Chapter 7

ALKALINE BATTERIES, SINTERED-PLATE, TYPE K (SAFT)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. The sintered-plate alkaline batteries described in this chapter, known as Type K (SAFT Voltabloc) types, differ considerably from conventional alkaline batteries both in construction and in operating characteristics. They are comparable in weight with a lead-acid battery of the same capacity, and have the additional advantages of mechanical strength and improved performance.

DESCRIPTION

2. There are two distinct types of Voltabloc cell, the semi-sealed, normally used for heavy-duty applications, and the semi-open; batteries made up from semi-open cells have the same dimensions as equivalent batteries of semi-sealed cells, and are distinguished by the suffix K or KH following the type number.

Semi-sealed type

3. A cut-away view of a typical cell of this type is given in fig. 1. The reduction in weight and in internal resistance in comparison with a conventional alkaline battery is achieved by the sintered-plate construction of the cells. Each plate consists of a thin strip of nickel-plated perforated steel or gauze, on to which is sintered a base of extremely porous nickel. The plates are then impregnated with the

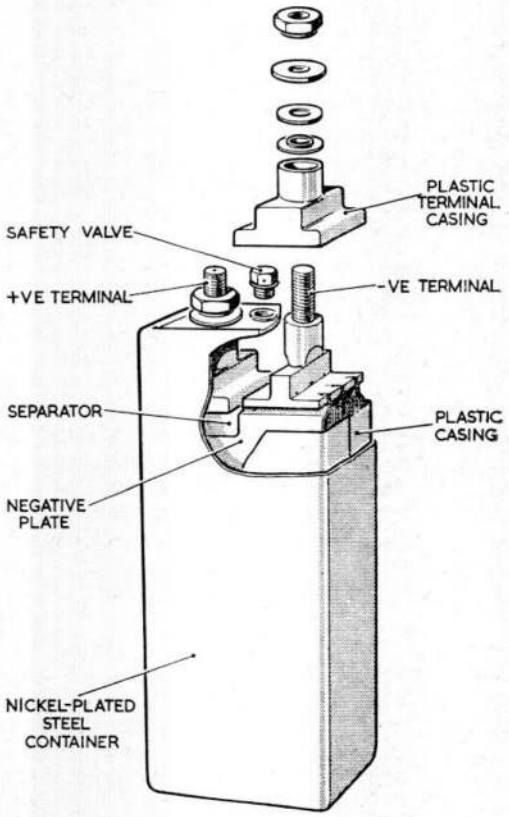

Fig. 1. Cut-away view of typical cell

active material, i.e., nickel hydroxide for the positive plate, and cadmium hydroxide for the negative plate. The sintered base gives high conductivity throughout the whole of the active material, so giving very low internal resistance combined with stable discharge characteristics even at high operating rates.

4. The plates are welded to two connecting pieces, and insulated by separators which are impervious to the action of electrolyte. Battery cases may be of nickel-plated steel or plastic. After assembly, the cells are filled with potassium hydroxide electrolyte.

5. All these cells contain a small amount of free electrolyte, but in normal use gas recombination is ensured by the balance of active materials. On overcharge or over-discharge, however, there is the possibility of gassing, and cells are fitted with a safety valve to allow the escape of gases should the pressure build up with increase of temperature under abnormal conditions.

6. Under normal charging conditions this type of cell does not evolve heat during the charge, but at the end of the charge any surplus current passed into it will be transformed into heat, with the consequent possibility of instability. Such batteries which are charged during flight are normally fitted with thermal relays and control equipment, which operates when the battery reaches a pre-determined temperature and switches the battery out of the charging circuit until it returns to its normal working temperature. Should the generator fail, the battery will be automatically returned to the line.

Semi-open type

7. In the semi-open type of cell, a different type of separator is employed, giving the battery inherent stability on overcharge so that the use of thermal relays and control equipment is unnecessary. This is achieved by introducing a separator material which causes the plates to be polarized on overcharge.

8. Whereas in the semi-sealed type of cell the surplus energy with continued overcharge is transformed into heat, in the semi-open type no heating takes place at the end of charge, the surplus energy being absorbed by electrolysis; consequently the need for topping up this type of cell is increased. The extent of topping up will vary with the conditions of use, temperature, etc.

Capacity

9. The quantity of electricity that can be taken from a fully charged cell at a given discharge rate, before the voltage falls to a defined end point, is termed the capacity of the cell. It is the product of the average current and the time, and is normally stated in ampere-hours. The effective capacity of a battery decreases with increasing load current, and decrease of temperature; as full information becomes available, this will be included in the form of curves in the chapter on the particular battery in A.P.4343A, Vol. 1. At high ambient temperatures, the battery has a higher rate of self-discharge.

10. The one-hour rate has been found to be a more satisfactory medium than the ten-hour rate for assessing the capacity of an aircraft battery, and in future the capacity at the one-hour rate will be introduced in the official nomenclature of the battery and the relevant Specification.

SERVICING

11. Servicing of these batteries will consist of a periodic capacity check, routine charging and external cleaning. With semi-open types, topping up is required; with semi-sealed types, the need for topping up is considerably reduced. It should be noted that such cells were not designed to be topped up in service, and therefore extreme care should be exercised when this is done. Full details will be found in the chapter on the particular battery in A.P.4343A, Vol. 1.

Insulation resistance test

12. Before a battery is issued from the charging room, it should be tested for insulation resistance between the battery terminals and the metal case, using a 250-volt insulation resistance tester; the minimum permissible reading is 0·5 megohm.

◀ **Note . . .**

Batteries with plastic containers, such as Ref. No. 5J/3458, may be tested for insulation resistance by placing the battery on a metal plate, and testing between the plate and the battery terminals. ▶

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