April 23, 1957 D. W. RICHARDSON ET AL 2,790,046

TEMPERATURE RESPONSIVE SWITCH DEVICE

Filed Feb. 23, 1955

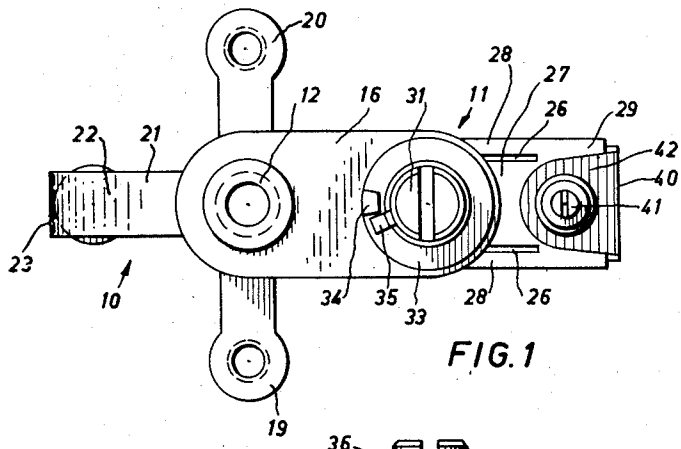

FIG. 1

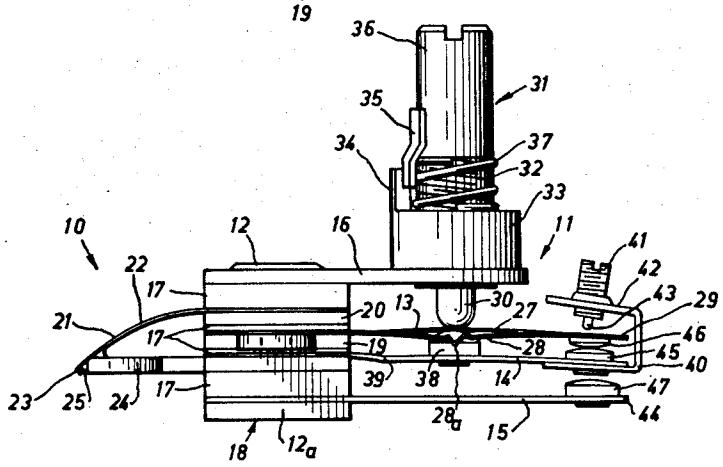

FIG. 2

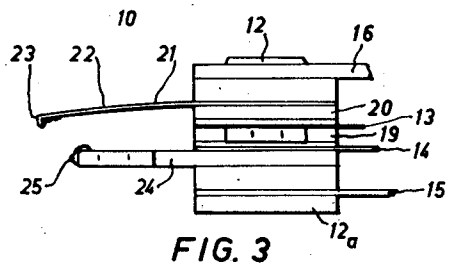

FIG. 3

INVENTORS
Malcolm R. Sabiston
Douglas W. Richardson

By: J. Richard Cavanaugh

United States Patent Office 2,790,046 Patented Apr. 23, 1957

2,790,046

TEMPERATURE RESPONSIVE SWITCH DEVICE

Douglas W. Richardson and Malcolm R. Sabiston, Aurora, Ontario, Canada

Application February 23, 1955, Serial No. 490,038

4 Claims. (Cl. 200—114)

This invention relates to a temperature responsive switch device and more specifically, to a switch device containing within the organization of operative components, a single pole thermal switch or fuse device electrically in series with a thermostat unit forming a part thereof.

A thermostat may be rendered unresponsive to dangerous temperatures from a number of causes. While a separate fuse is often provided for the electrical circuit served by the thermostat, the latter is located at all times in a temperature sensing position whereby thermal overload can be detected. Thermal overload is primarily the danger circumvented by the use of the thermostat itself. However, in the event of inaccuracy of operation or failure of the thermostat, the danger of thermal overload will arise. Electrical overload can occur independent of thermal overload.

