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ELECTRICAL CIRCUIT OVERLOAD PROTECTOR OF THE THERMALLY RESPONSIVE BIMETAL ELEMENT TYPE

Filed May 13, 1968 4 Sheets-Sheet 1

Fig. 1

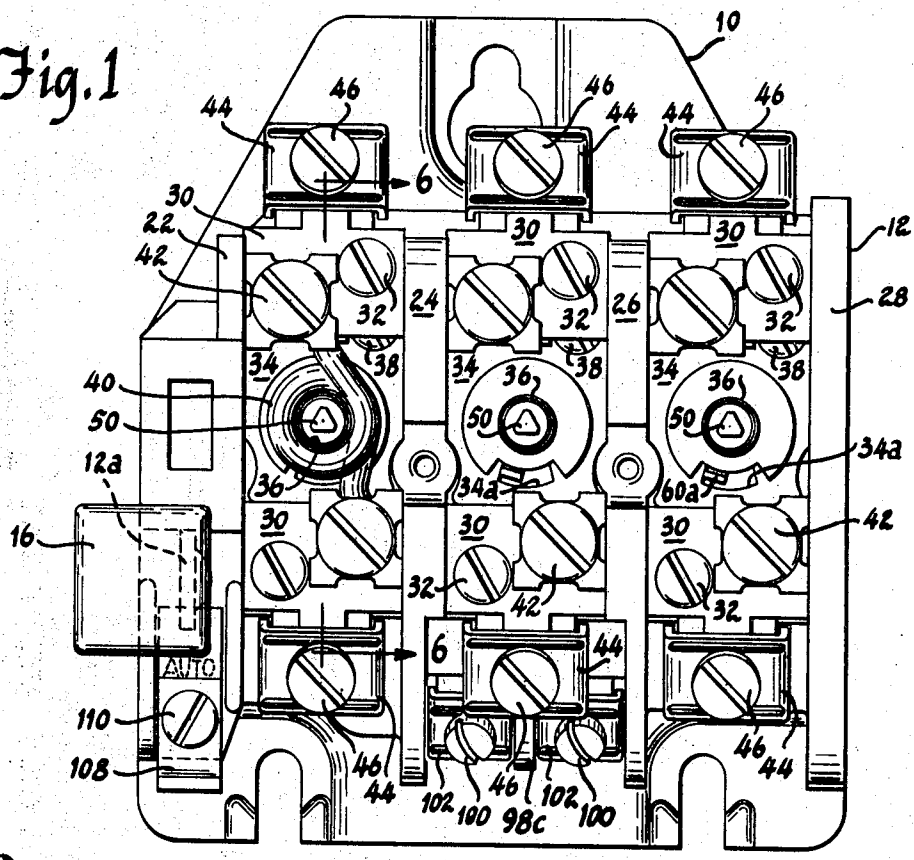
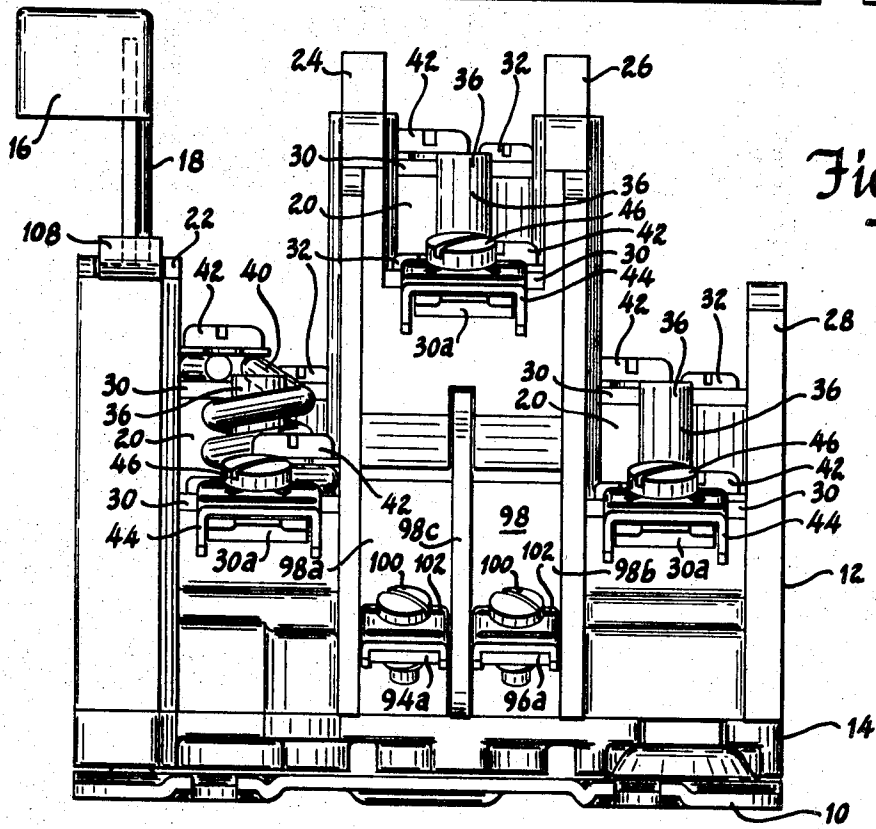


Fig. 2



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ELECTRICAL CIRCUIT OVERLOAD PROTECTOR OF THE THERMALLY RESPONSIVE BIMETAL ELEMENT TYPE
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Fig. 3

