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Lead acid battery, in particular a U-boat propulsion battery

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ABSTRACT

In order to create a lead acid battery, in particular a U-boat propulsion battery, in which a large number of cells are connected by means of terminals and cell connectors to positive and negative plate groups interconnected by means of connecting straps, which battery despite high battery capacity can be used in a U-boat without the need to modify the electrical installation of the U-boat, it is proposed that electric protective resistors are integrated into the individual cells.

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COMPLETE SPECIFICATION
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Invention Title:

LEAD ACID BATTERY, IN PARTICULAR A U-BOAT PROPULSION BATTERY

The following statement is a full description of this invention, including the best method of performing it known to us:

Lead acid battery, in particular a U-boat propulsion battery

5 The invention concerns a lead acid battery, in particular a U-boat propulsion battery, in which a large number of cells are connected by means of terminals and cell connectors to positive and negative plate groups interconnected by means of connecting straps.

10 U-boat batteries make it possible for U-boats to cruise submerged. The operator is interested in increasingly higher battery capacities in order to achieve maximum diving times. Especially with replacement batteries for existing U-boats this desire may run counter to the possibilities provided by the electrical propulsion installation of the boat.

15 It is known that in the case of batteries whose capacity is in an inverse ratio to their internal resistance, the higher the capacity of the battery, the lower its internal resistance. The internal resistance is in turn a measure of the short-circuit current of the battery. The short-circuit current is in an inverse ratio to the internal resistance of the battery i.e. the lower the internal resistance of the battery, the higher the short-circuit current. Accordingly an increase in the capacity of a battery is accompanied by a decrease in the internal resistance and therefore a higher short-circuit current.

20 The maximum short-circuit current permissible on safety grounds on an existing U-boat depends on the boat-specific electrical installation and may be exceeded by the increased battery capacity sought by the operator. In that case it is not possible to increase the battery capacity without a corresponding adjustment of the short-circuit resistance of the electrical installation of the boat. This may involve considerable expenditure or even be impossible because of space limitations (larger fuses, longer distances of the power rails).

30 Based on this state of the art the purpose of the invention is to create a lead acid battery, in particular a U-boat propulsion battery, which despite higher battery capacity can be used in a U-boat without the need for modifying the electrical installation of the boat.

To meet this purpose the invention proposes that electric protective resistors are integrated into the individual electric cells.

35 Preferred further developments are mentioned in the sub-claims.

By the integration of protective resistors in the individual electrochemical elements (cells) of the propulsion battery it is possible to increase the battery capacity without the need to adjust the short-circuit strength of the electrical installation of the U-boat.

- 5 In the state of the art copper terminals and copper connecting straps are used to feed the current generated in the electrodes of the cells to the connecting elements leading to the propulsion plant of the boat.

- The invention proposes that these terminals and/or connecting straps preferably be made of
10 materials with a lower specific conductivity than copper.

To this end use may be made of conductive materials such as iron, steel or preferably brass.

- Alternatively or in combination with these measures in regard to the cells, the invention also
15 proposes that some or all connecting elements made of copper in accordance with the state of the art, be replaced by materials with a lower specific conductivity in order to act as short-circuit limiting elements.

- The selection of the materials used instead of copper is determined by the boat-specific short-circuit current and can be selected from case to case to optimally adapt the battery to the boat-specific
20 limitations.

- The short-circuit limitation achieved by the invention makes it possible for the battery manufacturer to optimise given cell constructions with regard to their capacity contents and to adapt them without a change to the geometric construction of their internal resistance and therefore short-circuit
25 current. In particular it is possible for the user to carry out a precise adaptation by e.g. using some of the large number of available cell connectors in a suitable material so that with the appropriate number of cell connectors of the material proposed by the invention it is possible to set a corresponding desired internal resistance and hence short-circuit current.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A lead acid battery, in particular a U-boat propulsion battery, in which a large number of cells are connected by means of terminals, connecting straps and cell connectors to positive and negative plate groups interconnected by means of connecting straps, wherein electric protective resistors are integrated in the individual cells, characterised by the fact that that the connecting straps and/or terminals and/or some or all cell connectors are made from materials having a lower specific conductivity than copper.
2. The lead acid battery of claim 1 characterised by the fact that the material is selected from the group of iron, steel and/or brass.
3. The lead acid battery as claimed in claim 1 or 2, characterised by the fact that also or alternatively external connecting elements, connections and/or connecting lines are made of the material in claim 2.