PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements relating to Electric Cells

I, CHAN MING LEAM, a Chinese National, of 51 Main Street, Cha Kwo Ling, Hong Kong, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns electric cells and in particular so-called "dry" primary cells.

Dry primary cells usually comprise a zinc casing which forms one electrode of the cell, this casing being filled with active material in the form of a paste, the other electrode of the cell being constituted by a carbon rod embedded in the active material and, usually, protruding from the casing. Usually the said casing is in the form of a cup and the said carbon rod protrudes centrally from the open end of said cup, the latter being sealed around the carbon rod by a layer of bituminous material.

When cells of the above-described form are to be used in hand torches or the like it is customary to encase the zinc casing with an insulating sheath which merely exposes a portion of the casing, usually at the end thereof opposite to the carbon rod, so that electrical contact can be made with the exposed part of the casing.

The said sheath is usually formed of cardboard or similar fibrous material, although metal sheaths are sometimes employed, these either being insulated from the zinc casing or being in electrical communication therewith, depending on the use to which the cell is to be put.

Such arrangements have been quite satisfactory for use in temperate climes and in circumstances in which the cells are adequately protected against damp; however, in tropical climes or where the cells are to be used in damp atmospheres, the sheath materials do not protect the zinc casing from corrosion and the cells often become unusable owing to corrosion of the zinc casing long before their useful life should have been achieved.

Thus, where cardboard or the like fibrous sheaths are employed, these are susceptible to deterioration in damp atmospheres and, when damp, promote rapid corrosion of the zinc casing of the cell and also rapid corrosion of any metal, such as the barrel of a hand torch, with which they are in contact. Metal sheaths are liable to corrode themselves and, moreover, a film of moisture over such sheath is very likely to lead to breakdown of the insulation between the two electrodes of the cell and consequent discharging of the latter.

It is a primary object of the present invention to provide an electric cell construction, particularly a dry primary cell construction, of such form that the aforesaid disadvantages of known arrangements are obviated or reduced to the minimum, cells in accordance with this invention being particularly suitable for use in tropical climes and in situations where exposure to moisture must not affect the durability or life of the cells.

According to the present invention, therefore, there is provided an electric cell comprising a cup-shaped casing constituting one electrode of the cell and containing active material in which is embedded the second electrode of said cell, such second electrode extending beyond the open end of the cup-shaped casing and the casing being enclosed by a close-fitting impervious sheath of plastic material covering the open end of said casing and sealed around a protruding cap on said second electrode, such cap having a flange located within the said sheath and adapted to trap a resilient seal between itself and the said sheath around an aperture in the latter through which said cap extends to the exterior of the sheath, a portion of said casing being exposed by said sheath to enable electrical contact to be made with said casing.

With such an arrangement, the said sheath will effectively protect the said casing from corrosion except at the portion of the casing exposed for contact-making purposes; such exposed portion need only be small in area and may be rendered more resistant to corrosion than the remainder of the casing without materially adding to the cost of manufacture of the cell.

Conveniently, the said sheath will be of cup form dimensioned to telescope over the cup-shaped casing with the open end of the sheath exposing the end of the casing remote from the open end of the latter.

Preferably, and in accordance with a further feature of this invention, the open end of said

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sheath is furnished with an inturned flange adapted to abut the periphery of the exposed end of said casing thereby to locate and hold said sheath on said casing.

According to a further feature of the invention, the open end of the said casing may itself be sealed about the said second electrode by means of a layer of impervious plastic material thereby doubly to guard against leakage of active material from the casing or the ingress of moisture or other contaminants into the active material.

In order that the invention may be more readily understood, an embodiment thereof will be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a dry primary cell constructed in accordance with the present invention, this cell being of generally cylindrical form for use, for example, in a hand torch; and

Figure 2 is a vertical section through the cell of Figure 1, certain parts, however, being shown in elevation.

The cell illustrated in the drawings comprises, as clearly shown in Figure 2, a casing 1 in the form of a cylindrical cup of zinc, this cup constituting one electrode of the cell. The casing 1 is packed with active material 2 in the form of a paste surrounding a central rod 3 of carbon which forms the second electrode of the cell. Whilst the active material 2 is shown as merely a mass entirely filling the casing 1 around the carbon rod 3, it is of course to be understood that the active material could be constituted by two or more concentric layers of different materials for the purpose of enhancing the life and current capacity of the cell.

