Aug. 27, 1968 J. W. HUFFMAN 3,399,366

THERMORESPONSIVE SNAP ACTION SWITCH

Filed May 9, 1966 2 Sheets-Sheet 1

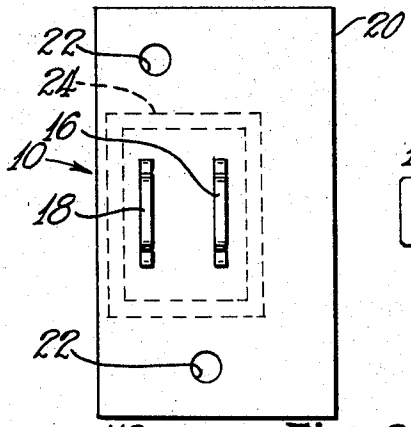

Fig. 2

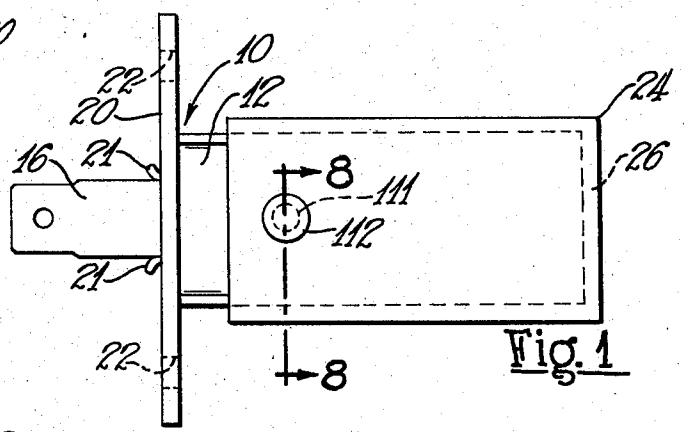

Fig. 1

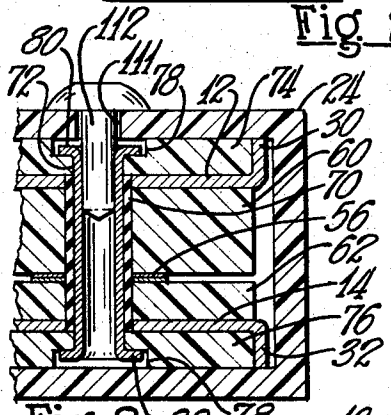

Fig. 8

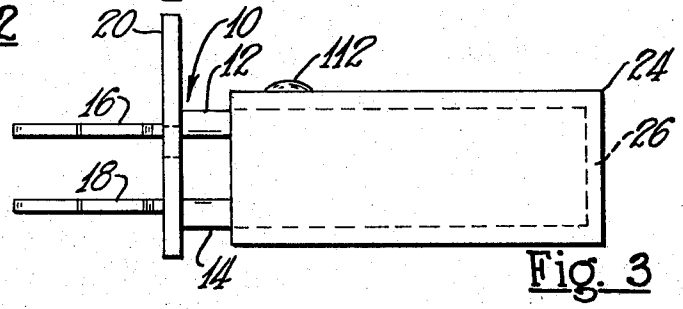

Fig. 3

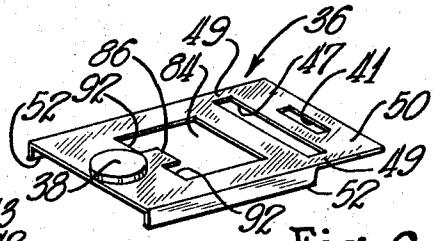

Fig. 6

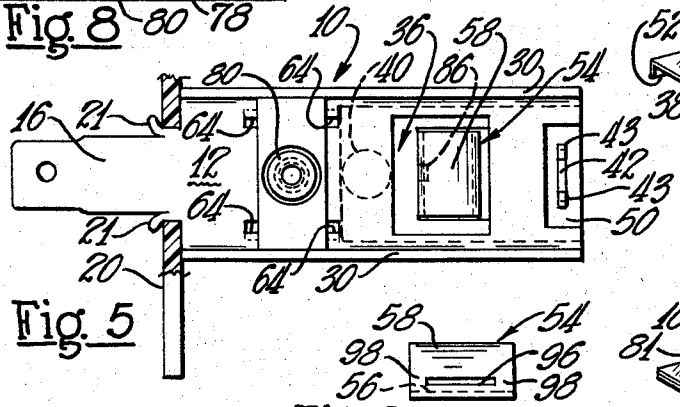

Fig. 5

Fig. 9

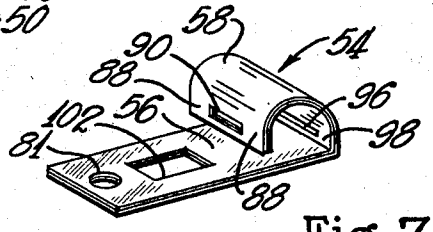

Fig. 7

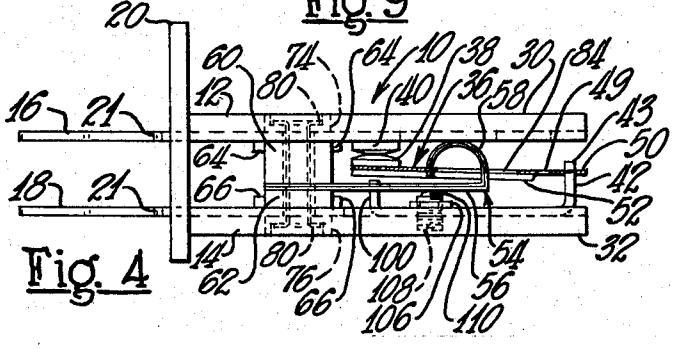

Fig. 4

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THERMORESPONSIVE SNAP ACTION SWITCH

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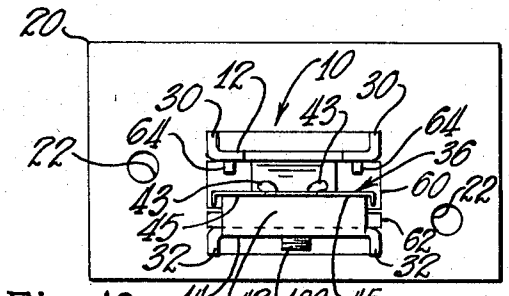

