

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS RELATING TO INTERCELL CONNECTORS FOR MULTI-CELL ELECTRIC STORAGE BATTERIES

(71) We, ELECTRIC POWER STORAGE LIMITED, a Company registered under the Laws of Great Britain, of Clifton Junction, Swinton, Manchester, Lancashire, 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:—

10 This invention relates to intercell connectors for multi-cell electric storage batteries of lead-acid type and is primarily concerned with means for sealing an intercell connector at the point where it passes through an intercell partition. Thus the invention is particularly, though not exclusively, concerned with intercell connectors which extend substantially directly between plate straps in neighbouring cells, or between portions of the intercell connector functioning as plate straps, rather than extending upwards and then downwards so as to pass over the top of the intercell partition. Such direct intercell connectors have the advantages not only that they save weight and economise material but also that they reduce internal resistance. At the same time, since they pass through the partition at a relatively low level, near or even below the surface of the electrolyte, they necessitate careful sealing of the joint and an object of the invention is to provide a convenient and reliable form of seal.

35 According to the present invention a multi-cell electric storage battery of lead acid type has an intercell connector bar passing through a slot opening through an upper edge of an intercell partition, and a combined closure and mould closing at least a part of the unoccupied part of the slot extending up from the connector bar and comprising a saddle of inverted U-shape with a pair of legs between which the connector bar fits and which depend from a transom, in which at least part of each leg is grooved or split into two sections spaced apart by a gap so as to overlie opposite faces

of the partition along the side edges of the slot in it, and the grooves or gaps communicate with one or more openings through the top of the saddle through which sealant can be introduced into contact with opposed faces of the slot and the sides of the connector. 45

In one form of the invention the lower face of the transom has in it a groove communicating with the gaps to allow sealant to flow across the top of the connector bar. 50

The underside of the connector bar may have in it a transverse groove to receive the edge of the partition along the bottom of the slot. The arrangement may be such that only part of the depth of the groove is occupied by the partition so as to leave a passage interconnecting the gaps to allow sealant to flow along the groove between it and the bottom of the slot in the partition. 55

Thus in a preferred form of the invention a substantially straight connector bar extends perpendicularly through an open-topped slot in a partition and a single piece saddle, which may conveniently be a plastics moulding, is then inserted so as to fill the part of the slot not occupied by the connector bar and provide a mould through which a sealant (such, for example, as an epoxy resin) can be introduced from the top so as to extend completely round the connector bar and into contact with the sides and bottom of the slot in the partition. Accordingly the invention provides a particularly simple and effective method of sealing the joint where the connector bar passes through the partition. 60 65 70 75

The invention may be put into practice in various ways but one specific embodiment and modifications will be described by way of example with reference to the accompanying drawings in which:— 80

Figure 1 is an exploded perspective view of an intercell connector passing through an intercell partition; 85

Figure 2 is a sectional side elevation of the

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intercell connector passing through the intercell partition, shown in Figure 1, on the line 2—2 of Figure 3;

5 Figure 3 is a sectional plan view on the line 3—3 of Figure 2;

Figure 4 is an enlarged perspective view of one leg of the combined closure and mould shown in Figure 1;

10 Figure 5 is a view, similar to that of Figure 4, but of slightly modified design;

Figure 6 is a perspective view of a modified form of internal partition;

15 Figure 7 is a sectional side elevation of an arrangement employing the partition of Figure 6, and

Figure 8 is a view similar to Figure 7 of a further modification.

20 In the specific embodiment shown in Figures 1 to 3 an intercell connector 10 comprises a straight flat strip connector bar 12 lying generally in a horizontal plane and extending between a pair of bars forming plate straps in adjacent cells, or integrally connected to lugs
25 or plates of appropriate polarity in the respective cells. An intercell partition 16 of a battery container 15 is provided with a deep slot 17 which opens through the top of the partition 16, and of which the lower parts of the sides 18 are substantially parallel, and
30 spaced apart a distance somewhat greater than the width of the connector bar 12, whilst at the top they diverge outwards. The connector bar 12 rests in the bottom of the slot 17, or
35 about one thirty-second of an inch above it, at a level very little above the tops of the plates and has in its lower face a transverse groove 13, in the bottom of which the margin of the lower edge of the slot 17 is received.
40 The groove 13 may be formed in a projection in the underface of the connector bar so as not to reduce its cross-section to less than that of the remainder of the bar.

45 After the elements, comprising plates and separators, have been assembled in the container 15 and the intercell connectors 10 connected to them (either before or after their insertion) a combined closure and mould 22, which will be referred to as a saddle, is applied
50 to the slot 17 in the intercell partition 16.

55 The saddle 22 is generally of rectangular inverted U-shape with a pair of legs 23 depending from a deep transom 24. Each leg is split into two parallel sections 25 and 26 spaced apart by a gap 27 equal to the thickness of the partition 16, so that the two sections 25 and 26 of the legs 23 can overlies opposite faces of the partition 16 along the side edges of the slot 17. The gap 27 continues upwards
60 as a groove in each end of the transom 24 so as to open through the upper face 29 of the saddle 22. The groove may be of key-hole section so that when the saddle is in position the parallel-sided portion of it is occupied by the partition 16 along the margin of the

slot 17 leaving a circular hole 30 through which sealant can be introduced. The lower ends of the legs 23 extend below the bottom of the slot 17 so as to overlies the faces of the partition 16 along the ends of the bottom of the slot 17.

