

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN HERMETICALLY SEALED GALVANIC CELL CASINGS

(71) We VARTA BATTERIE AKTIEN-GESELLSCHAFT, A German Joint Stock Company, of 3000 Hannover, Stockener Strasse 351, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a hermetically sealed galvanic cell casing, and concerns a casing for a gas-tight cylindrical accumulator comprising a metal container, in which the container is bent over to form the cover of the accumulator, and to a method for the production of such a casing.

Hermetically sealed galvanic cells, in which cylindrical cell containers are closed by a separately produced cover, are known. These cell containers and the covers thereof are generally made of an electrically conductive material, viz. a metal, and thus almost always serve for the conduction and supply of current.

The cell container and the cover have to be insulated from each other since they are at different potentials. The manufacture of cell containers of this kind is expensive, since the cover and the cell container are produced separately. In addition, the construction of the cover has to meet high standards with respect to insulation and sealing. This applies particularly to gas-tight and electrolyte-tight cells, such as gas-tight alkaline accumulators.

A gas-tight alkaline accumulator in which the cylindrical container has a bent-over edge, is described in United States Patent Specification Nr. 3 230 112. A cover constructed as an insulating disc, through which the conductor connected to the electrodes of one polarity extends, is clamped in position by the bent-over edge.

A construction of this kind needs to be carefully sealed at the two positions at

which a leak may occur, that is to say in the region around the position at which the conductor passes through the cover, and in the region close to the bent-over edge of the container.

Theoretically, gas-tight galvanic cells operate at low internal pressures of about 0.2 to 0.5 atmosphere gauge. In practice, these values are, however, generally exceeded, for example when the evolution of gas in the cell increases to such an extent as to permit the consumption of only some of the evolving gases. Additional safety devices are provided and arranged to operate when a determined permissible internal pressure is exceeded, so that such inadmissible excessive pressures may be released to the outside in good time to avoid the danger of an explosive destruction of the galvanic cell. These safety devices may either operate as a valve, or they may be provided in the form of a diaphragm which may be destroyed, by means of a puncturing pin. Such safety devices should have the smallest possible volume and adjust to the general construction of the cell so that its reliable functioning may be ensured. In a cell container provided with a cover, the safety device is provided in the cover. For this purpose, the cover has to be specially constructed as a result of which the manufacturing costs are increased.

A hermetically sealed galvanic cell disclosed in British Specification Nr. 1 359 004, is characterised in that the bent-over edge of the cell container is constructed as a cover in which a gas and liquid-tight contact rivet is embedded. This galvanic cell has the disadvantage that an additional pressure relief valve has to be incorporated in the contact rivet.

It is an object of the invention to provide a hermetically sealed galvanic cell in which at least some of the disadvantages hereinbefore described are reduced or avoided.

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According to the invention, there is provided a hermetically sealed galvanic cell casing for a gas-tight cylindrical accumulator, comprising a metal container plastically deformed to form a cover and a collar upstanding co-axially from the cover, the outer surface of the collar making an undercut or re-entrant angle with the cover, an insulating ring surrounding the collar and a contact cap embracing the ring to effect a gas and liquid tight seal with the ring.

One embodiment of the invention is hereinafter described, by way of example, with reference to the accompanying drawing, in which:—

Figure 1 shows, partly in cross-section, a gas-tight cylindrical accumulator having a hermetically-sealed metal casing according to the invention, and

Figure 2 shows part of the container.

The metal container 1 contains an electrode winding 2 covered with an insulating disc 3.

In accordance with the invention, the plastically deformed edge of the open-ended can forming the casing 1 is not only transformed into a cover, but the cover is also provided with an upright small internal collar 7 during the metal forming operation. The tumbling or rolling method employed to plastically deform the can edge enables the small, centrally provided collar 7 to be provided with an undercut or re-entrant shape (Figure 2) by which a metal contact cap 6 may subsequently be anchored in position. This new method permits for the first time the manufacture of hermetically sealed cylindrical galvanic cells with a minimum of structural parts.

In addition to the advantage afforded by the small number of structural parts required, there is also the advantage that the contact cap 6 not only constitutes the closure of the cell, but may simultaneously serve as a safety valve. This multiple function is achieved in the following way:—

The tumbling or rolling metal-forming apparatus is so constructed as to effect a plastic deformation of the edge of the can and to produce the small collar 7 hereinbefore described by means of a mandrel following the rotational movement of the can, as illustrated in Figure 2.

