

[54] ELECTRICAL INSULATING ELEMENT
SUCH AS A DISTRIBUTOR CAP

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DR, 19 WG, 168 G; 220/9 F; 339/26, 116 R

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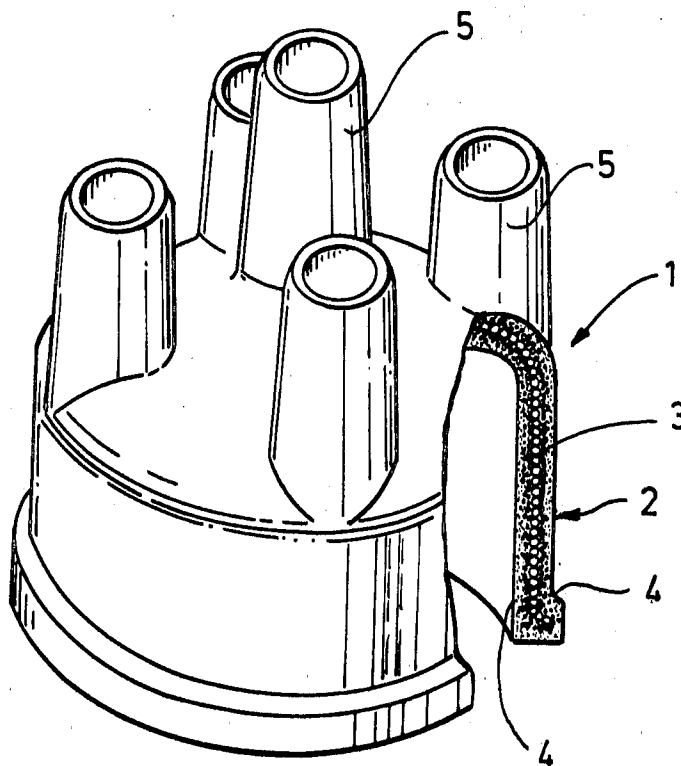
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[57] ABSTRACT

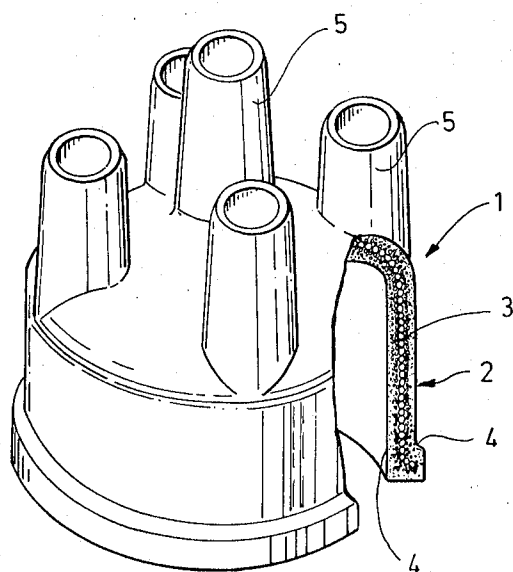
An insulating element, particularly one which is suitable to accommodate a high-voltage component of a combustion engine ignition system, has a peripheral wall which is composed of closed-cell rigid synthetic plastic foam material to the extent of at least 50 percent its weight. Combustion suppressing and/or reinforcing filler substances may be added to the foam material.

10 Claims, 1 Drawing Figure



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ELECTRICAL INSULATING ELEMENT SUCH AS A DISTRIBUTOR CAP

BACKGROUND OF THE INVENTION

This invention relates to a novel article of manufacture, and in particular to a novel insulating element.

More specifically, the invention relates to an insulating element — such as a distributor cap — which can be used to accommodate a high-voltage component of a combustion engine ignition system.

The invention will be discussed hereafter for the purpose of convenience in terms of a distributor cap. It should be understood, however, that the invention is not limited to such an application and could equally well be applied to a housing (or part thereof) for an ignition coil, and to still other applications.

Known distributor caps have a peripheral wall of solid cross-section material, usually of phenolic or polyester resin. In the course of normal use it is inevitable that these caps become heated, just as it is inevitable that at times they will be subsequently subjected to sudden and drastic cooling, e.g., due to atmospheric conditions, due to splashing of water onto them, or for other reasons. When such sudden cooling occurs, a condensation of water droplets takes place at the inner surface of the wall, and this has been found to lead to difficulties. If, namely, these droplets contact dirt particles or nitrous oxides formed by electrical sparking in the interior of the cap, surface leakage paths may develop on the cap, i.e., paths along which electrical energy will tend to preferentially creep. This leads to reduction in the electrical insulating capability of the cap and may finally result in spark-over. Moreover, acid tends to develop after a while, which can attack and destroy the material of the cap.

SUMMARY OF THE INVENTION

It is an object of the invention to overcome the disadvantages of the prior art.

More particularly, it is an object of the invention to provide an improved insulating element — e.g., a distributor cap — wherein the development of condensation under the aforementioned or similar circumstances is at least minimized.

In keeping with these objects, and with others which will become apparent, we provide an improved insulating element in form of a cupped body having a peripheral wall. According to the invention, this wall is composed of closed-cell rigid synthetic plastic foam material to the extent of at least 50 percent of its weight.