Fig. 10

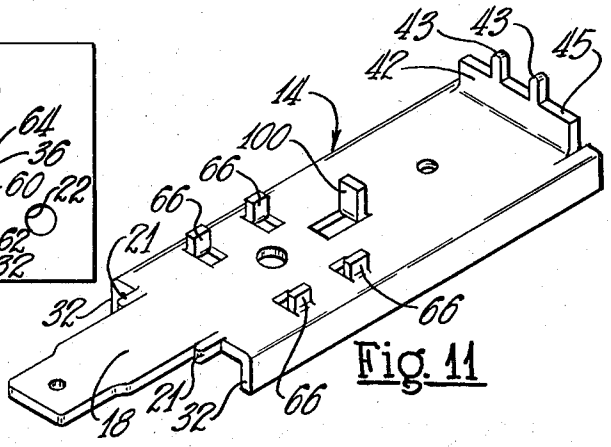

Fig. 11

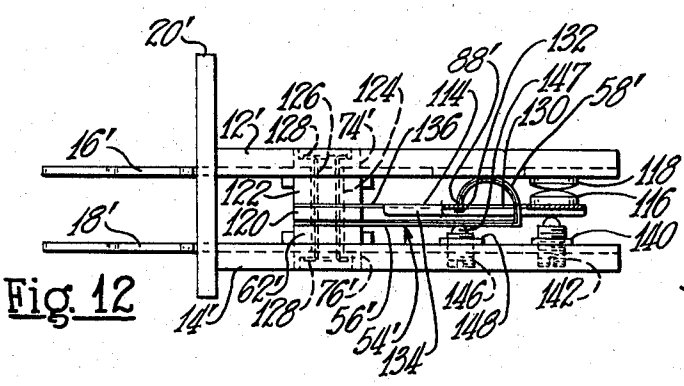

Fig. 12

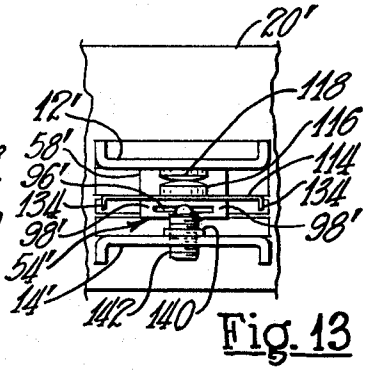

Fig. 13

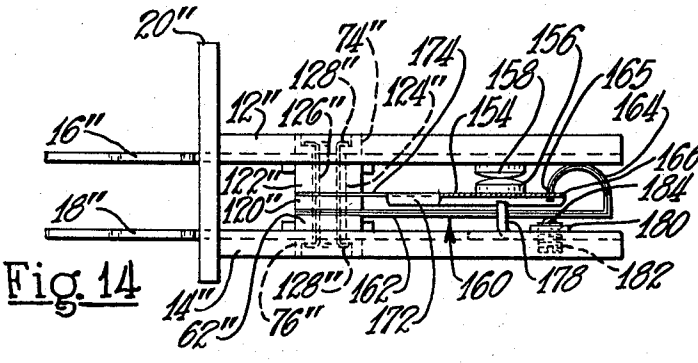

Fig. 14

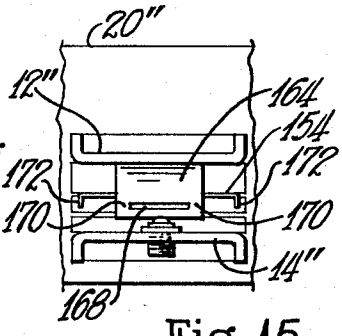

Fig. 15

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United States Patent Office 3,399,366
Patented Aug. 27, 1968

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THERMORESPONSIVE SNAP ACTION SWITCH

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Filed May 9, 1966, Ser. No. 548,476
8 Claims. (Cl. 337—365)

ABSTRACT OF THE DISCLOSURE

A thermoresponsive snap action switch mechanism having a frame with parallel metal support member maintained in spaced relation by an insulating mounting plate. The switch mechanism further embodies a movable switch member having a contact cooperating with a second contact, and a bimetal element having a planar portion and an arcuate portion, the latter portion being articulately connected with the movable switch member to obtain snap action of the switch member under the influence of temperature variations on the bimetal element.

This invention relates to thermostat snap switches and more especially to a snap action switch construction embodying a thermoresponsive means arranged to provide a toggle action for effectively biasing a switch member to circuit making or circuit breaking positions.

Thermostat control switches have been utilized wherein an actuating member and a switch member are connected through the medium of an arcuately shaped spring member wherein the position of the actuating member is varied or controlled by an independent thermoresponsive means or bimetal element acting through the actuating member to provide a toggle action responsive to positions of the actuating member under the influence of the independent thermoresponsive means. A thermostat snap action switch of this character is disclosed in applicant's Patent 3,004,124 granted Oct. 10, 1961.

The present invention embraces a switch means arranged for snap action embodying a resilient thermoresponsive means having direct connection with a relatively movable contact carrying switch member whereby flexure of the resilient thermoresponsive means directly controls the position of the movable switch member for engaging and disengaging contacts by snap action.

An object of the invention embraces a thermoresponsive snap action switch in which a resilient bimetal element has direct articulate connection with a relatively movable contact-carrying switch member for cooperation with a second contact whereby snap action of the switch member is attained through relative movement of the bimetal element under temperature variations to provide a snap action switch whereby a high degree of sensitivity of temperature control is attained.

