other element, said elements arranged to compensate for ambient temperatures and maintain

the latch in the same relative latching engagement, a heater arranged within the bend of the first bimetal element for heating the same to cause its free leg to move whereby the latch is unlatched after the lapse of a predetermined time interval, said latch biased to move about its pivot after being unlatched, means on the adjusting plate for moving said second element to vary the latching engagement of the latch for changing the time interval, said adjustment means comprising an eccentric screw engaging a slot in the adjusting plate for moving said adjusting plate about its pivot, and manual means for restoring said latch into latching position after the heater has cooled.

12. A warp switch comprising a pair of U-shaped bimetal elements having a releasable latch arranged between them, and an electric heater arranged within the bend of one of the elements to cause release of the latch.

13. A warp switch comprising two U-shaped bimetal blades arranged in substantially parallel relationship, a latch extending between the blades and arranged at right angles thereto, an electric heater controlling one of the bimetal blades to release the latch, and means to reset the latch.

14. A warp switch comprising a pair of U-shaped bimetal elements each supported at one of their ends and having their other ends free to move, a releasable latch extending between the free ends of the elements, the free ends of both elements arranged to move together in the same direction in response to certain temperature conditions to hold the latch restrained, an electric heater associated with one of the bimetal elements for causing an additional movement of one of the free bimetal ends to release the latch, and means for resetting the latch.

15. A warp switch comprising a first and second U-shaped bimetal element arranged in spaced relationship, a latch member extending between one blade of the first element and one blade of the second element, an electric heater associated with one of the elements for causing the element to release the latch member after a time interval, and adjustable means associated with one of the elements for adjusting the releasing time of the latch.

16. A warp switch comprising a pair of bimetal elements having their blades arranged in spaced parallel relationship, a latch member arranged at right angles across the ends of the blades, said latch pivoted to the end of one blade and having latching engagement with the other blade, an electric heater associated with one of the elements for causing the blade thereof to warp and release the latch after a predetermined time interval, and adjusting means associated with the other element for adjusting the blade thereof to change said time interval.

17. A warp switch comprising a pair of bimetal elements supported at one of their ends, a latch pivoted to the free end of one element and having latching engagement with the free end of the other element, an electric heater for causing movement of one of the free element ends to release the latch, an energizing circuit for the heater, and a switch controlled by the release of the latch for disconnecting the heater.

18. A warp switch comprising two U-shaped bimetal elements supported at one of their ends and having their other ends free to move, a latch releasably engaging the free end of one element and pivoted to the free end of the other element,

said latch maintained engaged during the movement of both free ends in response to certain temperatures, an electric heater for causing additional movement of one of the free bimetal ends to effect a release of the latch, an energizing circuit for the heater, and means responsive to the release of the latch for opening the heater circuit.

19. In a safety mechanism for an oil burner arrangement in which the operation of the burner motor is initiated by a thermostat and maintained upon the establishment of combustion conditions as long as the thermostat calls for heat, a switch mechanism comprising a pair of U-shaped bimetal elements supported at one of their ends and having their other ends free to move, a latch member pivoted to the free leg of one element and having latching engagement with the free leg of the other element, an electric heater associated with one of the elements and energized by the thermostat to cause said element to release the latch in case combustion is not established in the burner, means controlled by the release of the latch for rendering the burner motor inoperative, said last mentioned element rendered ineffective to cause the release of the latch upon the successful establishment of combustion, and means for resetting the latch member.

20. In a safety mechanism for an oil burner arrangement in which the operation of the burner motor is initiated by a room thermostat and maintained only if combustion is established, a switch mechanism comprising a pair of U-shaped bimetal elements supported at one end and having their other ends free to move, a latch member pivoted to the free leg of one element and having latching engagement with the free leg of the other element, both of said elements effective to move their free ends together in response to certain temperature conditions and maintain the latch engaged, an electric heater associated with one of the bimetal elements, said heater energized by the room thermostat to cause the bimetal element to release the latch after a predetermined time interval in case combustion is

not established in the burner, control means operated by the release of the latch to render the burner motor inoperative, said electric heater rendered ineffective to cause the release of the latch prior to the expiration of the time interval upon the successful establishment of combustion.

21. In a safety mechanism for a fuel burner in which the fuel supply is automatically turned on and off and which is equipped with a combustion responsive device for preventing unsafe operation; comprising a pair of U-shaped bimetal elements each supported at one end with the other end free to move, a latch member attached to the free end of one element and having latching engagement with the free end of the other element, said elements arranged to compensate each other on ambient temperature changes for maintaining the latch in engagement, an electric heater associated with one of the elements for causing said one element to release the latch member a predetermined timed period after the fuel supply is turned on, a pair of contacts, said latch member arranged to open said contacts when released for turning off the fuel supply and deenergizing the electric heater, said safety mechanism arranged to prevent the latch being released if combustion is successfully established, manual means for resetting the latch, and a second set of contacts opened by the manual means during the resetting operation for preventing operation of the fuel supply means.

22. A warp switch comprising a pair of bimetal elements supported at one of their ends, latching means including a latch attached to the free end of one element and arranged to be tripped upon relative movement between the free ends of said elements, an electric heater for causing movement of one of the free element ends to release the latch, an energizing circuit for the heater, a circuit including a switch controlled by the release of said latch, and a re-set member movable from a normally inactive position to re-engage said latch and operable when moved from said inactive position to break said circuit.

HERBERT E. LINDEMANN.