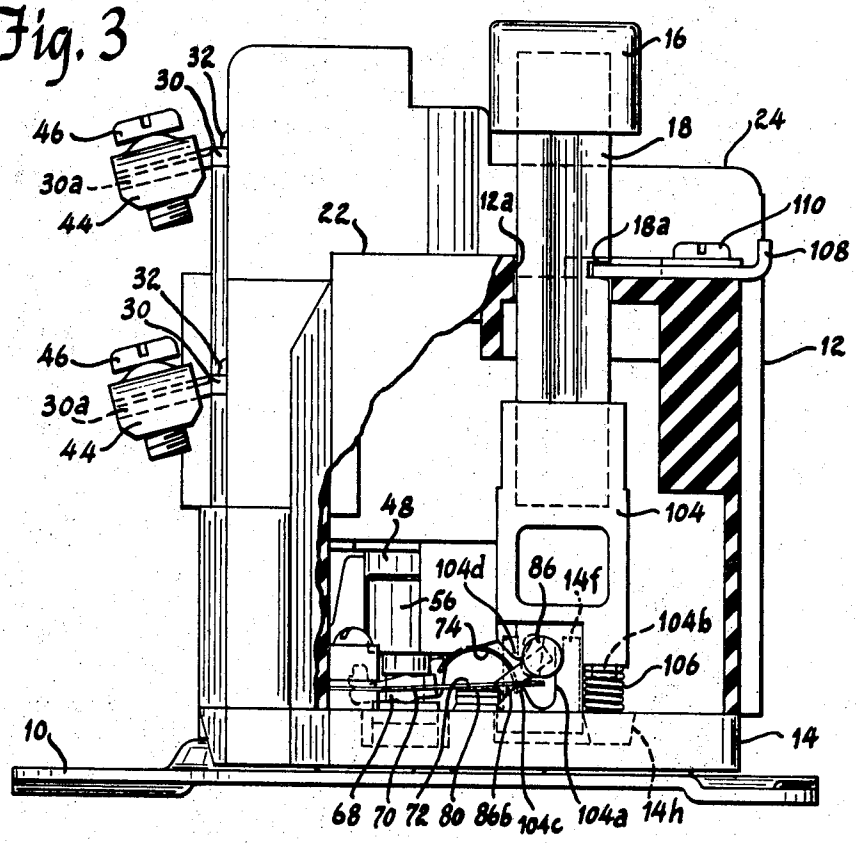
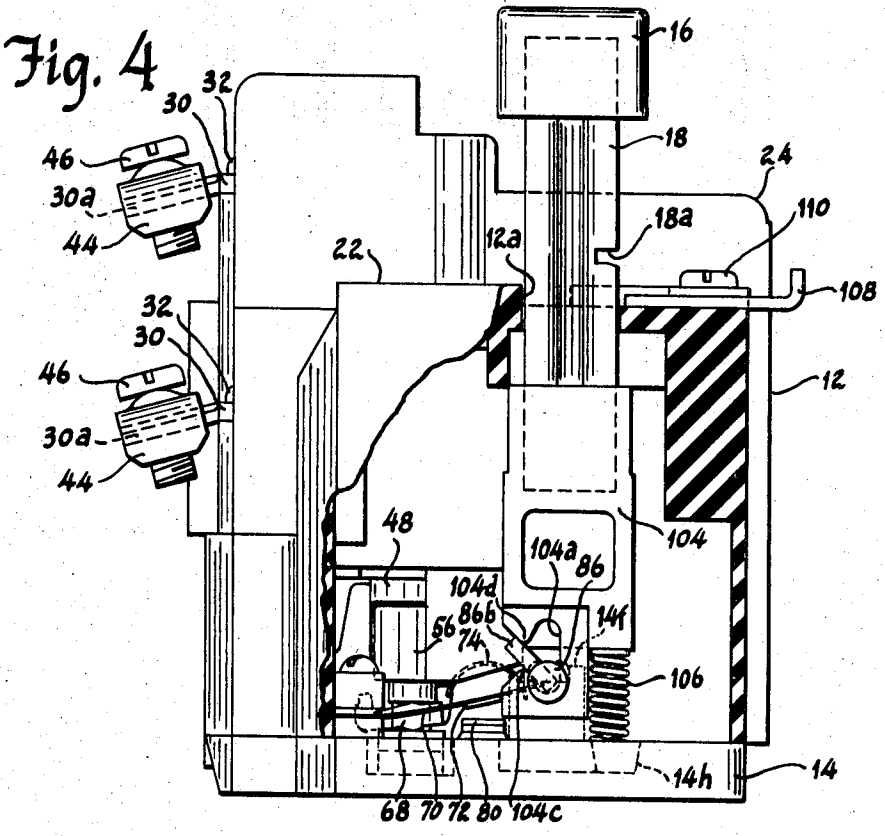


Fig. 4



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ELECTRICAL CIRCUIT OVERLOAD PROTECTOR OF THE THERMALLY RESPONSIVE BIMETAL ELEMENT TYPE
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Fig. 5