Another object of the invention is the provision of a snap action switch wherein the frame or mounting means comprises similarly shaped support members maintained in spaced relation by insultating means, the arrangement embodying a relatively movable switch arm having a contact cooperating with a second contact, and a resilient bimetal element articulately connected with the movable switch member to obtain snap action of the switch member wherein the operative components of the switch are disposed between the support members providing a compact, highly sensitive switch means which is reliable in its operation.

Another object of the invention is the provision of a thermoresponsive snap switch embodying a bimetal element directly engaging a movable switch member to obtain snap action wherein the sensitivity of operation of

the snap action may be adjusted by means cooperating with the bimetal element whereby the switch mechanism is effective to maintain ambient temperatures within extremely small temperature differentials.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIGURE 1 is a top plan view of the switch mechanism particularly illustrating a housing for the switch and mounting means;

FIGURE 2 is is an end view of the arrangement shown in FIGURE 1;

FIGURE 3 is a side elevational view of the arrangement shown in FIGURE 1;

FIGURE 4 is a side elevational view illustrating one form of thermostat snap switch of the invention;

FIGURE 5 is a top plan view of the switch construction illustrated in FIGURE 4;

FIGURE 6 is an isometric view illustrating the movable switch member of the switch construction shown in FIGURE 4;

FIGURE 7 is an isometric view of a form of bimetal element for actuating the movable switch arm;

FIGURE 8 is a greatly enlarged fragmentary detail sectional view taken substantially on the line **8—8** of FIGURE 1;

FIGURE 9 is an end view of the bimetal element illustrated in FIGURE 7;

FIGURE 10 is an end view of the switch construction shown in FIGURES 4 and 5 with the housing removed;

FIGURE 11 is an isometric view of a component of the support means of the switch construction shown in FIGURES 4 and 5;

FIGURE 12 is a side elevational view illustrating a modified form of snap switch of the invention;

FIGURE 13 is an end view of the switch construction shown in FIGURE 12;

FIGURE 14 is a side elevational view illustrating a further modification of snap switch construction of the invention, and

FIGURE 15 is an end view of the construction shown in FIGURE 14.

