

The invention relates to a plastics sealing element for galvanic primary elements in the form of round cells having a metal casing, which plastics sealing element has a central through-guide opening for the carbon rod current collector, and to a process for its manufacture.

For galvanic primary elements of the Leclanché type, sealings of a variety of types are in use, but the majority of these are derived from plastics bodies, disc-shaped or shaped in the manner of a plate, as the essential constituent of the respective sealing arrangement. Such a sealing element as a rule has a central opening through which the carbon rod current collector is guided, and closes off the zinc cup, for example in accordance with DE-PS 26 19 178, like a plug. In accordance with DE-AS 19 37 605, the sealing element substantially has the shape of a hollow closure cap which on the one hand surrounds the carbon rod at its central opening in the manner of a sleeve, and on the other hand bears by means of a downwardly extending outer edge against the inner wall of the zinc cup. Above these contact zones, however, the closure cap is separated from the carbon rod and from the zinc cup, before the edge thereof is turned back to grip the closure cap, by peripheral hollow spaces which have to be filled with a sealing composition. The provision of relatively large sealing surfaces which make it difficult for any electrolyte creep out of the cell interior to occur is here achieved at the expense of an inconvenient measure.

A cell sealing type of substantially simpler construction is known from the German Utility Model 19 21 573. This simply comprises an annular disc of rubber, which bears on a plastics cover for the electrode cup, and a rubber ring of the same external diameter as the annular disc. During assembly, the metal plus cap is placed by means of its lower flange-type edge on the annular disc and the rubber ring is then placed on the flange-type edge. The pressure generated by the subsequent turning back of the metal housing casing results in slight deformation of the rubber-elastic sealing parts, in particular the annular disc being displaced into the space between the housing casing and the external periphery of the flange-type edge

of the plus cap. In this manner, although the sealing of the electrolyte from the housing is improved, that from the carbon rod is not, since the narrow sealing zone between the latter and the annular disc, in particular with regard to the porous carbon material, represents only a limited obstacle to the emergence of electrolyte, and with this known sealing arrangement the possibility that some electrolyte will penetrate into the hollow space delimited by the hood-shaped central part of the cap and the annular disc and be collected there is even regarded as obvious knowledge.

The object of the invention is to make available a plastics sealing element for dry batteries which is of as simple a construction as possible, which can be assembled quickly and which prevents emergence of electrolyte or water vapour which can lead to drying out of the cell from the side of the carbon rod current collector, as reliably as in the region of the housing wall.

This object is achieved by the features specified in the characterizing part of Claim 1. Preferred embodiments of the sealing element and a process for its manufacture are specified in the sub-claims.

The invention is explained in more detail below with reference to two figures.

Figure 1 shows a plastics sealing element according to the invention, before it is assembled with a metal plus cap.

Figure 2 shows a dry battery manufactured using the sealing element according to the invention.

In accordance with Figure 1, the sealing element 1 according to the invention is a rotationally symmetrical body 2 substantially similar to a perforated disc, of acid-resistant plastics, but which has a raised edge and on whose upper side, which forms, between the raised edge and a conically increasing cross-sectional thickening of the disc around the central opening, a peripheral trough-shaped depression with a flat base, there is injection moulded a soft elastic plastics material 3 in the form of an annular bead. The external diameter of the raised edge can at least approximate to the internal diameter of the

metal casing 8 (cf. Figure 2) so that a snugly fitting seating results in the latter.

While the disc-shaped main part of the sealing element comprises a relatively hard plastics material, although one quite conventional for sealing purposes, in accordance with the invention a particularly soft plastics from the group comprising elastomers is provided for the annular injection moulding.

In accordance with the invention, selected plastics should be dimensionally stable to approximately 50°C and of course should be corrosion-resistant to much higher temperatures. They should be distinguished, both in cold and hot conditions, by extreme deformability and have a good adhesion capacity both to other plastics and to metals, but on the other hand also be hydrophobic. For this reason, elastomeric adhesives such as for example the adhesive acrylic resins, which are not only capable of adapting to narrow closure gaps but which also fill the microscopic uneven features of the surfaces to be sealed, comprising fine cracks, gaps, pores and the like, are favourable.

An elastomeric plastics material which fulfils to the optimum the qualities required in accordance with the invention was found in a copolymer comprising ethylene and vinyl acetate (EVA). In addition, however, ethylene acrylates (EAM), which also stem from the group comprising elastomers, and of these in particular ethylene butyl acrylate and ethylene tetrafluoroethylene copolymer (ETFE), are also possible.