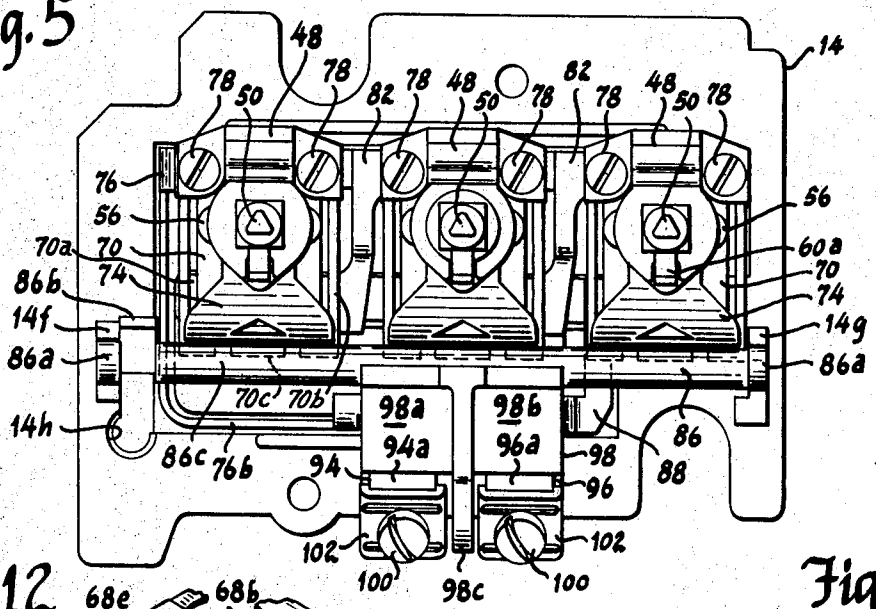


Fig. 12

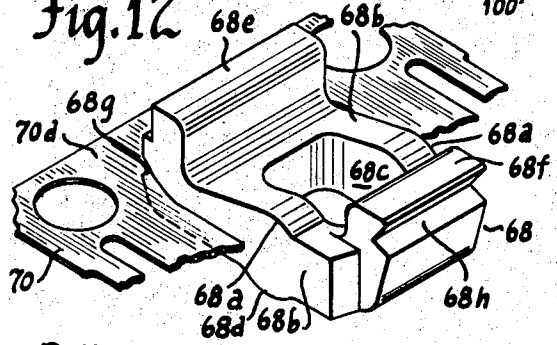


Fig. 8

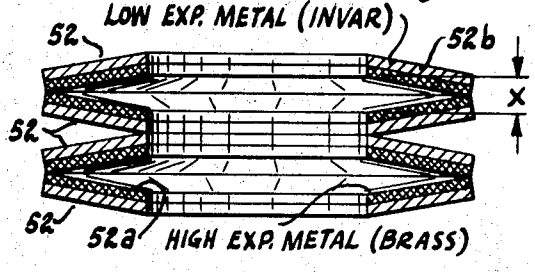


Fig. 6

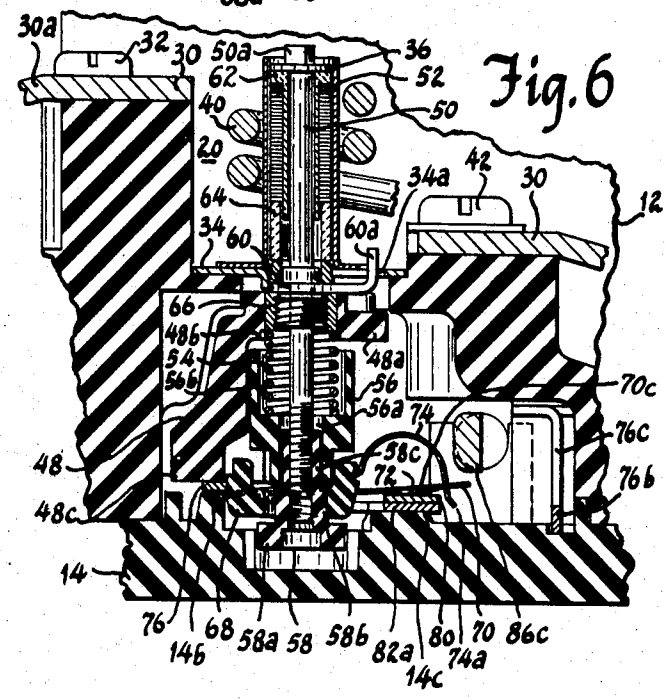
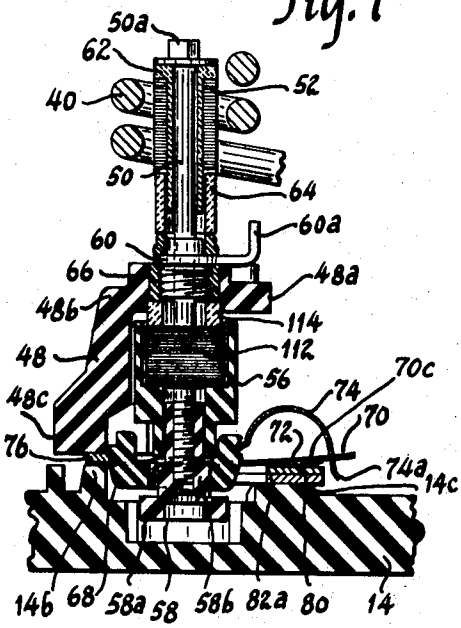


Fig. 7



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ELECTRICAL CIRCUIT OVERLOAD PROTECTOR OF THE THERMALLY RESPONSIVE BIMETAL ELEMENT TYPE