It is the main object of the invention to provide a safety temperature responsive switch device having a fuse device incorporated in the construction of thermostat components thereof and operative to break the electrical circuit served by the latter with which it is disposed electrically in series, upon thermal overload arising due to incorrect action of the thermostat components and preferably also upon electrical overload occurring in the electrical circuit served by the switch device of the invention.

Other objects of the invention will be appreciated by a study of the following specification taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a plan view of a temperature responsive electrical switch device of the invention;

Figure 2 is an elevation of the device of Figure 1; and

Figure 3 is a partial view of the device of Figure 2 illustrating opening of the single pole thermal safety switch of the invention.

Referring to the drawings, the thermal switch device of the invention is comprised of two main components, a safety fuse device **10** and a thermostat device **11** on the support member of tube **12** which passes through switch arms **13** and **14**, bimetal arm **15** and mounting arm **16** near one end thereof, to retain them in spaced apart superposed relationship by insulating means **17** to form a stack type mounting **18** on the base flange **12***a* of the tube **12**. Electrical terminals **19** and **20** are supported in like fashion for each of the switch arms **13** and **14** respectively. However, terminal **20** is electrically isolated in the stack mounting from arm **14**. A spring member **21** is supported at one end in the stack mounting **18** in electrical connection with isolated terminal **20** therein and embodies a free portion **22** deflectable against the spring pressure thereof to cause electrical engagement of its otherwise free end **23** to a bar or third terminal **24** in electrical communication with arm **14** in stack mounting **18**. The free end **23** of member **21** is preferably retained in electrical engagement with bar **24** by means of an eutectic metal body **25** serving as a thermal fuse

solder. The composition of body **25** is well known and can be ascertained for a particular service from Table II on page 744 under the heading "Low melting alloys" in Metals Handbook, published by the American Society for Metals, 1948.

The thermostat components shown are of improved and preferred form according to the invention. Switch arm **13** is of the snap acting type in the construction shown, being formed of suitable spring strip metal perforated longitudinally to form spaced apart slots **26** defining a compression strip **27** integrally joined at its ends to tension strips **28** on body sides thereof. The desired snap acting ability is endowed by creasing the tension strips **28** at **28***a* whereby the length thereof is shortened with respect to that of the compression strip. Accordingly, if the free end **29** of arm **13** is moved upwardly (in the present illustration) to cause the tension strips to pass upwardly beyond the stationary position of adjustment of compression strip **27**, the tension strips will draw the free end **29** further upwardly in a snap action.

The compression strip is maintained in an adjustable position by finger **30** formed of an insulating material and projecting downwardly from a bore (not shown) in adjusting screw **31** having reverse thread **32** in fitting **33** on mounting arm **16**. Fitting **33** embodies an upwardly projecting stop **34** adapted to be engaged by the stop member **35** spot welded to the shank **36** of adjusting screw **31** thereby limiting rotation of the latter to about 320 degrees to afford correlation of adjustment thereof with action of the thermostat for calibration purposes. Spring **37** avoids thread backlash in action of the adjusting screw while holding to a position of adjustment.

Preferably both upper and lower surfaces of compression strip **27** are positively supported. Accordingly, the invention contemplates the provision of a support member **38** formed of an insulating material and rising from arm **14**. The latter is crimped as at **39** or otherwise normally biased in the upward direction. Thus, support member **38** effects the two-fold purpose of supporting compression strip **27** and serving as a spacer maintaining the desired spaced apart relationship of arms **13** and **14**. In this respect, the free end of arm **14** preferably mounts a motion limiting bracket **40** rising above and extending over the free end **29** of arm **13** to mount motion limiting adjusting screw **41** on flange **42** thereof.