The application of the elastomer to the "harder" base body is performed by extrusion out of a fine die while the base body rotates below the die at a high speed. Here, during a brief pulsed pressure time in which a needle valve opens the die, a thin strand of the outflowing plastics is laid in a plurality of windings in the trough-like peripheral depression of the base body and leaves behind, as the individual windings flow into one another, a uniform annular bead adhering to the hard plastics substrate.

During the assembly of the dry battery using the sealing element according to the invention, the latter and the metal plus cap 5 are pre-assembled, this taking place simply by inserting

the plus cap in the plastics body in the direction of the arrow in Figure 2. The plus cap is here pressed in far enough for its flange-type edge to latch under the snap-on edge 4 which is preferably integrally formed on the raised edge of the plastics body. The elastomeric application is thus already largely deformed.

The component which is ready-made from the sealing element and the plus cap or the metal housing cover 5 is then inserted into the housing opening of the dry battery 6, which is already filled with active material and electrolyte, with the carbon rod 7 forming a centring aid, and the raised edge of the plastics body is turned inwards, together with the edge of the metal casing 8, over the edge of the plus cap. The turning-in pressure means that the edge of the zinc cup 9 cuts into the underside of the plastics body a little, while the elastomeric material 3 is now pressed together completely between the original application surface and the plus cap and is thus displaced in the direction of the carbon rod.

The state of the sealing element according to the invention in the finished cell is illustrated in Figure 2. The particularly advantageous effect of the sealing achieved consists substantially in the fact that the elastomeric plastics material, injection moulded in a ring shape, thanks to its extreme deformability is brought to a very small sealing cross-section by flat pressing, while at the same time the contact surfaces with the base body and the plus cap are disproportionately large. As a result, the sealing composition represents a reliable barrier against water vapour and similarly prevents emergence of electrolyte as a result of the extremely long creep path along the above-mentioned contact surfaces. If the sealing zone resulting from the elastomeric injection moulding of the sealing element according to the invention were not present, then the emergence of moisture from the turn-back region would be unavoidable because of the permeability of the carbon rod to water vapour.

The sealing element according to the invention thus fulfils the stated object to a high degree, in that with its help a dry

battery may be manufactured in which all water vapour which otherwise diffuses or permeates outwards through the porous carbon rod is retained in the sealing zone.

Evidence of the quality of the sealing element according to the invention was provided by measurements of voltage in cells which were subjected to three months' dry storage, with some of the test cells lacking the elastomeric component in the sealings used. While, in the case of the cells sealed according to the invention, after storage the same set values for voltage at rest and for voltage under load were found as in fresh cells with only negligible fault straying, very different, downwardly tending voltage values were measured in the control cells, the cause of which was insufficient sealing between the carbon rod and the outer metal casing, resulting in the emergence of electrolyte and/or water vapour.



Claims

1. Plastics sealing element for galvanic primary element, in the form of a round cell having a metal casing, which plastics sealing element has a central through-guide opening for the carbon rod current collector, characterized in that it comprises a rotationally symmetrical plastics body (2) with a raised edge, the upper side of which has a peripheral trough-shaped depression outwardly delimited by the raised edge, an elastomeric plastics material (3) being injection moulded onto the flat base of the projection as a closed annular bead.
2. Plastics sealing element according to Claim 1, characterized in that a peripheral snap-on edge (4) is integrally formed with the raised edge of the rotationally symmetrical plastics body on its inside.
3. Plastics sealing element according to Claims 1 or 2, characterized in that the elastomeric plastics material is an ethylene vinyl acetate copolymer (EVA).
4. Process for manufacturing a galvanic element in the form of a round cell, using a plastics sealing element according to one of Claims 1 to 3, characterized in that the metal housing cover of the element is inserted from above into the plastics body, with elastomeric ring inside, until its edge latches under the snap-on edge on the raised edge of the plastics body, in that the thus pre-assembled parts are inserted into the housing opening of the cell, which is already filled with active material and electrolyte, with the carbon rod forming a centring aid, until the plastics body bears upon the edge of the zinc cup, and in that the edges of the plastics body and of the metal casing, projecting over the cover edge, are turned inwards with flat pressing of the elastomeric annular bead enclosed between the metal cover and the plastics body.