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Fig. 9

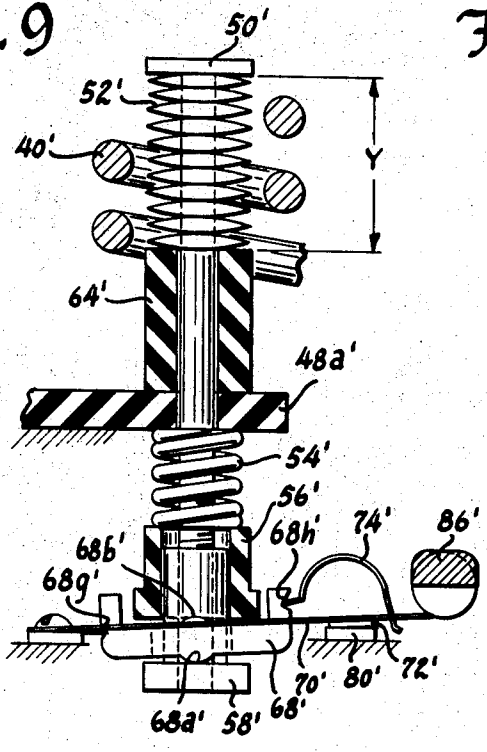


Fig. 10

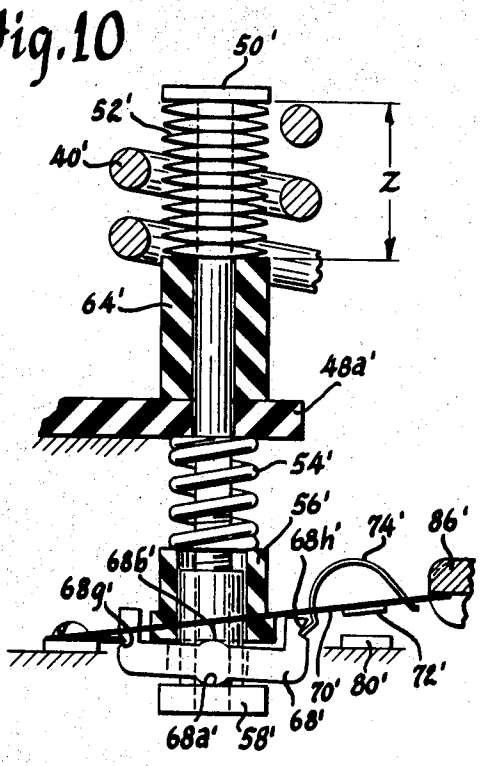
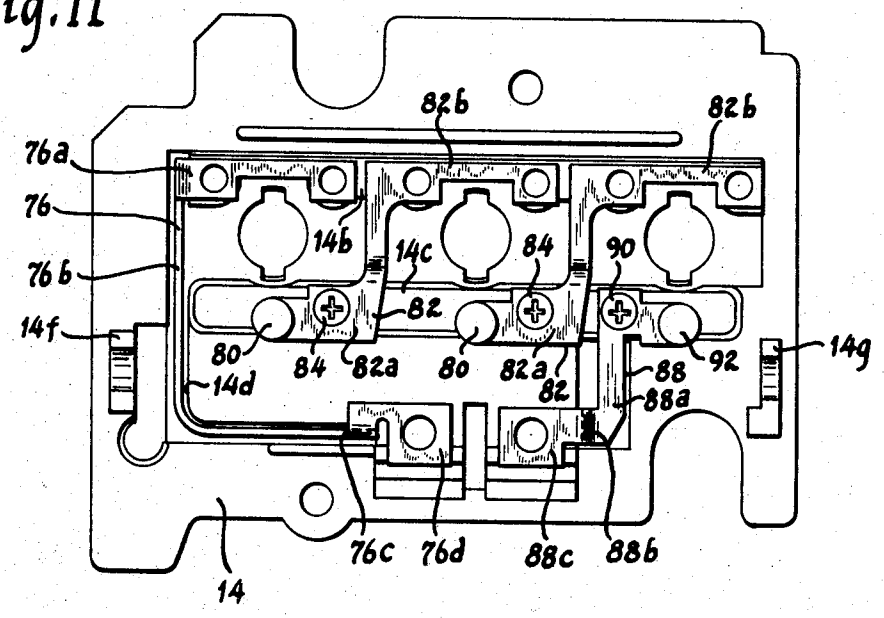


Fig. 11



United States Patent Office 3,566,328 Patented Feb. 23, 1971

3,566,328

ELECTRICAL CIRCUIT OVERLOAD PROTECTOR OF THE THERMALLY RESPONSIVE BIMETAL ELEMENT TYPE

Uriel F. Carter, deceased, late of Wauwatosa, Wis., by Ruth Carter, administratrix, Wauwatosa, Wis., and Edward A. Mallonen, Hales Corners, Wis., assignors to Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware

Filed May 13, 1968, Ser. No. 729,496
Int. Cl. H01h 37/52, 37/60
U.S. Cl. 337—335 3 Claims

ABSTRACT OF THE DISCLOSURE

An electrical circuit overload protective device of the thermally responsive bimetal type which can be selectively set for either automatic or manual reset modes of operation. Overload responsive units, for one or more circuit branches employing stacks of bimetal discs as thermally responsive elements, and are mounted within a housing on a common base. Each overload unit has an individual snap acting switch which opens in response to an overload condition as detected by the heat developed in a heater coil connected in the branch circuit which surrounds its thermally responsive element. The switches of the overload units are all connected in a single series circuit between terminals provided for connection to a circuit to be controlled. In a manual trip-free mode of operation a pushbutton lever upon subsidence of all overload conditions is depressed inwardly of the housing to afford manual reset of the movable contact members of any switch tripped open by overload response. Alternately the reset lever may be latched in such depressed position wherein the contact opening movement of the movable switch contact members is so limited that they will individually automatically reset upon subsidence of the overload condition in their respective branch circuits. A modified form of ambient temperature compensated bimetallic disc type of overload responsive unit is provided for use wherein the device will be subjected to high or widely varying ambient temperature conditions.

Features of the invention described in this application are disclosed and claimed in the copending Uriel F. Carter, Arthur F. Kolb and Edward A. Mallonen application Ser. No. 729,879, filed May 13, 1968 and assigned to the assignee of this application.

This invention relates to an improved overload protective device of the thermally responsive, bimetal element type.

A primary object of the invention is to provide a protective device of the aforementioned type employing bimetal discs in a special stacked relation as the thermally responsive element in each of one or more overload units.

Another object is to provide in each overload unit a separate snap-action electric switch for individualized control by its associated thermally responsive element of the aforementioned type.

A further object is to provide a protective device of the foregoing type where the aforementioned switches of the individual overload units are electrically connected in a single series circuit so that the latter will be interrupted

upon opening of any switch unit in response to an overload condition to which its associated thermally responsive element may be subjected.

Still another object is to provide an overload protective device of the aforementioned type which can be selectively set so that reset of tripped switches of the overload unit will automatically reset, or alternatively require manual operation of a reset lever to effect reset of the switches upon subsidence of the overload conditions in protected circuit branches.

