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(54) Thermal cutoff and fuse

(57) A unitary electrical circuit component for protecting against both excessive temperature and excessive current is defined by a temperature responsive thermal cutoff having a current responsive fusible electrical lead.

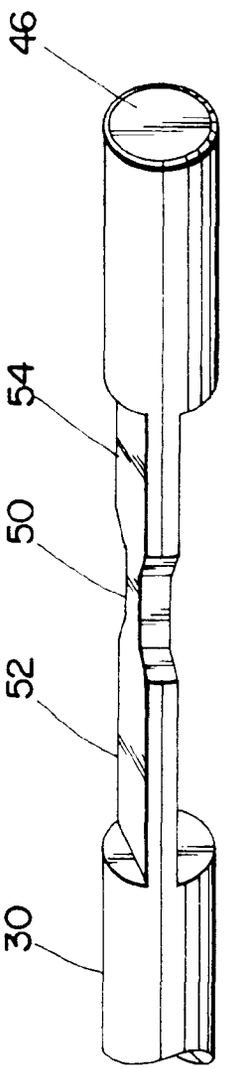

Fig. 2

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Description

BACKGROUND OF THE INVENTION

This application relates to the art of electrical circuit protectors and, more particularly, to such protectors that respond to either excessive heat cr excessive current to interrupt the circuit. The invention is particularly applicable to thermal cutoffs of the type having a thermal pellet that melts above a predetermined temperature to interrupt a circuit by opening a pair of contacts and will be described with specific reference thereto. However, it will be appreciated that the invention has broader aspects and can be used with other types of thermal cutoffs.

Electric circuit protection against both excessive heat and excessive current is commonly provided by the use of a thermal cutoff and a fuse. Installing two separate devices in a circuit is time consuming and expensive, and it would be desirable to have a single device that could be installed in a circuit for providing both types of protection.

SUMMARY OF THE INVENTION

A unitary device that provides electrical circuit protection against both excessive heat and excessive current includes a thermal cutoff and a fuse. In a preferred arrangement, the thermal cutoff has electrical leads and the fuse that responds to excessive current is integrally provided in one of the leads. Installation of the device in a circuit simply requires connection of the thermal cutoff electrical leads to provide protection against both excessive heat and excessive current.

The fusible section of the lead is preferably integral with the lead although it will be recognized that it is possible to weld or solder a fuse into the lead.

The circuit protector of the present application has a normal operating current rating that is between about 15-20 amps and the fusible section ruptures when it is subjected to current between about 500-1,000 amps.

It is a principal object of the present invention to provide a unitary device that affords circuit protection against both excessive heat and excessive current.

It is also an object of the invention to provide a circuit protector in the form of a combined thermal cutoff and fuse.

It is an additional object of the invention to provide a combined thermal cutoff and fuse in a compact package that is easy to manufacture and install.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a cross-sectional elevational view of a combined thermal cutoff and fuse constructed in accordance with the present application; and

Figure 2 is a perspective illustration of a thermal cutoff lead having a fusible section integrally formed therein.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing, wherein the showings are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting same, Figure 1 shows a combined thermal cutoff and fuse constructed in accordance with the present application. The thermal cutoff component includes a cylindrical metal housing 10 having an elongated electrical lead 12 attached to bottom end 14 thereof.

A dielectric thermal pellet 16 positioned within housing 10 adjacent bottom 14 thereof is solid at the normal operating temperature environment of device A, and melts at and above a predetermined excessive temperature. Many different organic chemical compositions may be used for thermal pellet 16 and examples include caffeine and animal protein.

A spring 20 compressed between metal washers 22, 24 normally biases a slidable star contact 26 into engagement with a fixed contact 28 on an electrical lead 30. Star contact 26 has a plurality of circumferentially-spaced resilient peripheral fingers slidably engaging the interior surface of housing 10.