The switch mechanism of the invention is adapted for controlling the energization of an electrically energizable instrumentality under the influence of variations in ambient temperatures, the switch construction having particular utility in controlling electrical circuits for electrically energizable heaters, air conditioning equipment, refrigeration units or for controlling any circuit where it is desirable to obtain a snap action to rapidly make or break an energizing circuit upon variations in temperature.

Referring to the drawings in detail, and initially to FIGURES 1 through 5, the switch construction and housing arrangement are illustrated approximately double actual size. The switch mechanism **10** is inclusive of support means comprising spaced components or frame members **12** and **14** on which the elements of the switch construction are mounted as hereinafter described.

The frame component **12** is provided with a forwardly projecting tab or extension **16** and the frame component **14** provided with a forwardly extending tab or extension **18**, the extensions projecting through openings in a mounting plate **20** fashioned of insulating material, such as Micarta, a phenolic resin-impregnated fibrous material. The projecting metal members **16** and **18** form terminals to which are connected conductors (not shown) to inter-

calate the switch means in the circuit of the instrumentality to be controlled.

Each of the frame members **12** and **14** is fashioned with partially severed ear portions **21**, shown on member **14** in FIGURE 11, which in assembly with the mounting plate **20**, are swaged or bent to the position shown in FIGURES 1 and 5 to secure the switch construction to the plate **20**. The mounting plate may be provided with openings **22** to accommodate bolts or other means for securing the switch unit to a panel. As shown in FIGURES 4 and 5, the frame components **12** and **14** of the support means are elongated and disposed in parallel relation.

A hollow housing **24** of rectangular cross section fashioned of molded resinous or plastic material embraces or encloses the switch construction as shown in FIGURES 1 and 3, the housing having an end wall **26** which, in assembly, is disposed adjacent the distal ends of the frame members **12** and **14**. The interior dimensions of the housing are such as to enable the switch construction to be slidably yet snugly received in the housing. The housing is maintained in assembled relation with the switch construction in a manner hereinafter described.

The frame component **12** fashioned of metal is provided with lengthwise extending reinforcing flanges **30** and the frame component **14** fashioned with lengthwise extending reinforcing flanges **32**. In assembly, the flanges or reinforcing portions **30** and **32** extend in opposite directions as shown in FIGURES 8 and 10. The switch construction is inclusive of a relatively movable switch member or switch arm **36** of comparatively thin flexible metal. The switch member **36** is equipped with a contact **38** which cooperates with a contact **40** which, in the embodiment illustrated, is carried by or mounted on the frame member **12**.

The rear end region of the frame member **14** is fashioned with an upwardly extending portion **42** which provides a support or anchor for the movable switch member **36**.

As particularly shown in FIGURE 6, the switch member **36** is fashioned adjacent one end with a transversely extending slot **41** which is adapted to receive ears or projections **43** on the portion **42**, particularly shown in FIGURE 11, the adjacent surface of the switch member **36** abutting or engaging the upper ledge or surface **45** of the projection **42**. In assembly after the switch member **36** is engaged with the surface **45**, the ears or projections **43** are swaged or bent outwardly to the configuration shown in FIGURES 5 and 10, providing a mounting for the switch member **36**.

Also provided in the switch member **36** is a second transversely arranged slot **47**, particularly shown in FIGURE 6. The slot **47** is of a length to provide connecting sections or bridge sections **49** connecting the anchored region **50** of the switch arm with the portion of the switch arm carrying the contact **38**. The connecting or bridge sections **49** are of comparatively small cross section and provide hinge regions or pivot zones to facilitate movement or flexure of the portion of the switch member carrying the contact **38**.

In order that flexing or hinging take place at the hinge or pivot regions **49**, the switch member **36** is provided with laterally extending lengthwise arranged flanges **52** terminating adjacent the hinge regions **49** of reduced cross section. The hinge regions **49**, in effect, provide a pivotal axis or zone for movement of the contact-carrying portion of the switch arm **36**.