An additional object afforded by the overload device is trip-free action of the switches of the respective overload elements in the event the overload condition has not subsided when the reset lever is manually operated.

A still further object is to provide a modified form of ambient temperature compensated overload responsive element of the aforementioned bimetal disc type which can be used interchangeably for the overload device for those aforementioned.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate preferred embodiments of the invention which will now be described in detail it being understood that the embodiments disclosed are susceptible of modification in respect of details without departing from the scope of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of an overload circuit protector switch incorporating the invention;

FIG. 2 is a front elevational view of the switch;

FIG. 3 is a left end elevational view of the switch with portions of the housing broken away;

FIG. 4 is a view similar to FIG. 3 but showing the switch in another operating mode;

FIG. 5 is a top plan view of the inside of the housing base showing the overload responsive switch mechanism;

FIG. 6 is a fragmentary cross sectional view taken generally along the line **6—6** of FIG. 1 showing an overload responsive element;

FIG. 7 is a view similar to FIG. 6 but showing a modified form of overload responsive element;

FIG. 8 is a view in cross section to greatly enlarged scale of a portion of a stack of bimetal disc elements shown in FIGS. 6 and 7;

FIG. 9 is a more or less schematic representation of the overload element depicted in FIG. 6;

FIG. 10 is a view like FIG. 9, but showing the overload device in another operating condition;

FIG. 11 is a view like FIG. 5 but with the overload responsive and switch elements removed; and

FIG. 12 is an isometric view of a switch drive lever and movable member shown in FIGS. 5, 6 and 7.

DETAILED DESCRIPTION

Referring to FIGS. 1 to 3, they show a circuit protector switch having a metal mounting plate **10**, a unitary insulating housing **12** to which plate **10** is attached, and an insulating bottom cover and base member **14**. The switch has a reset button **16** mounted on the end portion of a metal lever **18** which is reciprocably movable in a guide passage **12***a* formed in housing **12**.

The top opening recesses **20** are provided on housing **12**. Intermediate partition portions **22**, **24**, **26** and right-

hand end wall **28** of housing **12** provide electrical barriers between the recesses. Spaced apart pairs of combination wire terminal and overload heater mounting plates **30** are secured in place in each of the recesses by screws **32** which take into threaded recesses. One of each pair of plates **30** located at the rear is mounted at a higher level than the plate at the front. The center recess between partitions **24** and **26** is at a higher elevation to provide increased electrical and heat clearance between each adjacent sets of recesses and to provide for clearance for the interfit of a terminal mounting member **98**.

As thus far described, the housing **12** and elements mounted thereon are exactly the same as a counterpart housing shown and described in the Carter et al. application, Ser. No. 699,270, filed Jan. 19, 1968, now Patent No. 3,478,292, and assigned to the assignee of the present application. Housing **12** was designed to be interchangeably used in both types of overload protector switches.

Each of the aforementioned top opening recesses in housing **12** has mounted therein between the spaced plates **30**, a plate **34** to which is fastened a metal cylindrical tube **36** whcih has an anodized insulating exterior surface. The plates **34** are secured in place by screws **38**. As will hereinafter be more fully explained, bimetal disc overload elements are centered without appreciable peripheral clearance in each of the tubes **36**, and as shown in the left-hand recess between partitions **22** and **24**, a helical heater coil **40** is positioned around and in contact with each of the tubes **36** and secured to the upper and lower terminal plates by screws **42**.

The terminal plates **30** have outward and slightly downwardly projecting tabs **30***a* to which are secured wire retaining members **44** by screws **46**. In actual service, the other two recesses would also be fitted with heater coils **40**, the same having been omitted in FIGS. 1 and 2 to clarify construction details of the plates **34** and tubes **36**.

With each pair of terminals **30** wired in series in branches of a three-phase A.C. circuit it will be apparent that the heater coils **40** will be subjected to the load current in their respective branches. Heat generated by such current flow will transfer by conduction to the tubes **36**, and as will hereinafter be explained, causes movement of the bimetal discs of the overload elements.

As shown in FIGS. 5, 6 and 11, the overload responsive elements and switches controlled thereby for each of the three branches are mounted on the inside of base **14**. As best seen in FIGS. 5 and 6, each overload responsive element comprises a support bracket **48**, a rectilinear movable rod **50**, a stack of bimetal discs or washers **52**, a loading spring **54**, a spring gland **56**, an adjusting pin **58** and adjusting screw **60**. A flanged cylindrical insulating member **62** seats against the flanged end portion **50***a* of rod **50** and provides a spindle on which the stack of discs **52** are mounted. A cylindrical insulating spacer **64** abuts at its upper end against the lowermost bimetallic washer and has the lower end portion of spindle **62** projecting into its bore.

The lower end of spacer **64** seats against the upper end of adjusting screw **60** which is centrally bored to accommodate rod **50**, and exteriorly threaded to be adjustable in the complementally threaded insert **66** molded in place in the upper arm **48***a* of bracket **48**. Adjusting screw **60** has a laterally and upwardly extending arm **60***a* which extends through an arcuate slot **34***a* formed in cover plate **34**. As will hereinafter be explained, lever **60***a* within the limits of slot **34***a* affords a certain range of adjustment for controlling the compressor loading of the stack of discs **52**.

Adjusting pin **58** has a cylindrical flanged end portion **58***a*, an intermediate portion **58***b* which is rectangular in transverse cross section and an upper cylindrical end portion **58***c* of reduced diameter. The upper end portion **58***c* is internally threaded and the lower end portion of rod **50** is threadedly engaged therein. Also the upper end portion **58***c* projects into an opening **56***a* which extends from the

lower end of gland **56** to the bottom of the spring receiving recess **56***b* that opens to the upper end of the gland. Loading spring **54** is of the coiled compression type and seats at its upper end in a shallow recess **48***b* formed in the lower surface of arm **48***a* of bracket **48** and at its lower end against the bottom of recess **56***b* in gland **56**.

