

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) ELECTRIC STORAGE BATTERIES

(71) We, JOSEPH LUCAS (INDUSTRIES) LIMITED, a British Company, of Great King Street, Birmingham 19, do hereby declare this 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:—

This invention relates to electric storage batteries, particularly lead-acid batteries.

A battery according to the invention comprises a battery box divided into a plurality of compartments, a lid closing the battery box, an assembly of battery plates and separators within each compartment, means inter-connecting plates within adjacent compartments so that the assemblies within the compartments are connected in series, and a pair of posts extending upwardly from the assemblies in the end compartments through apertures in the lid, each aperture accommodating a sleeve and each post being secured to said sleeve, each of said sleeves comprising an upper part and a lower part, the parts being secured relative to the lid and being secured by resistance welding to each other.

An example of the invention is illustrated in the accompanying drawings, in which Figure 1 is a part-sectional view of part of a battery in accordance with one example of the invention during the manufacture thereof, Figure 2 shows part of the lid, and Figure 3 shows one of the parts used in forming the sleeve in the lid.

Referring to the drawing, a battery box 11, conveniently formed from polypropylene, includes partition walls dividing the box into a plurality of compartments 13. Within each compartment 13 is an assembly of battery plates and separators, the required intercell connections being made by securing the appropriate plates in one cell to a connector 15 having an upstanding portion 16 which is connected to a similar connector in the adjacent cell by resistance welding using an electrode 18. Integral sealing rings 10 are provided on the upstanding portions 16 to improve the seal. In addition, the appropriate battery plates in the end compartments are connected to a pair of upstanding posts 17.

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The lid 21 of the battery is also moulded in polypropylene and is secured to the battery box, with ribs (not shown) on the lid engaged with and being secured to the tops of the partition walls, and a pair of apertures in the lid accommodating the pair of upstanding posts 17 respectively, each aperture having a shoulder 24 projecting into the aperture, the portions 23 of the aperture at opposite sides at the shoulder 24 being hexagonal. However, before securing the lid to the battery box, a pair of hollow sleeves 22 are secured to the lid to provide means for securing the posts 17 in position. For this purpose, a hexagonal nut 25 having an upwardly extending cylindrical portion 26 is engaged with the lower recess 23 with the portion 26 extending into the hole defined by the shoulder 24, and engaged with the upper recess 23 is a similar part which incorporates an axially extending flange 27. The two parts are interconnected by resistance welding using a removable former of polished stainless steel to prevent flow of material inwardly. In this way, the sleeve is secured relative to the lid, so that when the lid is secured to the battery box the post 17 will extend upwardly through the sleeves, and can then be secured thereto in any convenient manner, for example by melting the top of the post, to seal the battery and form the required terminals. The removable former may be slightly tapered to assist in its removal after the weld has been effected.

The face of the hexagonal nut 25 which is presented to the projecting shoulder 24 has integral sealing rings 28 which are pushed into the thermoplastic lid during the welding to improve the seal. The sealing rings 28 could alternatively be moulded integrally with each of the faces of the shoulders 24 which are to be presented to the hexagonal nuts 25 respectively. It will be appreciated that other means may be employed to prevent rotation of the post relative to the lid, wherein the hexagonal nuts and recesses may take other non-circular forms.

In a further example of the invention faces of each of the projecting shoulders 24 defining the apertures in the lid 21 are moulded with

SPECIFICATION AMENDED - SEE ATTACHED SLIP

longitudinal splines of triangular section around which material flows during the resistance welding operation, thereby assisting the key. Where this arrangement is used, the lower

5 recesses can still be hexagonal, but it could be circular, in which case the nuts engaging the lower recesses would of course be circular.

In a modification of the example cited above the faces of one or each of the nuts 10 25 which engage the recesses 23 are inclined outwardly in such a way that the peripheral thickness of the nut is greater than the central thickness thereof. In this way, the resistance welding of the nuts 25 to the lid 21 produces 15 an improved seal of the resultant sleeve 22 to the lid.

WHAT WE CLAIM IS:—

1. An electric storage battery comprising a battery box divided into a plurality of compartments, a lid closing the battery box, an assembly of battery plates and separators within each compartment, means interconnecting plates within adjacent compartments so that the assemblies within the compartments are 20 connected in series, and a pair of posts extending upwardly from the assemblies in the end compartments through apertures in the lid, each aperture accommodating a sleeve and each post being secured to said sleeve, each 25 of said sleeves comprising an upper part and a lower part, the parts being secured relative to the lid and being secured by resistance welding to each other.

2. A battery as claimed in Claim 1 wherein 30 the wall of each of said apertures is formed with an integral projecting shoulder, each of the shoulders defining its aperture into an upper and a lower recess on opposite sides of said shoulder.

3. A battery as claimed in Claim 2 wherein 35 the inwardly directed faces of each of said shoulders are formed with integral longitudinal splines.

4. A battery as claimed in Claim 2 or Claim 40 3 wherein said recesses are of non-circular cross-section.

5. A battery as claimed in Claim 4 wherein the upper and lower parts constituting each sleeve are in the form of first and second non-circular nuts respectively, the nuts being 45 complementary with said recesses and engaged therein, said first nut having an upwardly extending, axial flange in contact with its respective terminal post and protruding from the top of said lid, and said second 50 nut having an upwardly extending cylindrical portion extending into the aperture in said lid.

6. A battery as claimed in Claim 5 wherein 55 the first nut has a downwardly extending cylindrical portion extending into the aperture in said lid.

7. A battery as claimed in Claim 5 or Claim 6 wherein at least one of the nuts has the face thereof which is presented to its respective recess inclined outwardly so that the thickness 60 of the nut at the periphery thereof is greater than the thickness of the nut adjacent the centre thereof.