The switch construction embodies a thermoresponsive means or bimetal element or component **54** which is resilient and is arranged to provide a snap action movement of the switch arm **36** upon temperature variations in the region of the bimetal element **54**. The bimetal element **54** comprises a uniplanar or rectilinear portion **56** and an arcuately shaped portion **58** as particularly shown in FIGURES 4 and 7. The planar portion **56** of the bimetal member or component **54** is anchored in the manner illustrated in FIGURES 4 and 8. As particularly shown in FIGURE 8, there is disposed between the frame members **12** and **14**, blocks **60** and **62** of rigid insulating material.

Disposed between the adjacent surfaces of blocks **60** and **62** is the planar portion **56** of the bimetal element **54**. As shown in FIGURES 4 and 5, the upper frame member **12** is provided with integral downwardly-extending ear portions **64** and the lower frame member **14** is provided with upwardly-extending integral ear portions **66**, the insulating block **60** being positioned between the ear portions or projections **64** and the insulating block **62** being positioned between the ear portions or projections **66**.

The frame components **12** and **14**, the blocks **60** and **62** and the adjacent region of the planar portion **56** of the bimetal element **54** are fashioned with aligned openings to snugly receive a cylindrical sleeve **70** of rigid insulating material, the assembly being illustrated in FIGURE 8.

Extending through the insulating cylinder **70** is a tubular member **72**. Disposed contiguous with the upper planar surface of the frame component **12** is a block **74** of insulating material, and disposed below and contiguous with the planar surface of frame component **14** is a second block **76** of insulating material.

The blocks **74** and **76** are fashioned with counterbores **78** and with openings accommodating the cylindrical metal member **72**. In assembly, the end regions of the tubular metal member **72** are swaged as at **80** into the counterbores **78** to secure the components in assembled relation. The blocks **60** and **62** with the portion **56** of the bimetal element disposed therebetween provide means for positioning the frame members **12** and **14** in proper spaced relation. The opening **81** in the bimetal element **54** shown in FIGURE 7 accommodates the insulating sleeve **70** as shown in FIGURE 8.

With particular reference to FIGURE 6, the central region of the switch member **36** is fashioned with an opening **84** and with an integral projection or tab portion **86** extending into the opening. In assembly of the switch construction as shown in FIGURE 4, the curved or arcuate-shaped portion **58** of the bimetal component **54** is disposed in the opening **84** in the switch member **36**. The distal region **88** of the arcuate portion **58** of the bimetal element **54** is fashioned with a transversely extending narrow slot or opening **90**.

The projection or tab **86** on the switch member **36** extends into the slot **90** in the arcuate portion **58**. With the portion **86** extending into the slot **90**, the edge regions **92** of the switch member **36** at the sides of the projection **86** engage the arcuate portion **58** of the bimetal component **54** as shown in FIGURE 4.

In order to provide for increased flexibility of the arcuate portion **58** with respect to the remainder of the bimetal element **54** to attain a highly sensitive snap action for the switch member or arm **36**, the region of the arcuate portion adjacent the integral juncture of the arcuate portion **58** with the planar portion **56**, is fashioned with a transversely extending slot **96**, shown in FIGURES 7 and 9, forming hinge regions **98** provided by the bridging portions at the regions **98**, which are of comparatively small cross sectional area to provide flexing or hinge zones to facilitate flexing of the arcuate portion **58** with respect to the planar portion **56**.

As shown in FIGURE 4, the arrangement includes abutment means for limiting the downward relative movement of the switch member **36** effecting separation of the contacts **38** and **40**, the abutment means being a struck-up projection **100** integral with the frame component **14** as shown in FIGURES 4 and 11. It is to be understood that other suitable abutment means may be employed for limiting the movement of the switch arm **36** in contact disengaging position. The planar portion **56** of the bimetal element **54** is fashioned with an opening

102, shown in FIGURE 7, to accommodate the abutment or projection 100.

Means is provided for adjustably regulating the position of a portion of the bimetal element 54 to regulate or control the sensistivity of snap action movement of the switch arm 36 under temperature differentials. As shown in FIGURE 4, a disc 106 is fused or bonded to the frame component 14 at its central region beneath the planar portion 56 of the bimetal element 54. The disc 106 and the adjacent portion of the frame member 14 are provided with aligned threaded openings to accommodate an adjusting screw 108, the upper end 110 of the screw providing an abutment engageable with the planar portion 56 of the bimetal element at a zone spaced a short distance from the distal end of the planar portion to partially restrict flexure of the bimetal element in one direction.