A coil spring 32 partly pcsitioned around a reduced diameter end portion of a ceramic bushing 34 engages star contact 26 on the opposite side thereof from spring 20. Bushing 34 is closely received within housing 10 and the open end of housing 10 is crimped inwardly as indicated at 40 to retain bushing 34 therein. A potting compound such as epoxy 42 is positioned over bushing 34 and crimped housing end 40 around lead 30 to seal the interior of housing 10.

When thermal pellet 16 is solid as shown in Figure 1, the biasing force of spring 20 is substantially greater than the biasing force of spring 32 so that star contact 26 is held in engagement with fixed contact 28 on lead 30. This provides a complete circuit between leads 12, 30 through housing 10 and contacts 26, 28. When thermal pellet 16 melts, spring 20 expands and the biasing force of spring 32 becomes greater than the biasing force of spring 20 so that slidable star contact 26 is moved away from fixed contact 28 to open the circuit.

Electrical lead 30 extends through a central hole 44 in bushing 34 and has an enlarged end that defines fixed contact 28. Lead 30 has a free terminal end 46 and is provided with a fusible section located intermediate terminal end 46 and the thermal cutoff component portion of device A. In the arrangement shown, the fusible section is generally indicated at 50 as having a cross-sectional area that is substantially less than the cross-sectional area of the remainder of lead 30. Fusible section 50 is preferably located substantially remote from terminal end 46 so that it will not be affected by heat if lead 30 is soldered into a circuit and will not otherwise be damaged by attachment of lead 30 into a circuit. Fusible section 50 is shown as having been formed by stamping

lead 30 to provide a small section of substantially reduced cross-sectional area.

Figure 2 shows fusible section 50 as being located intermediate slightly reduced sections 52, 54 of lead 30. In the preferred arrangement shown, fusible section 50 is of the same material as lead 30 which may be a copper silver alloy. It will be recognized that it is also possible to weld, solder or otherwise secure a fusible section of other materials and shapes intermediate a lead 30 so that it becomes a unitary and integral part of combined device A. In the preferred arrangement, combined device A has a normal operating current rating that is between about 15-20 amps. Excessive current of about 500-1,000 amps will heat fusible section 50 sufficiently to cause rupture of same and interrupt the circuit. Excessive heat other than that provided by excessive current will melt thermal pellet 16 to interrupt the circuit by operation of the thermal cutoff portion of the combined device.

Although the invention has been shown and described with respect to a preferred embodiment, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of this specification. The present invention includes all such equivalent alterations and modifications, and is limited only by the scope of the claims.

Claims

1. A combined thermal cutoff and fuse comprising: a thermal cutoff including a housing containing normally closed separable contacts and a thermally responsive device that responds to an elevated temperature for separating said contacts, electrical leads external of said housing for connecting said contacts in an electrical circuit, and one of said leads including a fusible section that ruptures responsive to excessive current.

2. The device of claim 1 wherein said fusible section is integral with said one lead.

3. The device of claim 1 wherein said one lead has a terminal end and said fusible section is located intermediate said terminal end and said housing.

4. The device of claim 1 wherein said device has a normal operating current rating between about 15-20 amps and said fusible section ruptures when subjected to currents between about 500-1,000 amps.

5. A thermal cutoff including a pair of electrical leads connected electrically through said thermal cutoff, said thermal cutoff including a thermally responsive device that responds to an elevated temperature for interrupting the electrical connection between said leads, and one of said leads being fusible responsive to excessive current.