8. A battery as claimed in Claim 5 or Claim 6 wherein at least one of the nuts has the face thereof which is presented to its respective recess formed integrally with a sealing ring. 70

9. A battery as claimed in Claim 5 or Claim 6 wherein at least one of the faces of the shoulders which engage said nuts is formed 75 integrally with a sealing ring.

10. A battery as claimed in Claim 3 wherein said upper recess is of non-circular cross-section and said lower recess is of circular cross-section. 80

11. A battery as claimed in Claim 10 wherein the upper part of each of said sleeves is engaged in said upper recess and comprises a non-circular nut having an upwardly extending axial flange in contact with its respective 85 terminal post and protruding from the top of said lid, and wherein the lower part of each of said sleeves is engaged in said lower recess and comprises a circular nut having an upwardly extending cylindrical portion extending 90 into the aperture in said lid.

12. A battery as claimed in Claim 10 wherein the upper part of each of said sleeves also comprises a downwardly extending cylindrical portion extending into the aperture in said lid. 95

13. A battery as claimed in Claim 10 or Claim 11 wherein one of the nuts has the face thereof which is presented to its respective recess inclined outwardly so that the thickness 100 of the nut at the periphery thereof is greater than the thickness of the nut adjacent the centre thereof.

14. A battery as claimed in Claim 10 or Claim 11 wherein at least one of the nuts has the face thereof which is presented to its respective recess formed integrally with a sealing ring. 105

15. A battery as claimed in Claim 10 or Claim 11 wherein at least one of the faces of the shoulders which engage said nuts is 110 formed integrally with a sealing ring.

16. A battery as claimed in any one of Claims 4 to 15 wherein each non-circular recess is hexagonal.

17. An electric storage battery comprising 115 the combination and arrangement of parts substantially as described with reference to the accompanying drawings.

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longitudinal splines of triangular section around which material flows during the resistance welding operation, thereby assisting the key. Where this arrangement is used, the lower recesses can still be hexagonal, but it could be circular, in which case the nuts engaging the lower recesses would of course be circular.

In a modification of the example cited above the faces of one or each of the nuts 25 which engage the recesses 23 are inclined outwardly in such a way that the peripheral thickness of the nut is greater than the central thickness thereof. In this way, the resistance welding of the nuts 25 to the lid 21 produces an improved seal of the resultant sleeve 22 to the lid.

WHAT WE CLAIM IS:—

1. An electric storage battery comprising a battery box divided into a plurality of compartments, a lid closing the battery box, an assembly of battery plates and separators within each compartment, means interconnecting plates within adjacent compartments so that the assemblies within the compartments are connected in series, and a pair of posts extending upwardly from the assemblies in the end compartments through apertures in the lid, each aperture accommodating a sleeve and each post being secured to said sleeve, each of said sleeves comprising an upper part and a lower part, the parts being secured relative to the lid and being secured by resistance welding to each other.

2. A battery as claimed in Claim 1 wherein the wall of each of said apertures is formed with an integral projecting shoulder, each of the shoulders defining its aperture into an upper and a lower recess on opposite sides of said shoulder.

3. A battery as claimed in Claim 2 wherein the inwardly directed faces of each of said shoulders are formed with integral longitudinal splines.

4. A battery as claimed in Claim 2 or Claim 3 wherein said recesses are of non-circular cross-section.

5. A battery as claimed in Claim 4 wherein the upper and lower parts constituting each sleeve are in the form of first and second non-circular nuts respectively, the nuts being complementary with said recesses and engaged therein, said first nut having an upwardly extending, axial flange in contact with its respective terminal post and protruding from the top of said lid, and said second nut having an upwardly extending cylindrical portion extending into the aperture in said lid.

6. A battery as claimed in Claim 5 wherein the first nut has a downwardly extending cylindrical portion extending into the aperture in said lid.

7. A battery as claimed in Claim 5 or Claim 6 wherein at least one of the nuts has the face thereof which is presented to its respective recess inclined outwardly so that the thickness of the nut at the periphery thereof is greater than the thickness of the nut adjacent the centre thereof.

8. A battery as claimed in Claim 5 or Claim 6 wherein at least one of the nuts has the face thereof which is presented to its respective recess formed integrally with a sealing ring.

9. A battery as claimed in Claim 5 or Claim 6 wherein at least one of the faces of the shoulders which engage said nuts is formed integrally with a sealing ring.

10. A battery as claimed in Claim 3 wherein said upper recess is of non-circular cross-section and said lower recess is of circular cross-section.

11. A battery as claimed in Claim 10 wherein the upper part of each of said sleeves is engaged in said upper recess and comprises a non-circular nut having an upwardly extending axial flange in contact with its respective terminal post and protruding from the top of said lid, and wherein the lower part of each of said sleeves is engaged in said lower recess and comprises a circular nut having an upwardly extending cylindrical portion extending into the aperture in said lid.

12. A battery as claimed in Claim 10 wherein the upper part of each of said sleeves also comprises a downwardly extending cylindrical portion extending into the aperture in said lid.

13. A battery as claimed in Claim 10 or Claim 11 wherein one of the nuts has the face thereof which is presented to its respective recess inclined outwardly so that the thickness of the nut at the periphery thereof is greater than the thickness of the nut adjacent the centre thereof.

14. A battery as claimed in Claim 10 or Claim 11 wherein at least one of the nuts has the face thereof which is presented to its respective recess formed integrally with a sealing ring.

15. A battery as claimed in Claim 10 or Claim 11 wherein at least one of the faces of the shoulders which engage said nuts is formed integrally with a sealing ring.

16. A battery as claimed in any one of Claims 4 to 15 wherein each non-circular recess is hexagonal.

17. An electric storage battery comprising the combination and arrangement of parts substantially as described with reference to the accompanying drawings.

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