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Chapter 7

BATTERY, TYPE J, SIZE 2.EO, 24-VOLT, 27 AMP. HR. (VARLEY 24. 15/35.EO)

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LEADING PARTICULARS

Battery, Type J, Size 2.EO, 24-volt, 27 amp. hr.	*Ref. No. 5J/3506*
Capacity at 1 hour rate	*27 amp. hr.*
Overall dimensions	
Base	9·95 *in.* x 7·69 *in.*
Length (over receptacle)	11·575 *in.*
Length (over plug)	13·95 *in.*
Width (overall)	9·812 *in.* (*max.*)
Height (overall)	8·75 *in.*
Height (to terminal centres)	6·875 *in.* (*min.*)
Height (to hold down face)	8·5 *in.*
Fixing bolt centres	8·812 *in.*
Weight	67 *lb.* (*approx.*)

Introduction

1. The battery, Type J, Size 2.EO, 24-volt, 27 amp. hr. is a Varley type battery constructed on the principal described in A.P.4343, Vol. 1, Sect. 3, Chap. 5. It is used as an aircraft main supply battery.

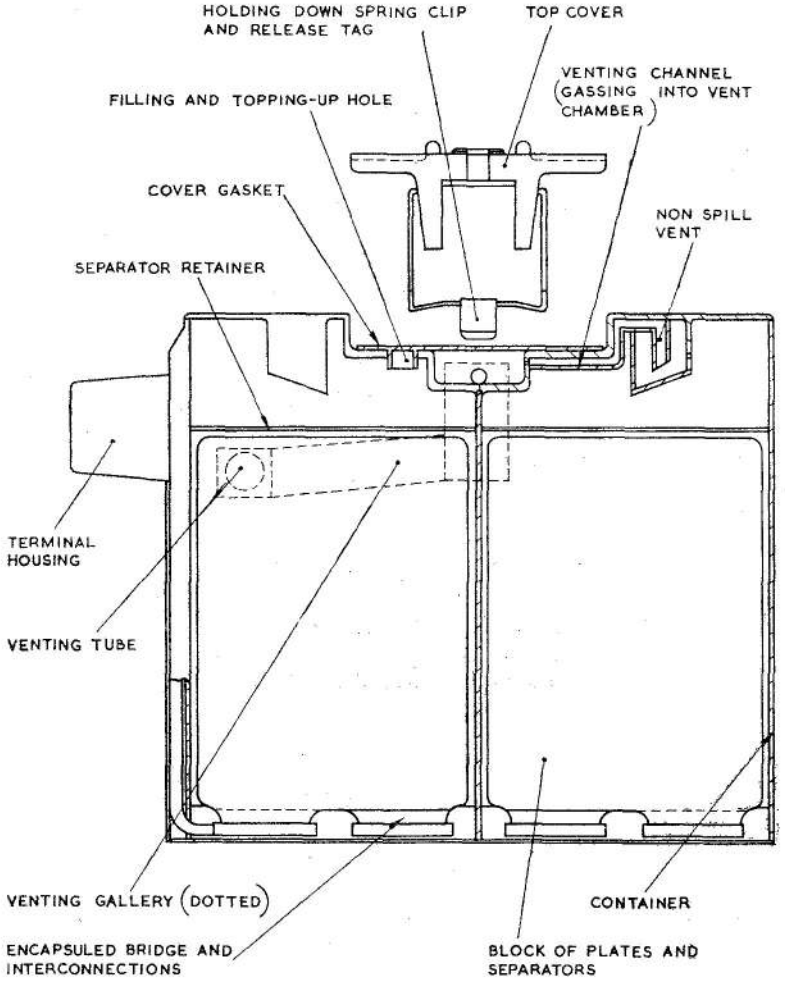

Fig. 1. Battery, Type J, Size 2.EO, 24-volt, 27 amp. hr.

DESCRIPTION

2. The battery is illustrated in fig. 1. Each cell consists of a compressed block of eight 0·034 in. negative and seven 0·308 in. positive grids filled with porous active material, with thin separators; the cell blocks are embedded in a 24-volt monobloc container made of epoxy resin/dynel/glass fibre. Connections within the cells and the inter-cell connections are completely enclosed at the bottom of the container.

3. No conventional type vent stoppers are provided. The venting outlets are situated in a common venting chamber, the filling holes being stoppered by plugs incorporated in a rubber gasket held in position by the top cover, the whole venting chamber being sealed by this gasket.

4. The top cover is an epoxy resin/glass fibre moulding, and is so designed as to provide a holding down bar and a carrying handle. The external connection to the battery is made by an Elcon quick-disconnect type connection to a receptacle which protrudes outside the main container.

Capacity

5. The effective capacity of a battery, ex-

pressed in ampere-hours, depends on the rate at which it is discharged, i.e., the higher the rate of discharge, the lower the ampere-hour capacity. The discharge characteristics for this battery are given in Table 1, and will later be shown graphically in fig. 2.

TABLE 1

Discharge characteristics at 20 deg. C

Time of discharge	Discharge current (amp.)	End voltage (volts)
20 hr.	1·8	21·6
10 hr.	3·5	21·6
2 hr.	15·0	21·6
1 hr.	27·0	21·6
30 min.	50·0	21·6
20 min.	64·0	16·0
10 min.	110·0	16·0
5 min.	190·0	16·0
1 min.	500·0	16·0

SERVICING

6. General information on the servicing of this type of battery is given in A.P4343, Vol. 1,, Sect 3, Chap. 5. In addition, the following particular instructions apply.