The air which is entrapped in the cells of the foam material provides for excellent thermal insulation, so that even if the body is hot and is suddenly subjected to cooling, the development of condensate is minimized to a very substantial extent as compared to the prior art.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE is a partly sectioned perspective view, illustrating one embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the FIGURE, it will be seen that in the exemplary embodiment the novel insulating element, designated in toto with reference numeral 1, is shown as a distributor cap, i.e., as the cap for the housing of a distributor which forms a part of the ignition system of a combustion engine. Of course, neither the system nor the housing of the distributor have been illustrated; both are well known per se and not necessary for an understanding of the invention.

The element 1 has a peripheral wall 2 which, in this instance where the element is configured as a distributor cap, is provided with a plurality of tubular projections 5. The high-voltage lead wires from the ignition coil and to the sparkplugs, respectively, are to be introduced through these projections into the interior of the hollow cap.

In accordance with the invention, the wall 2 (including the projections 5) is composed to the extent of at least 50 percent of its weight from a rigid synthetic plastic foam material. It is preferable, however, that this percentage be on the order of 65 percent. Since it is desirable to have good strength even if the wall 2 is relatively thin, we have chosen to illustrate that the wall 2 is of so-called "rigid structural foam," also known as "rigid integral foam". Such foam, which may be of polyurethane or polyisocyanurate, to name just two suitable materials, has the characteristic that its porosity is greatest at and near the center, so that the wall 2 has a cellular core indicated at 3. The porosity decreases continuously in direction outwardly away from the core 3, until the surfaces of the wall 2 are reached where there is no porosity at all, so that at these surfaces the wall is provided with non-porous skins 4. This type of foam provides high rigidity and strength at relatively low wall thickness, and prevents the entry of dirt, moisture and other contaminants into the cell structure of the wall 2. Moreover, the wall 2 also has good resistance to attack by acids.

Where there is a danger of inflammation, e.g., if the wall element is used as a distributor cap and subjected to fire hazards associated with a combustion engine, it is advisable to include in the material of the wall a flame-suppressing or combustion-suppressing substance. Aluminum oxide hydrate ($\text{Al}_2\text{O}_3 \cdot 30\text{--}35\% \text{H}_2\text{O}$) has been found suitable for this purpose. Such a substance may be admixed with the foam to the extent of between 10 and 50 percent by weight of the wall 2, preferably about 35 percent.

If necessary, the rigidity of the wall 2 can be further increased by admixing with the foam a filler material, for example kaolin, talcum or mica. There, again, the filler substance may amount to between 10 and 50 percent, preferably about 35 percent by weight of the wall 2.

It will be appreciated that it is possible to add a flame- or combustion-suppression substance as well as filler material. In that case, however, the two substances together must not amount to more than at most 50 percent by weight of the wall 2, and preferably should not exceed 35 percent.

The foam material of wall 2 not only serves as an efficient thermal insulator, but also as a fully satisfactory electrical insulator. This eliminates the need for a separate layer of electrical insulating material and, in conjunction with the low expense of the foam material, substantially reduces the manufacturing costs of the novel element.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of applications differing from the types described above.

While the invention has been illustrated and described as embodied in a distributor cap, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a distributor for a motor vehicle, in combination, a distributor mechanism; a distributor cap having a circumferential wall at least partially surrounding said distributor mechanism, an end wall substantially closing an end of said circumferential wall, and a plurality of tubular wall portions projecting from said end wall for accommodating electric input and output leads, said distributor cap being composed of a first reinforcing skin facing exteriorly of said distributor cap, a second reinforcing skin facing interiorly of said distributor cap, said skins being impermeable to fluids, and a cellu-

lar core integral with and intermediate said first and second skins for electrically and thermally insulating the former from the latter, whereby condensation of water vapor on said second skin is effectively prevented.

2. A distributor cap comprising a peripheral wall including a circumferential wall portion, an end wall portion substantially closing one end of said circumferential wall portion, and a plurality of tubular wall portions projecting from said end wall portion, said peripheral wall being composed of closed-cell rigid synthetic plastic structural foam material to the extent of at least 50 percent of its weight and having a cellular core and non-cellular impermeable outer exposed reinforcing skins.

3. An element as defined in claim 2, wherein said foam material includes a plurality of closed cells, the size of said cells gradually decreasing from a point substantially midway of said skins in direction towards the latter.

4. A distributor cap as defined in claim 2, wherein said structural foam is a polyurethane foam.

5. A distributor cap as defined in claim 2, wherein said structural foam is a polyisocyanurate foam.

6. A distributor cap as defined in claim 2, wherein said peripheral wall further includes a combustion-suppressing substance.

7. A distributor cap as defined in claim 6, wherein said substance is aluminum oxide hydrate.

8. A distributor cap as defined in claim 6, wherein said peripheral wall additionally includes a filler substance for increasing the rigidity of said foam material.

9. A distributor cap as defined in claim 2, wherein said peripheral wall further includes a filler substance for increasing the rigidity of said foam material.

10. A distributor cap as defined in claim 9, wherein said filler substance is kaolin.

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