When the deformation of the edge of the can in the manner hereinbefore described is complete, a matching insulating ring 4 of a suitable construction is slipped over the collar 7 provided in the cover. The insulating ring may be previously varnished with a layer of an electrolyte-inhibitor, such as bitumen. The positive conductor 5 may then be electrically spot-welded to the contact cap 6 and the contact cap is pressed over the insulating ring 4 surrounding the collar 7. The cap is deformed by a

subsequent pressing operation, so that it may interengage in claw-fashion around the under-cut shape of the collar 7. For safety reasons, the conductor 5 may be covered with an additional insulating jacket or coating.

The undercut or re-entrant angle of the small rolled-on collar 7 permits the force necessary to remove the contact cap 6 to be selected within determined limits. This is of particular importance where the contact cap 75 is simultaneously required to serve as a safety valve. The force of removal is also determined by the thickness of the metal of which the contact cap is made. Thus, for example, by a correct dimensioning of these two variables, it is possible to facilitate the construction of hermetically sealed galvanic cells in which the contact cap does not open until an internal pressure of from 18 to 20 atmospheres is exceeded. However, in practice the force of withdrawal of the contact cap may be adjusted to the size of any individual cell thus ensuring an adequate safety factor between the desired blowing-off pressure and the mechanical strength of the cell casing. When the gas pressure in the interior of the cell casing increases excessively, the contact cap is lifted, but it cannot blow off completely by reason of the conductor 5 being spot-welded to it.

A hermetically sealed galvanic cell provided with a casing according to the invention has the advantage of the low manufacturing costs of the cell casing and cell cover and of effectively preventing the escape of gases and electrolyte as a result of the small area to be sealed between the collar and the contact cap. A galvanic cell provided with a casing according to the invention has the particular advantage over conventional galvanic cells that the contact cap may simultaneously perform the function of a safety valve by adjustment of the undercut or re-entrant angle to a given blowing-off pressure.

WHAT WE CLAIM IS:—

1. A hermetically sealed galvanic cell casing for a gas-tight cylindrical accumulator, comprising a metal container plastically deformed to form a cover and a collar upstanding co-axially from the cover, the outer surface of the collar making an undercut or re-entrant angle with the cover, an insulating ring surrounding the collar and a contact cap embracing the ring to effect a gas and liquid tight seal with the ring.

2. A hermetically sealed galvanic cell casing according to Claim 1, in which a conductor connected to one pole of the cell electrodes is securely connected to the contact cap.

3. A method of manufacturing a hermetically sealed galvanic cell casing according to Claim 1 or Claim 2, in which the

According to the invention, there is provided a hermetically sealed galvanic cell casing for a gas-tight cylindrical accumulator, comprising a metal container plastically deformed to form a cover and a collar upstanding co-axially from the cover, the outer surface of the collar making an undercut or re-entrant angle with the cover, an insulating ring surrounding the collar and a contact cap embracing the ring to effect a gas and liquid tight seal with the ring.

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In addition to the advantage afforded by the small number of structural parts required, there is also the advantage that the contact cap 6 not only constitutes the closure of the cell, but may simultaneously serve as a safety valve. This multiple function is achieved in the following way:—

The tumbling or rolling metal-forming apparatus is so constructed as to effect a plastic deformation of the edge of the can and to produce the small collar 7 hereinafter described by means of a mandrel following the rotational movement of the can, as illustrated in Figure 2.

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A hermetically sealed galvanic cell provided with a casing according to the invention has the advantage of the low manufacturing costs of the cell casing and cell cover and of effectively preventing the escape of gases and electrolyte as a result of the small area to be sealed between the collar and the contact cap. A galvanic cell provided with a casing according to the invention has the particular advantage over conventional galvanic cells that the contact cap may simultaneously perform the function of a safety valve by adjustment of the undercut or re-entrant angle to a given blowing-off pressure.

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2. A hermetically sealed galvanic cell casing according to Claim 1, in which a conductor connected to one pole of the cell electrodes is securely connected to the contact cap.

3. A method of manufacturing a hermetically sealed galvanic cell casing according to Claim 1 or Claim 2, in which the



collar is formed on the cover by a rolling method by a mandrel following rotational movement of the casing causing the plastic deformation of the edge of the casing the

- 5 insulating ring is subsequently slipped over the collar and the conductor is then securely connected to the contact cap, whereupon the contact cap is pressed over the insulated collar and deformed, so that the contact cap
10 interengages claw-fashion with the undercut shape of the collar.

4. A method according to Claim 3, in which the undercut or re-entrant angle of the collar is adjusted so that the cap has
15 a predetermined blowing-off pressure.

5. A gas-tight cylindrical accumulator

substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

6. A method of manufacturing a mer- 20
metically sealed galvanic cell casing substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

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