Adjustment of the relative position of the abutment 110 controls the sensitivity of the snap action movement of the switch member 36. The thermoresponsive means or bimetal component 54 is fashioned of two metals having dissimilar coefficients of expansion whereby variations in ambient temperature cause flexing or relative movement of the thermoresponsive means. The metals comprising the bimetal component may be reversed in fabrication where flexure in reverse directions is desired.

Where the switch construction is utilized for controlling the motor circuit of an air conditioning or air cooling unit or instrumentality, the bimetallic element 54 is fabricated whereby decrease in ambient temperature effects flexure and movement of the arcuate portion 58 to move the switch member 36 downward, as viewed in FIGURE 4, to separate the contacts 38 and 40.

Upon increase in the ambient temperature, the arcuate portion 58 is flexed upwardly to effect snap action of the switch member 36 to reengage the contacts and energize the motor of the air cooling unit being controlled.

Where the switch mechanism is utilized to control a heating unit and it is desired to disengage the contacts upon an increase in temperature ambient the bimetal component 54, the metals of different coefficients of expansion are fabricated in reverse relation so that an increase in ambient temperature causes flexure of the bimetal element 54 to effect snap action movement of the switch arm 36 downwardly to separate the contacts and deenergize the heating unit or instrumentality in circuit with the switch mechanism. By proper adjustment of the abutment 110, snap action movement of the switch arm may be attained by an ambient temperature of one degree F. or less.

After the completion of the assembly of the components of the switch mechanism, as shown in FIGURES 4 and 5, the thin-walled housing 24 of resinous material or other insulating material having an open end is telescoped over the switch assembly to the position shown in FIGURES 1 and 3. The wall region of the housing adjacent the frame component 12 is fashioned with an opening 111 to accommodate a headed pin or drive screw 112, as shown in FIGURE 8, which is driven or pressed into the tubular member or sleeve 72 to secure the housing in enveloping relation with the switch mechanism.

It will therefore be apparent that the switch may be utilized to control the motive means of an air cooling unit or refrigeration apparatus or the switch may be used to control the energization of a heating instrumentality where the heat from the instrumentality varies the temperature in the region of the switch mechanism.

FIGURES 12 and 13 illustrate a modification of the switch mechanism of the invention. In this form the frame components 12', 14', the panel 20', terminals 16', 18', the bimetal component 54' and the mounting means for the bimetal component are the same as in the form of the invention shown in FIGURES 4 through 11. This form of the invention includes a flexible switch member or arm 114 provided with or carrying a contact 116 which cooperates with a relatively stationary contact 118 mounted by the metal frame component 12'. The switch arm or member 114, in this form of the invention, is mounted in a manner differently from that disclosed in FIGURE 4.

The mounting means for the bimetal elements 54' and the switch arm 114 is inclusive of a block 62' of insulating material disposed between the planar portion 56' of the bimetal component 54' and the frame component 14'. The distal end region of the switch arm 114' is disposed between two blocks 120 and 122 of insulating material. The blocks of insulating material, the switch arm 114 and the planar portion 56' of the bimetal element are provided with registering openings to receive a sleeve 124 of insulating material which is similar to the sleeve 70 shown in FIGURE 8.

The blocks 62', 120 and 122, an end region of the switch arm 114 and an end region of the bimetal element 54' are held in fixed relation by a metal sleeve 126 similar to the sleeve 72 shown in FIGURE 8, the ends of the metal sleeve 126 being swaged as at 128 into engagement with insulating blocks 74' and 76' to provide a stacked construction for mounting the bimetal element 54' and the switch arm 114. The switch arm 114 is provided with an open region 130 similar to the open region 84 in the switch arm 36 shown in FIGURE 6. The switch arm 114 is provided with a projection or tab portion 132 similar to the tab portion 86 shown in FIGURE 6.

The bimetal component 54' is fashioned with an arcuate portion 58' terminating in an end region 88' provided with a slot to receive the projection 132 providing an articulate connection between the switch arm 114 and the arcuate portion 58' of the bimetal element 54'. The arcuate portion 58', near the region of its juncture with the planar portion 56' is fashioned with a slot 96' providing connecting regions or bridging sections 98' which form hinge zones to facilitate flexure of the arcuate portion 58' to obtain snap action movement of the switch arm 114.

The switch arm 114 is fashioned with flanges 134 which terminate a short distance from the mounting means providing an unflanged region adjacent the mounting means, as show in FIGURE 12.