A finger **43** of insulating material projects downwardly from screw **41** to limit upward motion of arms **13** relative to arm **14**. Arm **15** may be formed to raise its free end **44** responsive to an increase in temperature. It may also be formed to raise the free end **44** thereof responsive to a decrease in temperature. Regardless, motion limiting bracket **39** and arm **14** upon engagement during rising motion of arm **15** will be raised therewith. Contact **45** of arm **14** normally in engagement with contact **46** of arm **13** will raise the free end **29** of the latter to effect snap action of arm **13** opening contacts **45** and **46**. The positioning of compression strip **27** by the adjusting means described will determine the amount of motion of actuating button **47** of bimetal arm **15** required for the necessary snap action and hence will determine the temperature at which quick separation of the contacts will occur.

Preferably, fuse device **10** is responsive to both thermal overload and electrical current overload. Assuming that a temperature of 500 degrees Fahrenheit and a current of 10 amperes represent respectively thermal and electrical overload, the metal body **25** would be designed according to the invention to melt at the noted overload temperature. The member **21** at least in that portion adjacent the metal body **25**, would be designed to heat to overload temperature when conducting a current of 10 amperes. Accordingly, the fuse device of the invention

is responsive to both thermal and current overloads occurring separately or together. After the fuse device has opened as indicated in Figure 3, the spring member **21** can be reset under spring tension while the binding metal at **25** is reheated to retain the spring member in the position indicated in Figure 2.

What we claim as our invention is:

1. A temperature responsive electrical switch device comprising in combination: a plurality of resilient switch arms disposed in superposed spaced apart relationship; temperature responsive means for deflecting at least one of said arms; a support member extending through said arms near one end thereof and including insulating means forming a stack type mounting therefor; an electrical terminal in said mounting for each of said arms, one of said arms being electrically isolated from the terminal therefor; a spring member having one end supported in said stack mounting and having a free portion deflectable against spring pressure to provide electrical connection between said isolated terminal and arm isolated therefrom; and means retaining the free end of said spring arm deflected to maintain said electrical connection below a predetermined temperature.

2. A temperature responsive electrical switch device comprising in combination: a plurality of resilient switch arms disposed in superposed spaced apart relationship; temperature responsive means for deflecting at least one of said arms; a support member extending through said arms near one end thereof and including insulating means forming a stack type mounting therefor; an electrical terminal in said mounting for each of said arms; one of said arms being electrically isolated from the terminal therefor; a spring member having one end supported in said stack mounting and having a free portion deflectable against spring pressure to provide electrical connection between said isolated terminal and the switch arms isolated therefrom; and a binding fuse metal retaining the free end of said spring arm deflected to maintain said electrical connection below a predetermined temperature.

3. A temperature responsive electrical switch device comprising in combination: a plurality of resilient switch arms disposed in superposed spaced apart relationship; temperature responsive means for deflecting at least one of said arms; a support member extending through said

arms near one end thereof and including insulating means forming a stack type mounting therefor; an electrical terminal in said mounting for each of said arms, one of said arms being electrically isolated from the terminal therefor; a spring member having one end supported in said stack mounting and having a free portion deflectable against spring pressure to provide electrical connection between said isolated terminal and arm isolated therefrom; means retaining the free end of said spring arm deflected to maintain said electrical connection below a predetermined temperature; and means for heating said retaining means to said predetermined temperature responsive to a predetermined electrical current therethrough.

4. A current overload and temperature responsive electrical switch device comprising, in combination: a plurality of switch arms; a support member extending through said arms near one end end thereof and forming a stack-type mounting disposing said arms in cantilever superposed relationship; means in said mounting electrically isolating said arms; temperature responsive means for deflecting the free end of at least one of said arms; an electrical terminal for each switch arm supported by said mounting and in direct electrical contact therein with the switch arm thereof; an additional terminal supported by said mounting and electrically isolated therein from said switch arms; and a current conducting fuse device including means in said mounting making direct electrical contact with said additional terminal and extending electrically between the latter and one of said terminals to render said switch device inoperative responsive to a current overload independent of said temperature responsive means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,518,595	Bletz	Aug. 15, 1950
2,522,718	Huck	Sept. 19, 1950
2,692,317	Bletz	Oct. 19, 1954

FOREIGN PATENTS

718,347	Great Britain	Nov. 10, 1954