Initial charging

7. Batteries are supplied by the manufacturer already filled, but requiring a first charge. On receipt of a new battery, the following procedure should be adopted, unless the label attached to the battery instructs otherwise.

8. After removal of the top cover, remove the sealing tape from the venting outlets, and remove the rubber gasket. Before putting on charge, check that the electrolyte is visible approximately $\frac{1}{4}$ in. above the top of the perforated strip; restore the electrolyte level if necessary, using sulphuric acid of specific gravity 1·270 at 60 deg. F (16 deg. C).

9. Charge at 2·5 amp. until the voltage is stable over five consecutive half-hourly readings; this will take approximately 40 hours. Should the temperature of the acid reach 60 deg. C (140 deg. F), interrupt charging until the temperature falls below 43 deg. C (110 deg. F).

10. During the first charging keep the gasket on, but check from time to time that the electrolyte remans $\frac{1}{4}$ in. above the perforated strip. If the electrolyte level disappears, add acid of specific gravity 1·270; if it is high, withdraw the excess.

11. Half an hour after the end of the charging period adjust the acid level to $\frac{1}{8}$ in. above the perforated strip, and replace the gasket and top cover.

State of charge

12. The state of charge is determined by voltage, as no check of specific gravity is possible.

State of charge	*Open-circuit voltage*
Fully charged	25·1V to 25·8V
$\frac{1}{4}$ to $\frac{1}{2}$ discharged	24·5V to 25·1V
$\frac{1}{2}$ discharged	24·2V to 24·5V

13. To obtain definite information on the condition of a battery, it is recommended that an open-circuit reading be taken immediately after reading on a load of approximately 20 amp. which has been applied for 15 seconds. The increase of voltage from the load reading to the open-circuit reading with a fully-charged battery should not exceed approximately 1V, showing that the internal resistance is not excessively high, thus indicating that the battery is in working order. This test should be carried out not less than 8 hours and not more than 24 hours after taking off charge.

14. Towards the end of its useful life, difficulty may be experienced in obtaining a 25·1V open-circuit voltage for a fully-charged battery. The voltage may be between 24·9V and 25V. In this instance a capacity check should be given, and if within the limits laid down the battery may be returned into service.

Topping up

15. If the aircraft is in regular service the battery should be topped up with distilled water only. It is preferable to top up after and not before a flight. Since with this type of battery the electrolyte is absorbed into the block of plates and separators, the time taken to reach saturation point may be several minutes. Topping up should be carried out as follows.

16. Remove the top cover by freeing the two spring clips. Take off the loose rubber gasket, and add distilled water to each cell one after the other until the liquid level is visible $\frac{1}{8}$ in. above the plate/separator block and remains constant in all the cells. Replace the gasket, put on the top cover and spring the clips back into position.

Routine charging

17. It is important that batteries of this type, which have very thin plates, should not be allowed to stand in a discharged condition. If for any reason the battery has been discharged during service it should be re-charged without delay. After a battery has been out of use for two weeks, a freshening charge should be given.

18. Before being connected for charging batteries should be examined for cleanliness, the container and vents for leakage and the terminals for corrosion. The terminals should be free from corrosion, and when clean and dry should be lightly smeared with protective PX-7 or silicone compound XG-250 (previously known as MS-4).

Capacity testing

19. Top up each cell with sufficient distilled water to cover the plate/separator block. Charge the battery at any one of the following rates, until the voltage is stable over three consecutive half-hourly readings; the 17 hour rate is recommended. (1) 10 hour rate—charge at 5·1 amp. for 10 hours or (2) 17 hour rate—charge at 3 amp. for 17 hours or (3) 24-hour rate—charge at 2 amp. for 24 hours. The electrolyte level should be maintained throughout the charge approximately $\frac{1}{8}$ in. above the plate separator block, using distilled water. Re-check this level half an hour after charge.

20. The capacity test discharge should not be started for at least two or not more than 24 hours after the end of charge. Discharge the battery at the one hour rate until the voltage drops to 21V on load. For a battery up to service capacity the discharge period should not be less than 45 minutes. If this time is exceeded, re-charge, replace the rubber gasket and top cover and return to the aircraft or stores.

21. If the period is less than 45 minutes, the battery should be re-charged and the charge/discharge cycle repeated once or twice, as may be necessary. Should the capacity on the second discharge show a tendency to rise and be very near the minimum 45 minute period, before re-charging remove excess electrolyte from each cell and refill to $\frac{1}{4}$ in. above the plate/separator block with acid of 1·270 S.G. Re-charge and discharge once more and if the battery is then satisfactory, return to service with an electrolyte level of $\frac{1}{8}$ in. above the plate separator block, as with a normal battery. Should the duration of the third discharge be less than 45 minutes, the battery should be rejected as unsuitable for further use in aircraft.

22. Before being re-issued for further service, ensure that the electrolyte level is visible and remains $\frac{1}{8}$ in. above the plate/separator block by addition of distilled water.

Storage

23. A filled but uncharged battery can be stored for a period of up to five years in temperate and two years in tropical climates, provided that the storage conditions are dry and cool and the battery remains well sealed at all times until required.

24. A filled and charged battery should be inspected and given a freshening charge every two weeks; under no circumstances should it be left without a freshening charge for longer than four weeks.

25. The battery should be topped up regularly with distilled water. When a filled and charged battery has been out of use for three months, it must be given a capacity test before being issued.

Repair

26. Due to the material of which the case is constructed, the repair procedure detailed in A.P.4343, Vol. 1, Sect. 3, Chapter 5 for certain Type J batteries is not applicable to this battery.

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