At its open end the casing 1 is closed by a disc of plastic material impervious to water or water vapour and inert with respect to the active material 2. The disc 4 is a tight fit around the carbon rod 3 and is located in the open end of the casing 1 by being trapped between a bead 5 formed just below the open end of the casing and an inwardly directed flange 6 at the open end of the latter. The bead 5 is conveniently formed in the casing 1 by rolling a shallow groove 7 around the exterior of the casing to a depth of, for example, 0.05 inch and, after the disc 4 has been inserted in the open end of the casing 1 until it abuts the bead 5, the flange 6 may be formed by pressing or spinning over the end of the casing.

The end of the carbon rod 3 which protrudes through the disc 4 carries a metal cap 8 constituting one terminal for the cell. The cap 8 may have any suitable configuration, for example domes as shown, or it could comprise a threaded rod adapted to carry a nut.

The cap 8 is furnished on its lower end with a peripheral flange 9 which abuts against the upper surface of the disc 4; a rubber or like resilient ring 10 is located on the upper surface of the flange 9 of the cap 8.

An impervious sheath 11 of plastic material encloses the cylindrical walls of the casing 1 of the upper end of the cell, the cap 8 protruding through the sheath 11. The sheath 11 is moulded from a fairly resilient plastic material, e.g. plasticized poly-vinyl chloride, in the form of a cup having an internal diameter substantially equal to the external diameter of the casing 1 so that the sheath 11 will be a tight fit upon the latter; at its open end the sheath 11 is formed with an inturned flange 12 which serves to retain the sheath in place on the casing should frictional adhesion between the casing and sheath prove insufficient for this purpose.

The sheath 11 is furnished at its closed end with an aperture which is dimensioned to be a close fit about the cap 8 and the sheath is slidden over the casing 1 into position so that the inner surface of the closed end of the sheath traps the ring 10 between itself and the flange 9 of the cap 8, thereby effectively sealing the interior of the sheath against the ingress of air or moisture through any gap between the cap 8 and the sheath 11; in sliding the sheath 11 into position, the flange 12 of the sheath is of course sprung outwardly.

The lower or closed end of the casing 1 which is not covered by the sheath 11 is preferably, as shown, protected from corrosion by means of an additional plate 13 which may also be formed of zinc or some other metal resistant to corrosion; the plate 13 may be secured to the casing 1 or may be merely held in place by means of the flange 12 of the sheath 11. Alternatively the plate 13 may be integrally formed with the casing 1, that is to say the plate 13 could be omitted and the casing 1 formed of thicker material at its closed end.

The above-described cell construction is very suitable for use in tropical climes or in situations where the cell may be exposed to atmospheric damp and will effectively resist corrosion. Moreover, ingress of moisture or other contaminants into the active material of the cell is adequately prevented by the sealing ring 10 and the plastic disc 4, whilst the non-absorbent character of the sheath 11 minimises the risk of a film of moisture short-circuiting the cell in damp atmospheric conditions.

Whilst the invention is particularly applicable to dry primary cells which comprise a zinc casing which is very prone to corrosion in damp atmospheres, the invention is also applicable to secondary cells, for example of the alkaline type in which the cell casing 1 is constituted by a steel cup which, whilst unlikely to corrode, often has to be insulated from contact with surrounding metals by means of a sheath; a plastic sheath such as above described would be suitable for such alkaline cells in tropical climes or damp atmospheres.

What I claim is:—

1. An electric cell comprising a cup-shaped

sheath is furnished with an inturned flange adapted to abut the periphery of the exposed end of said casing thereby to locate and hold said sheath on said casing.

According to a further feature of the invention, the open end of the said casing may itself be sealed about the said second electrode by means of a layer of impervious plastic material thereby doubly to guard against leakage of active material from the casing or the ingress of moisture or other contaminants into the active material.

In order that the invention may be more readily understood, an embodiment thereof will be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a dry primary cell constructed in accordance with the present invention, this cell being of generally cylindrical form for use, for example, in a hand torch; and

Figure 2 is a vertical section through the cell of Figure 1, certain parts, however, being shown in elevation.

The cell illustrated in the drawings comprises, as clearly shown in Figure 2, a casing 1 in the form of a cylindrical cup of zinc, this cup constituting one electrode of the cell. The casing 1 is packed with active material 2 in the form of a paste surrounding a central rod 3 of carbon which forms the second electrode of the cell. Whilst the active material 2 is shown as merely a mass entirely filling the casing 1 around the carbon rod 3, it is to be understood that the active material could be constituted by two or more concentric layers of different materials for the purpose of enhancing the life and current capacity of the cell.