This region of the switch arm 114 is provided with a transversely extending slot, corresponding to the slot 47 shown in the switch arm 36 in FIGURE 6, to provide hinge regions 136 for the switch arm of reduced cross section to facilitate pivotal or flexing movement of the switch arm 114 about the hinge regions 136.

An abutment means mounted by the frame component 14' is provided for limiting the extent of movement of the distal end of the switch arm 114 away from the contact 118 when the contacts are separated under the influence of the bimetal element 54'. As shown in FIGURE 12, a disc or member 140 is secured or bonded to the frame component 14' and the disc 140 and adjacent portion of the frame component 14' have aligned threaded openings to accommodate an adjusting screw 142. By adjusting the screw 142 the extent of opening movement of the switch arm may be controlled.

Means is also provided to adjustably restrict flexure of a portion of the bimetal component 54' and thereby regulate or control the sensitivity of snap action of the switch arm 114. Disposed beneath the planar portion 56' of the bimetal element 54' at a region spaced a comparatively short distance from the distal end region of the planar portion of the bimetal element 54' is an adjustable abutment in the form of a threaded member or screw 146.

Soldered or otherwise bonded to the frame component 14' is a disc-like member 148, the disc-like member and the adjacent region of the frame component 14' having aligned threaded openings to accommodate the adjustable abutment or screw 146, the upper end 147 of the screw or member 146 being disposed for engagement with the planar portion 56' of the bimetal element.

The abutment positions the bimetal element to restrict

flexure in a downward direction to regulate the sensitivity of the snap action. Through this adjustable means, the snap action sensitivity may be adjusted to effect snap action under a desired differential in ambient temperature. It is found that through this adjustment, snap action movement of the switch arm may be attained by an ambient temperature change of one degree F. or less.

FIGURES 14 and 15 illustrate a further modification of the snap action switch of the invention. In this form the frame components **12''**, **14''**, the insulating panel **20''** and terminals **16''**, **18''** are the same as in the form of construction shown in FIGURES 4 through 11. The switch mechanism includes a flexible switch member or arm **154** provided with a contact **156** which cooperates with a relatively stationary contact **158** mounted by the meal frame component **12''**. The switch arm or member **154** is mounted in the same manner as the switch arm shown in FIGURE 12.

The switch construction shown in FIGURES 14 and 15 includes a bimetal element or thermoresponsive means **160** having a planar portion **162** and a curved or arcuate portion **164** integral with the planar portion **162**, the latter being mounted at one end in the same manner as illustrated in FIGURE 12. The mounting means for the bimetal element **160** and the switch arm **154** includes a block **62''** of insulating material disposed between the portion **162** of the bimetal element and the frame component **14''**. The mounting end of the switch arm **154** is disposed between two blocks **120''** and **122''** of rigid insulating material.

The blocks **120''**, **122''**, the end region of the switch arm **154** and the end region of the planar portion **162** of the bimetal element are fashioned with registering openings to receive a sleeve **124''** of insulating material. The insulating blocks and the adjacent regions of the switch arm **154** and the planar portion **162** of the bimetal element are held in fixed relation by a tubular metal member or sleeve **126''** telescoped within the sleeve **124''**, the ends of the member **126''** being swaged as at **128''** into engagement with insulating blocks **74''** and **76''** providing a stacked construction for mounting the bimetal element **160** and the switch arm **154** and maintain the frame components **12''** and **14''** in spaced relation.

The contact **156** carried by the switch arm **154** is spaced from the distal end of the switch arm. The switch arm **154** is provided at its distal end with a tab or projection **166** engaging in a laterally extending slot in the end region **165** of the curved portion **164** of the bimetal element providing an articulate connection between the distal end of the switch arm and the arcuate portion **164** of the bimetal element.

The arcuate portion **164**, near the region of its juncture with the planar portion **162**, is fashioned with a laterally extending slot **168**, shown in FIGURE 15, providing narrow connecting portions or bridges **170** which form hinge regions or zones to facilitate flexure of the arcuate portion **164** to obtain snap action movement of the switch arm **154**. The switch arm **154** is fashioned with flanges **172** extending lengthwise of the switch arm at the edge regions, the flanges terminating short of the mounting means providing an unflanged region adjacent the mounting means as shown in FIGURE 14.