70 The circular holes 30, which form part of the key-hole grooves 27, may extend from the upper face 29 of the saddle 22 down to the lower ends of the legs 23, as shown in Figure 4. Alternatively they may terminate just short of the lower ends of the legs as shown in Figure 5 in which case the lower end of each circular hole 30 terminates in a gap 31
80 between parallel faces, like the gap 27, which faces fit flat against the faces of the partition 16.

85 The bottom face of the transom 24 is also provided with a groove 33 interconnecting the gaps or key-hole grooves 27, so that sealant fed in from the top can travel across this groove to form a seal between the lower face of the transom 24 and the upper face of the connector bar 12. In addition the level of the connector bar 12 in relation to the bottom of the slot 17 in the partition 16 may be such that the latter does not completely fill the transverse groove 13 in the connector bar but leaves a passage the ends of which communicate with the gaps 27 so that again sealant can flow
90 along it to form a seal between the bottom of the slot 17 in the partition 16 and the groove 13 in the under surface of the connector bar 12.

100 Accordingly a sealant such as an epoxy resin is poured or injected into the tops 30 of one or each of the key-hole grooves 27 (which form a continuation of the gaps between the sections of the legs) and this sealant flows through the passages described and forms a seal extending completely round the connector bar between it and the partition and between the partition and the saddle.

110 The arrangement shown in Figures 6 and 7 is generally similar to that described above. The only difference being that the portion 37, of the intercell partition 36, immediately below the intercell connector 10 is of extra thickness, approximately equal to the thickness of the saddle 22, so that when the saddle is inserted
115 the inside faces of the legs 23 engage with the sides 38 of the portion 37.

120 Figure 8 is similar to Figure 7 but the intercell connector 40 is in the form of a flat strip, without a transverse groove. Instead, the top face of the portion 37 of the intercell partition is provided with a groove 39 so that sealant can flow along it to form a seal between the bottom of the connector 40 and the partition 36.

125 Some clearances may be desirable between the parts in order to allow air to escape as the sealant, which may be a free flowing or viscous liquid or a paste, is introduced, for example by means of a syringe or injector gun.

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The tops of the saddles are preferably flush with the tops of the partitions so that no complicated shaping of the lid is needed to make a seal. The saddle is free to shift horizontally in the plane of the partition until the sealant is set, so that close tolerances are not needed in the location of the elements in this direction.

WHAT WE CLAIM IS:—

1. A multi-cell electric storage battery of lead-acid type having an intercell connector bar passing through a slot opening through an upper edge of an intercell partition, and a combined closure and mould closing at least a part of the unoccupied part of the slot extending up from the connector bar comprising a saddle of inverted U-shape with a pair of legs between which the connector bar fits and which depend from a transom, in which at least part of each leg is grooved or split into two sections spaced apart by a gap so as to overlie opposite faces of the partition along the side edges of the slot in it, and the grooves or gaps communicate with one or more openings through the top of the saddle through which sealant can be introduced into contact with opposed faces of the slot and the sides of the connector.

2. A battery as claimed in Claim 1 in which the lower face of the transom has in it a groove communicating with the gaps to allow sealant to flow across the top of the connector bar.

3. A battery as claimed in Claim 1 or Claim 2 in which the underside of the connector bar has in it a transverse groove to receive the edge of the partition along the bottom of the slot.

4. A battery as claimed in Claim 3 in which only part of the depth of the groove is occupied by the partition so as to leave a passage interconnecting the gaps to allow sealant to

flow along the groove between it and the bottom of the slot in the partition.

5. A battery as claimed in any one of the preceding claims in which the or each opening in the saddle is of key-hole section, and a channel of semi-circular section, which communicates with the or each opening extends down to the lower end of the or each leg.

6. A battery as claimed in any one of Claims 1 to 4 in which the or each opening in the saddle is of key-hole section, and a channel of semi-circular section, which communicates with the or each opening, terminates just short of the lower end of the or each leg and continues as a parallel sided gap down to the lower end of the or each leg.

7. A battery as claimed in any one of the preceding claims in which the saddle is a plastics moulding.

8. A battery as claimed in Claim 1 or Claim 2 in which the intercell connector bar is straight and rectangular in cross-section.

9. A battery as claimed in any one of the preceding claims in which the portion of the intercell partition immediately below the connector bar is thicker than the remainder of the partition.

10. A battery as claimed in Claim 9 in which the bottom of the slot in the intercell partition has in it a groove to allow sealant to flow across the bottom of the connector bar.

11. A battery as claimed in any one of the preceding claims in which the sealant is an epoxy resin.

12. A multi-cell electric storage battery of lead-acid type as specifically described herein with reference to the accompanying drawings.

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2. A battery as claimed in Claim 1 in which the lower face of the transom has in it a groove communicating with the gaps to allow sealant to flow across the top of the connector bar.

3. A battery as claimed in Claim 1 or Claim 2 in which the underside of the connector bar has in it a transverse groove to receive the edge of the partition along the bottom of the slot.

4. A battery as claimed in Claim 3 in which only part of the depth of the groove is occupied by the partition so as to leave a passage interconnecting the gaps to allow sealant to

flow along the groove between it and the bottom of the slot in the partition.

5. A battery as claimed in any one of the preceding claims in which the or each opening in the saddle is of key-hole section, and a channel of semi-circular section, which communicates with the or each opening extends down to the lower end of the or each leg.

6. A battery as claimed in any one of Claims 1 to 4 in which the or each opening in the saddle is of key-hole section, and a channel of semi-circular section, which communicates with the or each opening, terminates just short of the lower end of the or each leg and continues as a parallel sided gap down to the lower end of the or each leg.

7. A battery as claimed in any one of the preceding claims in which the saddle is a plastics moulding.

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