As shown in greatly enlarged cross section in FIG. 8, the bimetal discs **52** comprise two metal layers; layer **52***a* having a relatively high coefficient of thermal expansion and the other **52***b* having a relatively low coefficient of thermal expansion. In plan view the disc **52** are annular, and as shown in FIG. 8, they are convexly warped in transverse cross sectional form similar to that found in Belleville washers. They are stacked on the spindle portion of the guide **62** in the arrangement shown in FIG. 8 with one pair abutting along respective concaved edges, and an adjacent pair abutting on respective opposed convexed surfaces, etc., in a repeating alternate series. At ambient or room temperature the distance between bottoms of concaved surfaces on alternate pairs will be some distance X.

As the temperature of the discs **52** increase they will individually flatten and each of the distances X will decrease with increasing temperature. Consequently, the total height of the stack of discs **52** will decrease as a function of the sum of the individual decrease in X, between alternate pairs of discs in the stack. If the temperature of the discs **52** thereafter decreases the individual distance X increases as the individual discs in the stack return to their ambient temperature warped or dished shape in cross section depicted in FIG. 8.

The foregoing arrangement of the discs **52**, in affording decrease in individual warpage with increase in temperature is an advantage. As the stresses between the discs decreases with rise in temperature, subjection to thermal "shock" temperature rises which can occur during high electrical overload conditions will prevent the elastic limit of the discs from being exceeded. Accordingly, repeatability of change in total stack height and hence the force developed by the discs **52** for a given temperature change is considerably enhanced.

The lower end of gland **56** bears against arcuate protrusions **68***a* formed on each of the arms **68***b* of a switch drive lever **68**. Drive lever **68** is provided with a central rectangular opening **68***c* which accommodates the rectangular portion **58***a* of adjusting pin **58**. The arms **68***b* which are disposed on opposite sides of opening **68***c* also have arcuate protrusions **68***d* which bear against the upper surface of the end portion **58***a* of pin **58**. Drive lever **68** has upstanding end portions **68***e* and **68***f* which are provided with V-shaped notches **68***g* and **68***h*, respectively. Portion **68***e* engages within its notch **68***g* the inner edge of an opening of a movable, flat leaf switch member **70** which carries a contact **72** (see FIGS. 6 and 12). A C-shaped snap spring **74** seats along one edge in the notch **68***h* of lever **68** and has attachment within a slot **74***a* thereof with outer arms **70***a* and **70***b* and intermediate contact carrying portion **70***c* of member **70**.

The opposite end portion **70***d* of member **70** is sandwiched together with portion **76***a* of current conductor **76** between an upstanding boss **14***b* formed on the inside surface of boss **14** and the lower surface of the mounting pad **48***c* of bracket **48**. As best shown in FIG. 5, screws **78** which penetrate alined openings in pad **48***c*, portion **70***d* of member **70** and portion **76***a* of conductor **76** secure the member **70** and conductor **76** in electrical contact in place on base **14**.

As best shown in FIGS. 6 and 11, contact **72** through movement of member **70** is adapted to engage with a stationary contact **80** secured to the portion **82***a* of a current conductor **82** which is in turn secured to a boss **14***c* on base **14** by a screw **84**.

Switch member **70** together with snap spring **74** and drive lever provide a snap action type of electrical switch such as that disclosed and claimed in Patent No. 3,-

207,868. Reference should be made to that patent for detailed information on the formation and arrangement by switch member **70** and snap spring **74**.

Reference will now be made to FIGS. 9 and 10, to provide an understanding how each of the overload responsive devices and snap switches function under normal and overload electrical conditions. The representations in FIGS. 9 and 10 are simplified showings with certain parts of the overload devices hereinbefore described deleted. Numerals of like parts have been designated with additional prime (') postscripts. The overload device and switch as shown in FIG. 9 are in positions assumed under non-overload conditions. The bimetal discs **52'** are enlarged and shown with exaggerated curvature for purposes of illustration.

wardly against switch drive lever **68'** and tends to cause the left end of snap spring **74'** to move downward, and hence tends to toggle member **70'** upwardly to disengage contact **72'** from contact **80'**. However, a balancing upward force exerted on drive lever **68'** by adjusting pin **58'** due to the counter force action of the bimetal discs **52'** acting through rod **50'**, holds the snap switch in the contact engaged position depicted in FIG. 9.

Now assume that a current overload condition occurs and persists. Thus the heat transferred by conduction from the current carrying coil **40'** to the discs **52'** will cause them to flatten in a direction decreasing the degree of their individual convexed curvature. Thus the distance Y in FIG. 9 between the upper flanged end of rod **50'** and spacer **64'** will decrease to the distance depicted in FIG. 10 and rod **50'** consequently moves downwardly. The force exerted by spring **54'** then causes gland **56'** to move downwardly and hence move drive lever **68'** downwardly. When the left end of snap spring **74'** is moved across the plane of leaf member **70'**, snap action toggling of the latter member in the upward direction occurs to disengage contact **72'** from stationary contact **80'** as depicted in FIG. 10. Drive lever **68'** during such snap movement pivotally moves by virtue of its protrusions **68***a'* and **68***d'* rocking on the upper surface of portion **58***a'* and the lower end of the spring gland **56'**. In the first position member **70'** bears against a "stop-reset" bar **86'**.

It may be assumed that when the overload condition has subsided, discs **52'** will cool and hence assume their normal or ambient temperature curvature condition. Thus the distance Z depicted in FIG. 10 will increase and rod **50'** will be moved upwardly to correspondingly move drive lever **68'** upward. With stop-reset bar **86'** set in the rotary position depicted in FIGS. 9 and 10, the apex of notch **68***h'* will not move upwardly beyond the plane of member **70'** by the time rod **50'** and drive lever **68'** reach their respective normal, or non-overload position depicted in FIG. 9. In other words, the overload responsive switch will not automatically reset upon subsidence of the overload condition, and member **70'** must then be manually reset (moved downwardly across the apex of notch **68***h'*) to return it to the circuit closed position of FIG. 9. This will hereinafter be more fully explained in conjunction with FIGS. 4 and 5.