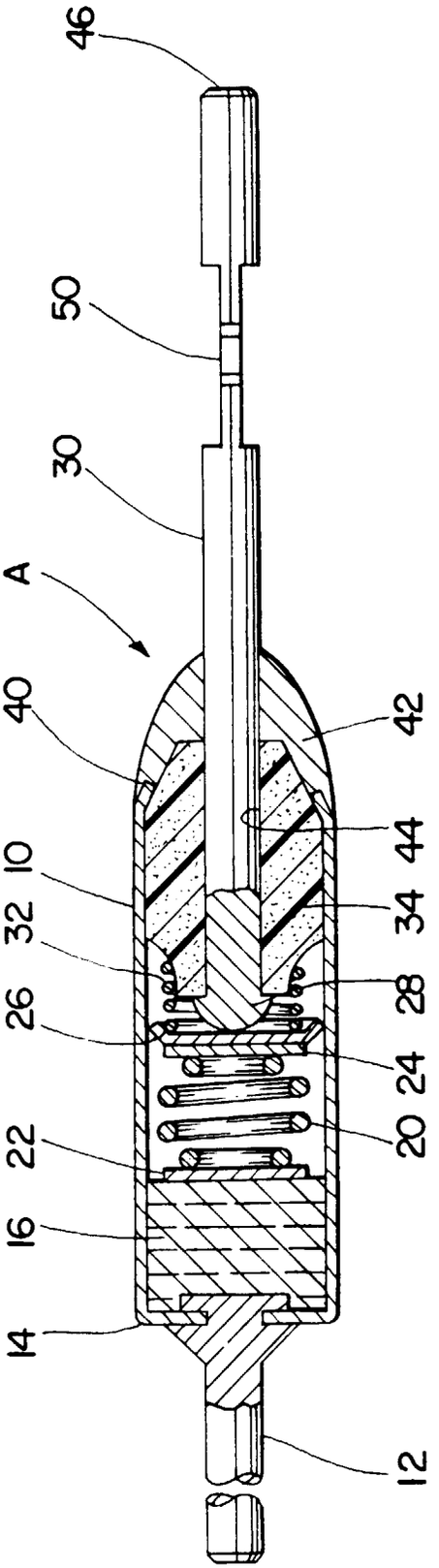

Fig. 1

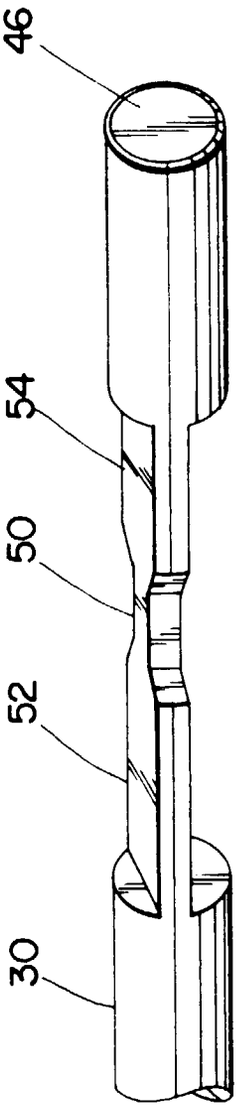

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 96 63 0044

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	DE-A-20 02 268 (RAUKAMP & CO) 29 July 1971 * the whole document *	1-5	H01H37/76 H01H9/10
Y	FR-A-1 218 795 (SOCIÉTÉ ANONYME DES ÉQUIPEMENTS S.E.I.M.) * the whole document *	1-5	
Y	GB-A-1 356 578 (BESWICK KENNETH E LTD) 12 June 1974 * the whole document *	1-5	
Y	GB-A-1 252 239 (MACLAREN) 3 November 1971 * the whole document *	1-5	
Y	EP-A-0 224 950 (LIMITOR AG ;MULLER MANFRED K (DE)) 10 June 1987 * figures 14,15 * * claims 1,4,5,7 *	1-5	
Y	CH-A-103 324 (W. SCHAUFELBERGER) * claims *	1-5	
A	DE-A-19 16 596 (LICENTIA PATENT) 15 October 1970 * figures * * claims 1-4 *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01H
A	US-A-5 014 036 (KOMOTO KAZUMASA) 7 May 1991 * abstract *	1-5	
A	US-A-4 837 547 (NIXON RONALD A ET AL) 6 June 1989 * figures *		
A	GB-A-1 031 836 (BURNDY) * figures 1,2 *		
	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 December 1996	Desmet, W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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European Patent Office

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Application Number
EP 96 63 0044

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-2 259 053 (C.P.XENIS) * figure 1 * ---		
A	GB-A-1 095 264 (J. LUCAS) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)

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