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(54) IMPROVEMENTS IN OR RELATING TO ELECTRIC BATTERIES

(71) We, RICARDO BARAÑANO BERGANZA, a Spanish citizen of Po Florida, 3, Vitoria, Spain, JAVIER ARREGUI LARRAÑAGA a Spanish citizen of Avenida Generalisimo, 52, Vitoria, Spain, VIKTOR ARSENIEVICH NAOUMENKO, a Russian citizen of Novoslobodskaya ul. 62 Kv. 64, Moscow, USSR, and MEER DANILOVICH KOCHERGINSKY, a Russian citizen of Novoslobodskaya ul. 62 Kv. 64, Moscow USSR 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 present invention relates to electric batteries.

According to the present invention there is provided an electric battery having one or more cells, the or each cell comprising two half-cells held together by way of a band arranged to apply a substantially uniform and constant pressure to contacting surfaces of the cell, the or each cell being received in a respective compartment of a tubular housing.

The band may be of heat shrinkable material which, when contracted by heat contracts with the force necessary to exercise regularly and homogeneously over the whole area a force of compression which facilitates the good contact and consequently the good operation of the cell, avoiding internal resistances caused by irregular connections.

The cells assembled in this way may be introduced into a plastics material housing provided with three compartments, the housing having two internal partitions. Each compartment has an internal dimension equal to that of the cell to thereby produce a constant pressure at any time along the four longitudinal surfaces of contact, thus obtaining a very regular and constant pressure at any time along the four longitudinal surfaces of contact, thus obtaining a very regular and constant electrical voltage as a result of the pressure of the partitions.

These compartments have sufficient spaces, in the direction at right angles to that of the four surfaces of contact, to ensure that the negative masses of the cells can expand during the electrical discharge, thus increasing the volume, for example, as a result of the conversion of the negative zinc into zinc oxide, which has a lower density and consequently a greater volume.

The plastics material housing may take the form of an individual tube for one cell only instead of three, in the event of its being a 1.5 volt battery, with equal pressure between walls and an expansion space for the negative mass of the cell.

The plastics housing preferably consists of an extruded tube of plastics material which has its partitions and in which, when the cells have been fitted, connections are made with terminals on the outside so that finally the upper and lower part can be sealed with lids also made of plastics material, which are joined to the housing by means of solvents, adhesives, ultra sound etc., thus making it possible to shape the battery with an external and standardized design as called for by the market.

An embodiment of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a perspective view of an assembled cell for an electric battery of the invention.

Figure 2 shows schematically a cross-section of an electric battery including three cells,

Figure 3 shows a view similar to Figure 2 illustrated expansion chambers for absorbing increases in dimensions of the cells,

Figure 4 shows a top plate for the battery of Figures 2 and 3,

Figure 5 shows a perspective view of an internal connector for providing the positive terminal of the battery,

Figure 6 shows a perspective view of the battery, with part of the housing omitted,

Figure 7 shows a base plate for the battery, and

Figure 8 shows a perspective view of the battery with parts broken away.

Figure 1 shows a perspective view of a cell for an electric battery. Each cell is formed from two half-cells each enclosed within a body 1 of plastics material. Each body 1 encloses the negative mass (not shown) and a diaphragm or separator (not shown). A negative connector 3 extends out of the body 1 of each half-cell. The two half-cells sandwich the positive mass therebetween and a positive connec-

tor 2 is connected to and extends from the positive masss. The assembled cell is held in position by way of a band 4. The band 4 is tubular and is made from heat contractable material, for example, from heat shrinkable plastics material. Upon assembly of the cell, the band is positioned to extend substantially transversely around the cell, and then the band 4 is heated so that it contracts and grips the two bodies 1 of the half-cells which thereby grip the positive mass therebetween. The band 4 acts to provide a compressive force which provides a substantially constant pressure over the areas of contact between the positive mass and the half-cells at each side thereof.

Assembled cells as shown in Figure 1 are assembled in a housing to form an electric battery as indicated in Figures 2 and 3. In the embodiment illustrated the battery incorporates three such cells, but it will be appreciated that any number of cells can be employed.

As illustrated in Figures 2, 3, 6 and 8, the housing 5 of the electric battery is substantially tubular and is preferably of extruded plastics material. The housing 5 is divided longitudinally into a number of compartments of substantially equal cross-sectional area by way of a plurality of longitudinally extending partitions 6. As shown in Figures 2 and 3, in the embodiment illustrated, the housing 5 includes two partitions 6 defining three compartments aligned transversely with respect to the housing. Each partition 6 extends completely from one side to the other of the housing 5 so that the compartments are completely separated with respect to one another.

A respective assembled cell is inserted into each compartment of the housing so that the longitudinal extent of each cell extends longitudinally of the housing. The transverse dimension B of each compartment is substantially equal to or slightly smaller than the depth A of each cell.

In this way, the cells are gripped by the partitions 6 and are retained thereby within the compartments. In addition, as the partitions 6 act on the longitudinally extending surfaces of the bodies 1 of the cells over substantially the whole area thereof, the partitions 6 tend to maintain the cells in their assembled condition.