If stop-reset bar **86'** is instead set at the rotary position depicted for bar **86** in FIG. 6 when the aforedescribed overload condition occurs, member **70'** upon snap upward movement will assume a switch-open position intermediate those depicted in FIGS. 9 and 10. Hence, upon subsequent subsidence of the overload condition the apex of notch **68***h'* will move across the plane of member **70'** to cause snap toggling of the latter to the circuit closed position shown in FIG. 9. In other words, the switch will automatically reset upon return of the overload responsive device to normal or non-overload conditions. This action will also be more fully described in conjunction with FIGS. 4 and 5.

Now referring to FIG. 11, it will be seen that conductor **82** has an integral portion **82***b* like portion **76***a* of conductor **76**. A second conductor **82** is also secured on boss **14***c* on base **14** to the right of the first mentioned conductor **82**. A third conductor **88** is secured to boss **14***c* by a screw **90** and has a stationary contact **92** secured thereto. Conductor **76** has an integral L-shaped portion **76***b* which seats within a complementally formed recess **14***d* in member **14** and a portion **76***c* which extends upwardly at a right angle to afford electrical connection between portion **76***b* and a terminal end portion **76***d*. Conductor **88** has a portion **88***a* lying in a shallow recess is base member **14** that connects with a portion **88***b* which is bent upward at right angles and then laterally toward the left as viewed in FIG. 11. Portion **88***b* connects with a terminal end portion **88***c* like portion **76***c* of conductor **76**.

As best shown in FIGS. 2, 5 and 11, terminal members **94** and **96** are secured together with terminal portions **76***d* and **88***c*, respectively, to a lower surface of side boss portions **98***a* and **98***b* of an insulating terminal mounting member **98** which has an intermediate barrier portion **98***c*. As best seen in FIGS. 2 and 5, terminals **94** and **96** have outwardly and slightly downwardly depending tabs **94***a* and **96***a* to which are secured by screws **100**, wire retaining members **102** of a form similar to the aforementioned members **44**.

Now referring to FIGS. 5 and 11, it will be seen that the overload switch device comprises three overload switch devices. With their respective switches closed, it will be apparent that current will be completed from terminal member **94** to **96**. Thus with terminals **94** and **96** appropriately connected in the energizing circuit of an electromagnetic contactor or relay (not shown) such circuit will be maintained when no overload condition exists in any of the branches of the polyphase circuit in which the heater coils **40** associated with the respective overload devices are connected.

In the event an overload occurs in any such branch circuit sufficient to cause opening of its associated overload responsive switch the circuit will, of course, be opened between terminals **94** and **96**, thereby opening the circuit to any electromagnet or other circuit that may be connected thereto.

Referring to FIGS. 3, 4 and 5, it will be seen that stop-reset bar **86** is journaled for rotation on cylindrical end portions **86***a* in the bearing brackets **14***f* and **14***g* formed integrally with member **14**. Immediately adjacent bearing **14***f* in FIG. 5, rod **86** is provided with an arm **86***b*, and between the latter and its opposite end portion **86***a* it has a portion **86***c* with the cross sectional form best shown in FIGS. 6, 9 and 10.

The arm **86***b* of rod **86** is disposed within the opening **104***a* of an insulating member **104** which is molded about and is an extension of reset lever **18**. A coiled compression spring **106** seats at one end within a recess **14***h* formed in base **14** and at its other end fits about a short cylindrical boss **104***b* formed on member **104**. Spring **106** biases member **104** and lever **18** upwardly to normally assume the position depicted in FIG. 4. In moving to that position the lower lip portion **104***c* at the entrance of opening **104***a* in member **104** engages arm **86***b* and rotates it clockwise to the position depicted in FIG. 4. In this latter position the portion **86***c* will be rotated to assume the position depicted for rod **86'** in FIGS. 9 and 10.

If reset lever **18** is moved inwardly of housing **12** to the position depicted in FIG. 3, the upper lip portion **104***d* of member **104** engages arm **86***b* of rod **86** and rotates the latter to the position depicted in FIG. 3 wherein the portion **86***c* then assumes the rotary position depicted in FIG. 6. It will be seen that in this last mentioned rotary position for the portion **86***c* the clearance distance between the free ends of the movable switch member **70** is considerably less than in positions depicted for rod **86'** in FIGS. 9 and 10.

If with the rod **86** in the rotary position depicted in FIG. 6, an overload occurs, the free end of any switch member **70** which moves to contact disengaging position will engage the rod **86** and thereby limit its movement. With the contact opening movement of any member **70** so limited, any tripped switch will automatically reset upon subsidence of the overload condition as aforedescribed. It will also be understood that after responding to an overload condition, a switch member **70** is moved to an open position depicted for member **70'** in FIG. 10 that subsequent rotation of rod **86** to the position shown in FIG. 6 following subsidence of the overload condition will cause it to engage the end of the member **70'** and move it downwardly sufficiently so that snap spring **74** will then toggle the same to the contact engaged position shown in FIGS. 6 and 9.

When lever **18** is moved to its inward extreme position shown in FIG. 3, it can be retained latched in that position by moving a lever **108** into engagement in a notch **18***a* formed in lever **18**. Thus rod **86** will be retained in the rotary position wherein its portion **86***c* assumes the position depicted in FIG. 6. Accordingly, the overload device will be set in its "automatic reset" mode, and upon subsidence of overload in all branches circuit completion between terminals **94** and **96** will be automatically restored.

