

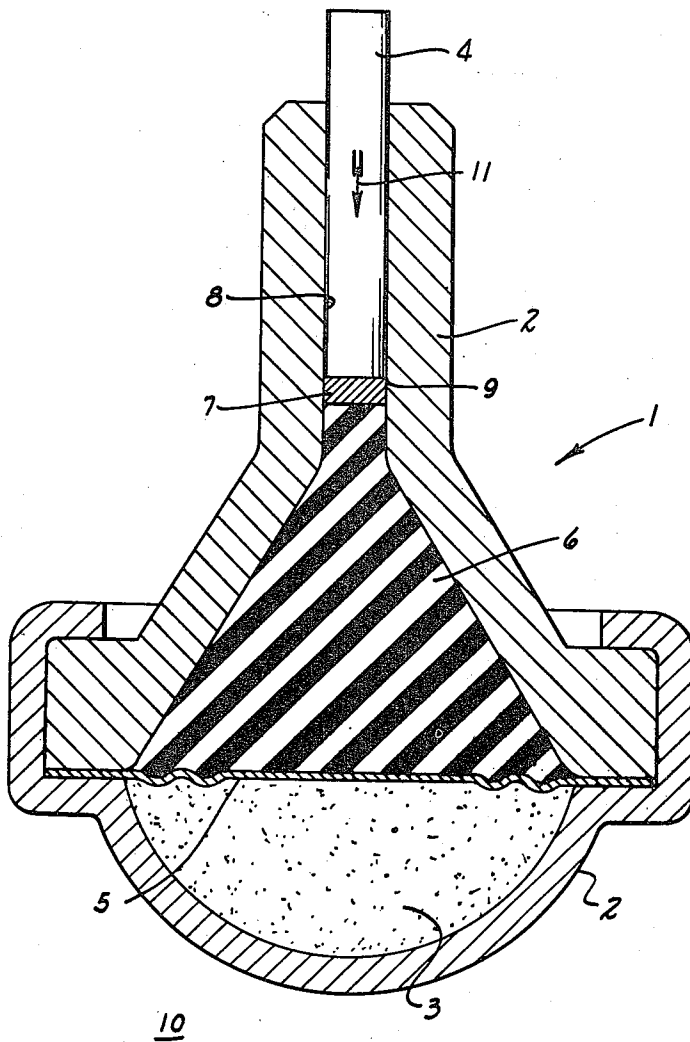
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POLYETHYLENE EXPANSION MATERIAL

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POLYETHYLENE EXPANSION MATERIAL

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1 Claim. (Cl. 252—1)

This invention relates to thermally expansible materials, and to power elements of the type disclosed in copending patent applications, Serial No. 551,829, filed on December 8, 1955, and Serial No. 510,708, filed on May 24, 1955.

Power elements of the type disclosed in application, Serial No. 510,708 include a casing member positionable in an ambient atmosphere of changing temperature characteristics. A body of thermally expansible material is contained in the casing, and during temperature increase in the ambient atmosphere the expansible material expands so as to move a piston out from the casing. Movement of the piston may be utilized to actuate a device, as for example a valve or switch.

In order to increase the time-response characteristics of the power element it has been proposed to incorporate discrete particles of a good heat-conducting material (such as copper or aluminum) with the thermally expansible material. However, with prior art expansion materials, at elevated temperatures (when the expansion material is in a liquid state) the heat conducting particles tend to settle down to the bottom of the casing unless a separate binder material is incorporated with the thermally expansible material.

Objects of the present invention are to provide a power element, including a thermally expansible material and discrete heat-conducting particles, wherein:

(1) The thermally expansible material will itself act as a binder material in the "expanded" condition, thereby eliminating the need for a separate binder material and allowing a greater volume change per given size power element, and

(2) The thermal material is resistant to chemical decomposition at elevated temperatures, as for example 600° F.

Other objects of this invention will appear in the following description and appended claim, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings the figure is a sectional view of a power element incorporating the invention.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings there is shown a power element 1 including a casing 2, a body or pellet of thermally-expansible material 3, a movable wall or piston 4, a corrugated stainless steel diaphragm 5, and a body of pliable

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force-transmitting material 6. Material 6 is preferably the pliable material disclosed in copending application, Serial No. 583,881, filed May 9, 1956. A disc 7 of polytetrafluoroethylene is positioned between material 6 and piston 4 in order to prevent material 6 from extruding into the clearance space 9 between piston 4 and bore 8. A spring (not shown) is provided for returning piston 4 to its illustrated position during contractive movement of material 3.

Material 3 includes a mixture of polyethylene and discrete particles of copper, preferably in a weight ratio of about 20% polyethylene and 80% copper. The polyethylene serves as the expansion medium; and the copper particles serve to quickly conduct heat from ambient atmosphere 10 through the polyethylene.

During temperature increase in atmosphere 10 the polyethylene expands from a solid to a gel (in contrast to a liquid). At elevated temperatures this gel tends to retain the heat-conducting particles in suspension, even after considerable lengths of time. It is of course desirable that the heat-conducting particles be dispersed evenly through the pellet in order to provide uniform heat transfer and quick power element response to ambient temperature change. In the past it was necessary to incorporate a binder material, such as polyisobutylene, with the expansion material in order to retain the heat conducting particles in suspension at elevated temperatures. The use of polyethylene as the expansion material eliminates the need for a separate binder material. Polyethylene has the further desirable characteristic of being resistant to chemical decomposition at elevated temperatures.

It will be understood that expansion of material 3 is effective to move piston 4 outwardly in bore 8 so as to perform useful work. Temperature decrease in atmosphere 10 is accompanied by a contractive movement of the expansion material from the gel state to the solid state, with a return movement of piston 4 in the direction of arrow 11 (under the influence of the previously mentioned spring).

During the foregoing specification the invention has been described with reference to a power element responsive to ambient atmosphere temperature changes. However it is contemplated that the invention could be employed in power elements responsive to variations in electric current as disclosed in the aforementioned application, Serial No. 551,829. The term "power element" will therefore be understood to comprehend both a temperature-responsive device and an electric current responsive device.

We claim:

A thermally expansible pellet consisting of discrete heat-conducting particles suspended in polyethylene expansion material; said polyethylene expansion material being a solid below its expansion temperature range and being transformed to a gel in its expansion temperature range, whereby to hold the heat-conducting particles in suspension at the expansion temperatures without need of a separate binder material.

References Cited in the file of this patent

UNITED STATES PATENTS

2,115,501	Vernet	Apr. 26, 1938
2,128,274	Vernet	Aug. 30, 1938
2,259,846	Vernet et al.	Oct. 21, 1941
2,265,586	Vernet	Dec. 9, 1941
2,303,348	Freeman et al.	Dec. 1, 1942
2,368,182	Vernet	Jan. 30, 1945