This unflanged region of the switch arm **154** is provided with a transversely extending slot corresponding to the slot **47**, shown in the switch arm **36** in FIGURE 6, to provide hinge regions **174** for the switch arm which are of reduced cross section to facilitate pivotal or flexing movement of the switch arm **154** about the hinge regions **136**. An abutment means in the form of a struck-up projection **178** on the frame component **14''** is adapted to be engaged by the switch arm **154** for limiting the extent of flexure or movement of the switch arm away from the contact **158** when the contacts are separated under the influence of the bimetal element.

It is to be understood that an adjustable abutment screw, such as that illustrated at **146** in FIGURE 12, may be employed in lieu of the projection or abutment **178** in the switch shown in FIGURE 14 or the projection **100** shown in FIGURE 4. Joined to the frame component **14''** is a disc **180**, the disc and adjacent region of the frame component **14''** having aligned threaded openings accommodating a screw **182** providing an adjustable abutment for restricting movement of the planar portion **162** of the bimetal element **160** to control the sensitivity of snap action of the switch arm.

The upper end **184** of the screw **182** is adapted for engagement with the planar portion **162** of the bimetal element. By adjusting the screw **182**, the sensitivity of the snap action may be controlled and thereby effect snap action under a desired differential in ambient temperature as in the other forms of the invention. The arcuate portion **164** of the bimetal element **160** extends beyond the distal end of the switch arm **154** rendering it unnecessary to provide any open areas in the switch arm between the hinge regions **174** and the zone of engagement of the switch arm with the curved portion **164** of the bimetal element.

The action or operation of the switch mechanism shown in FIGURES 14 and 15 is substantially the same as the action of the switch mechanisms hereinbefore described. Upon variations in ambient temperature, the bimetal element **160** is flexed and particularly through the flexure of the curved portion **164** a snap action of the movable switch arm **154** is attained.

By adjustment of the abutment **182**, the sensitivity of the snap action may be regulated to obtain action under various degrees of temperature or temperature differentials. The switch arrangement is highly sensitive to minute temperature changes whereby snap action may be obtained with ambient temperature variations of one degree F. or less.

Through the arrangements of switch mechanism hereinbefore described, a highly sensitive snap action is attained with a minimum of moving components. The switch constructions are compact and are capable of carrying substantial currents in controlling circuits of heating devices, motors of air cooling units or other instrumentalities where accurate control is desired responsive to variations in ambient temperatures.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

I claim:

1. Switch mechanism, in combination, a relatively movable current conducting member of planar shape provided with a contact, a second contact, means supporting the second contact, said current conducting member being movable to positions engaging and disengaging said contacts, a bimetal element formed with an arcuate portion and a planar portion, an end region of the arcuate portion having pivotal connection with the current conducting member, means mounting the planar portion of said bimetal element, the arcuate portion being provided with a region of reduced cross-section forming a hinge zone for said arcuate portion, said pivotal connection and the hinge zone being disposed with respect to the movable current conducting member whereby movement of the bimetal element under the influence of ambient temperature variations effects snap action movements of the current conducting member to engage or disengage the contacts.

2. The combination according to claim **1** including abutment means engageable with the bimetal element for impeding flexure of the bimetal element in one direction.

3. The combination according to claim **1** including adjustable abutment means engageable with the bimetal element for reducing flexure of the planar portion of the bimetal element in one direction.

4. The combination according to claim 1 including abutment means limiting the extent of movement of the current conducting member in contact disengaging position.

5. Switch mechanism, in combination, support means including substantially parallel spaced metal members and rigid insulating means disposed between the metal members, a relatively movable current conducting member of planar shape mounted by the support means and provided with a contact, a second contact mounted by the support means, said current conducting member being movable to positions engaging and disengaging said contacts, a bimetal element having a planar portion and an arcuate portion, said planar portion being mounted by the insulating means, the distal end region of the arcuate portion of the bimetal element having pivotal connection with the relatively movable current conducting member, said bimetal element having a weakened region intermediate its ends providing a hinge zone for the arcuate portion whereby relative movement of the bimetal element under the influence of ambient temperature variations effects snap action movements of the current conducting member to engage or disengage said contacts.

6. The combination according to claim 5 wherein the current conducting member is mounted on one of the metal members and the second contact mounted on the other metal member.

7. The combination according to claim 5 including an adjustable abutment engageable with the planar portion of the bimetal element for regulating the sensitivity of snap action of the current conducting member.

8. The combination according to claim 5 wherein the rigid insulating means, the metal members and the planar portion of the bimetal element have aligned openings, a tubular member of insulating material extending through said openings, and means extending through said tubular member securing the rigid insulating means, metal members and the planar portion of the bimetal element in assembled relation.

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