Lever **108** is provided with an elongated opening and a screw **110** penetrates such opening and takes into a threaded recess a housing **12**. When lever **108** is engaged within the notch **18***a* of lever **18** tightening of screw **110** insures retention of reset lever in the "automatic reset" mode. Of course, when lever **108** is out of engagement with lever **18** it can also be held in that position by tightening of screw **110**.

The temperature "trip" point of any of the aforedescribed overload responsive switches is determined by the adjustment of adjusting pin **58** on the threaded end of rod **50**. Turning pin **58** further on to rod **50** will, through its bearing on drive lever **68**, move the latter upwardly a corresponding amount. Drive lever **68** because it bears against the lower end of gland **56** will move the latter upwardly and spring **54** will be correspondingly compressed. Spring **54** then exerts increased force downwardly on gland **56**, drives lever **68**, pin **58** and rod **50**. Thus discs **52** will be caused to be compressed, and their stack height reduced. Accordingly, the upward force exerted on rod **50** by the stack of discs will then counterbalance the inward force of spring **59** acting downwardly on drive lever **68** at its new upper position.

It will be apparent that with drive lever **68** moved upwardly that the apex of its notch **68***h* will be moved upwardly a corresponding amount above the plane of movable contact member **70**. Hence lever **68** will have to be moved downwardly a greater distance before the apex of notch **68***h* passes the plane of member **70** at which point snap-action toggling of the latter to contact opening position occurs. Accordingly, the aforedescribed change in adjustment of pin **58** results in an increase of the "trip" point temperature. It will be apparent from the foregoing that if adjusting pin **58** is "backed" farther down from an initial position on rod **50**, that the "trip" point temperature will be decreased.

Screw **60** affords another more limited adjustment of the "trip" point temperature of each overload device. If lever **60***a* is turned counterclockwise in slot **34***a* in plate **34**, as viewed in FIG. 1, screw **60** will advance upwardly in insert **66** thereby moving spacers **62** and **64** upwardly which results in increased compression and hence decrease in the height of the stack of discs **52**. As a consequence of this drive lever **68** is moved upwardly to a new ambient temperature position. Conversely, if lever **60***a* is rotated clockwise in slot **34***a* the height of the stack of discs **52** will decrease resulting in a corresponding lowering of the ambient temperature position of drive lever **68**. The arcuate length of the slot **34***a* determines the range of change in "trip" point temperature that can be effected by adjustment of the screw **60**.

Normally the basic "trip" point temperature is determined after assembly of the overload device by adjustments of pin **58** to afford a "trip" point temperature which is some specified value above normal ambient temperature. Then with selection of a heater coil most appropriate for the particular load conditions, screw **60** permits a limited range change to partially compensate for the fixed increments existing between a heater coil of a given rating and those available which are immediately above or below it in rating tables.

FIG. 7 shows a modified form of ambient temperature compensated overload responsive switch unit which can be used in place of those aforedescribed. In this modified form the loading spring **54** is deleted and a stack of bimetal discs **112** together with a spacer **114** inserted in its place. The discs **112** are the same in form as the discs **52**, but somewhat greater in outer diameters, and warped depth at the same ambient temperatures. They are also stacked in the same arrangement as shown for discs **52** in FIG. 8.

It will be apparent that if the modified overload responsive switch units are subjected to ambient temperature conditions which vary relatively widely, that change in forces developed by the discs **52** with temperature will be offset by a corresponding change in forces developed by the discs **112**. Consequently,, the distance of the notch **68***h* of drive lever **68** above the plane member **70** (in contact closed position) will not change appreciably as the ambient temperature varies. Thus the "trip" point temperature of the compensated overload devices will not be appreciably affected by ambient temperature changes that may be encountered in certain conditions of mounting and housing of the overload devices.

The use of the ambient temperatures compensated overload responsive units is desirable when the overload protection switches are inside of enclosures which are subject to internal generation of heat by other equipment mounted therein, or to external heat such as by the sun or other heat radiating sources.

What is claimed is:

1. A thermally responsive overload switch comprising, in combination:

electric switch means having a pivoted operating lever movable in opposite directions to effect opening and reclosing of switch contacts, and

a thermally responsive switch operating mechanism comprising:

spring means biasing said operating lever for movement in the contact opening direction, means including a reciprocally movable member having engagement with said switch operating lever, and

a plurality of dished, annular bimetal discs disposed about said reciprocally movable member in stacked relation, said discs under ambient temperature conditions biasing said reciprocally movable member in a direction opposing movement of said operating lever by said spring means in said contact opening direction,

and said discs under overload temperature conditions transversely flattening to decrease the bias exerted by said reciprocally movable member on said operating lever so that the latter can move to contact opening position.

2. A thermally responsive overload switch according to claim **1** wherein said spring means biasing said operating lever in the contact opening direction comprises a coil compression spring engaging a fixed abutment at one end and at its other end with a hollow member which in turn engages said switch operating lever, and which, with said spring is concentrically disposed about said reciprocally moveable member, and wherein said recip-

rocally moveable member has a portion engaging said operating lever on a side opposite that engaged by said hollow member.

3. A thermally responsive overload switch according to claim 2 wherein said switch means additionally comprises a leaf spring moveable contact member on which said operating lever is pivoted and a C-shaped toggle spring engaging in a slot therein adjacent one end with said contact member and pivoted at its opposite end on said operating lever, and wherein said last mentioned end of said toggle spring when moved in either direction across the plane of said contact member causing snap action movement of said contact member in the direction opposite thereto.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,566,328 Dated April 26, 1971

Inventor(s) Uriel F. Carter and Edward A. Mallonen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 15, the sentence --It will be seen that spring 54' urges gland 56' down-- is omitted.

Column 6, line 12; "is" should read --in--.

Signed and sealed this 13th day of July 1971.

(SEAL)
Attest:

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Commissioner of Patents