Figure 3 shows a cross-section of the housing 5 with the cells assembled therein. As is indicated in Figure 3, before use of the battery, the depth of each compartment from one side thereof to the other is greater than the transverse dimension of the corresponding cell. An area of depth C is thus provided within each compartment at each side of the cell. When, during use of the battery, the cells expand, the expansion thereof can be accommodated by the areas in the compartments. It will thus be seen that expansion of the cells during discharge does not cause any variation in the overall dimensions of the housing and battery.

The cells within the housing 5 are electrically connected together, preferably in series, as is best seen from Figure 6. The negative and positive connectors 2 and 3 are connected, for example, by soldering as indicated at 9. The negative connector 3 of the cell at one end of the series connection is then connected, for example, by soldering, to a negative terminal 8, whilst the positive connector 2 of the cell at the other end of the series connection is connected, for example, by soldering, to an internal connector providing a positive terminal 7. As can be seen from Figure 6, the negative terminal 8 is a substantially flat metal strip which can be accommodated in the space between one side of a cell and the curved end portion of the housing 5. The positive terminal 7 (Figure 5) is a substantially right-angled metal strip having one arm fixed to a plastics material plate, and the other, free arm extending substantially perpendicularly to the plate. As is indicated in Figure 8, the positive connector 2 is fed through a hole in the plate and in the fixed arm of the terminal 7 and is connected to the fixed arm, for example, by soldering.

Once the interconnections of the cells, and the connections to the negative and positive terminals 8 and 7 have been completed, a top plate, as shown in Figure 4, is connected to the top of the housing 5. The top plate is preferably of plastics material and is secured to the housing 5 by, for example, solvent, adhesives, or ultra-sonic welding. It will be seen that the top plate as a pair of transverse, substantially parallel slots therein through which the positive and negative terminals 7 and 8 extend. As shown in Figure 8, once the battery has been assembled, the negative terminal 8 is preferably bent over to extend substantially along the top plate of the housing 5.

The base of the housing 5 is closed by way of a base plate, preferably of plastics material, which is shown in Figure 7. The base plate is secured to the housing 5, for example, by solvents, adhesives or ultrasonic welding. Preferably, the top and base plates are secured to the housing 5 simultaneously. A completed battery is shown in Figure 8.

Although the invention has been described above with reference to a three cell battery it will be appreciated that any number of cells may be utilized. In addition, the shape of the housing may be modified as required. The housing described above is made of plastics material but any other materials may be employed, for example, the housing could be made of cardboard. The housing may have any suitable cross-section.

It will be seen that the battery described above is relatively easy to manufacture and assemble.

WHAT WE CLAIM IS:–

1. An electric battery having one or more cells, the or each cell comprising two halve-cells held together by way of a band arranged to apply a substantially uniform and constant

pressure to contacting surfaces of the cell, the or each cell being received in a respective compartment of a tubular housing.

2. An electric battery as claimed in claim 1, wherein said band is of heat shrinkable material.

3. An electric battery as claimed in claim 1 or 2, wherein the tubular housing has a least one partition dividing the housing longitudinally into two or more compartments of substantially equal volume, each compartment receiving one cell of the battery.

4. An electric battery as claimed in claim 3, wherein one transverse dimension of each compartment is equal to or slightly less than the corresponding dimension of each cell so that the cells are retained within the compartments.

5. An electric battery as claimed in claim 4, wherein said one transverse direction is defined by the partition or partitions, whereby at least one partition engages each cell along the longitudinal extent thereof to maintain each cell in its assembled condition.

6. An electric battery as claimed in any preceding claim, wherein each compartment has a volume greater than that of the corresponding cell whereby the compartment can accommodate any increase in dimension of the cells.

7. An electric battery as claimed in any preceding claim, wherein cover plates are secured to either end of the tubular housing to seal the housing, and positive and negative terminals of the battery extend through one or both of said plates.

8. An electric battery as claimed in any preceding claim, wherein said housing is of plastics material.

9. An electric battery substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

Fig. 4

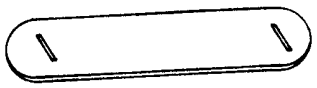

Fig. 5

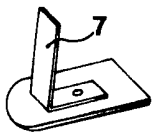

Fig. 6

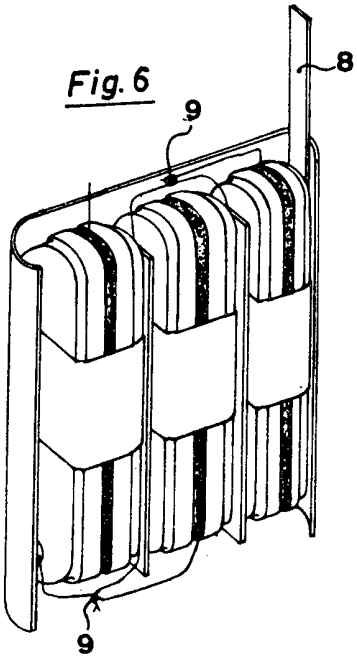

Fig. 7

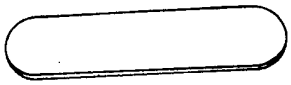

Fig. 8