At its open end the casing 1 is closed by a disc of plastic material impervious to water or water vapour and inert with respect to the active material 2. The disc 4 is a tight fit around the carbon rod 3 and is located in the open end of the casing 1 by being trapped between a bead 5 formed just below the open end of the casing and an inwardly directed flange 6 at the open end of the latter. The bead 5 is conveniently formed in the casing 1 by rolling a shallow groove 7 around the exterior of the casing to a depth of, for example, 0.05 inch and, after the disc 4 has been inserted in the open end of the casing 1 until it abuts the bead 5, the flange 6 may be formed by pressing or spinning over the end of the casing.

The end of the carbon rod 3 which protrudes through the disc 4 carries a metal cap 8 constituting one terminal for the cell. The cap 8 may have any suitable configuration, for example domes as shown, or it could comprise a threaded rod adapted to carry a nut.

The cap 8 is furnished on its lower end with a peripheral flange 9 which abuts against the upper surface of the disc 4; a rubber or like resilient ring 10 is located on the upper surface of the flange 9 of the cap 8.

An impervious sheath 11 of plastic material encloses the cylindrical walls of the casing 1 of the upper end of the cell, the cap 8 protruding through the sheath 11. The sheath 11 is moulded from a fairly resilient plastic material, e.g. plasticized poly-vinyl chloride, in the form of a cup having an internal diameter substantially equal to the external diameter of the casing 1 so that the sheath 11 will be a tight fit upon the latter; at its open end the sheath 11 is formed with an inturned flange 12 which serves to retain the sheath in place on the casing should frictional adhesion between the casing and sheath prove insufficient for this purpose.

The sheath 11 is furnished at its closed end with an aperture which is dimensioned to be a close fit about the cap 8 and the sheath is slidden over the casing 1 into position so that the inner surface of the closed end of the sheath traps the ring 10 between itself and the flange 9 of the cap 8, thereby effectively sealing the interior of the sheath against the ingress of air or moisture through any gap between the cap 8 and the sheath 11; in sliding the sheath 11 into position, the flange 12 of the sheath is of course sprung outwardly.

The lower or closed end of the casing 1 which is not covered by the sheath 11 is preferably, as shown, protected from corrosion by means of an additional plate 13 which may also be formed of zinc or some other metal resistant to corrosion; the plate 13 may be secured to the casing 1 or it may be merely held in place by means of the flange 12 of the sheath 11. Alternatively the plate 13 may be integrally formed with the casing 1, that is to say the plate 13 could be omitted and the casing 1 formed of thicker material at its closed end.

The above-described cell construction is very suitable for use in tropical climes or in situations where the cell may be exposed to atmospheric damp and will effectively resist corrosion. Moreover, ingress of moisture or other contaminants into the active material of the cell is adequately prevented by the sealing ring 10 and the plastic disc 4, whilst the non-absorbent character of the sheath 11 minimises the risk of a film of moisture short-circuiting the cell in damp atmospheric conditions.

Whilst the invention is particularly applicable to dry primary cells which comprise a zinc casing which is very prone to corrosion in damp atmospheres, the invention is also applicable to secondary cells, for example of the alkaline type in which the cell casing 1 is constituted by a steel cup which, whilst unlikely to corrode, often has to be insulated from contact with surrounding metals by means of a sheath; a plastic sheath such as above described would be suitable for such alkaline cells in tropical climes or damp atmospheres.

What I claim is:—

1. An electric cell comprising a cup-shaped

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casing constituting one electrode of the cell and containing active material in which is embedded the second electrode of said cell, such second electrode extending beyond the open end of the cup-shaped casing and the casing being enclosed by a close-fitting impervious sheath of plastic material covering the open end of said casing and sealed around a protruding cap on said second electrode, such cap having a flange located within the said sheath and adapted to trap a resilient seal between itself and the said sheath around an aperture in the latter through which said cap extends to the exterior of the sheath, a portion of said casing being exposed by said sheath to enable electrical contact to be made with said casing.

2. An electric cell according to claim 1, wherein said sheath is of cup form dimensioned to telescope over the cup-shaped casing with the open end of the sheath exposing the end of the casing remote from the open end of the latter.

3. An electric cell according to claim 2, wherein the open end of said sheath is formed with an inturned flange adapted to abut the periphery of the exposed end of said casing thereby to locate and hold said sheath on said casing.

4. An electric cell according to claim 1, 2 or 3, wherein the open end of said casing is sealed about the said second electrode by means of a layer of impervious plastic material.

5. An electric cell according to claim 4, wherein said plastic layer is trapped between a bead near the open end of the said casing and an inturned flange at said open end.

6. An electric cell according to any of the preceding claims, wherein the said exposed portion of the said casing is rendered more resistant to corrosion than the portion of the casing enclosed by said sheath.

7. An electric cell according to claim 6, wherein the exposed portion of said casing is protected by an additional metal plate.

8. An electric cell substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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