Chapter 6

Avoiding Hazards and Preventing Quality Problems

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Avoiding Hazards

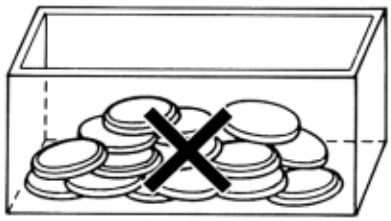
Case Study and Explanation

To store batteries, place each of the batteries in the sections provided on the designated tray in such a way that they will not make contact with one another.

Ignition

2,000 new batteries were taken out from the 20-piece tray containers and thrown randomly into a cardboard box where they were stacked on top of one another. About 30 minutes later, smoke was seen emanating from the batteries followed by ignition several minutes after that.

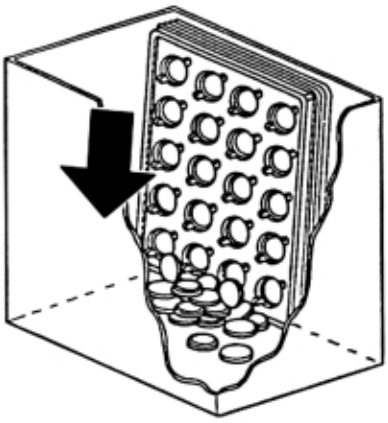
Case study: Ignition of batteries stacked together



Rupture

This particular case involves batteries which were packed in trays and destined for OEMs. The batteries were packed in an intermediate package consisting of 10 trays with each tray containing 20 (or 40) batteries, and the trays were stacked on top of each other. The intermediate package (of the 10 trays) was opened at the distribution stage of our operations, and five of the trays were delivered to one customer. Since the trays were stored at an angle inside the box, the batteries fell out of their positions on the trays and became stacked up on the bottom inside the small box. As a result, some of the batteries burst.

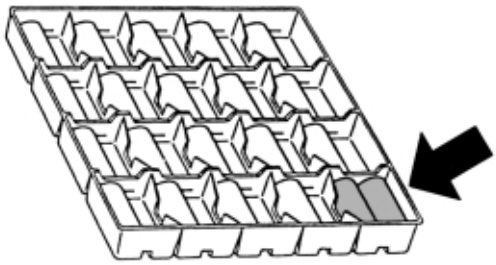
Case study: Bursting of batteries stacked on top of one another



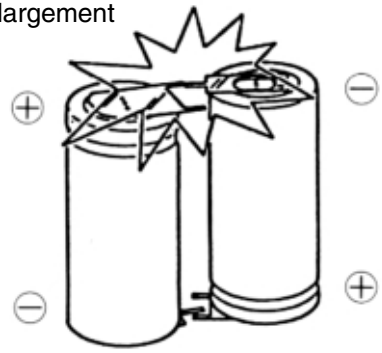
Generating Heat

21 cylindrical type lithium batteries with tab terminals were placed in a 20 piece tray--one battery more than the capacity of the 20-piece tray shown in the figure--two of the batteries were placed together with their poles reversed. As a result, the tab terminals came into contact with each other, causing external shorting, and the temperature of the two batteries rose dramatically, generating heat and causing the tubes to burst.

Since two batteries were placed in a space (indicated by ⬅) allocated to one battery, their terminals made contact with each other, and external shorting resulted.



➡ an enlargement



Generating heat and deterioration of capacity

To store batteries, place each of the batteries in the sections provided on the designated tray in such a way that they will not make contact with one another.

Reduction of Battery Voltage and Deterioration of Capacity

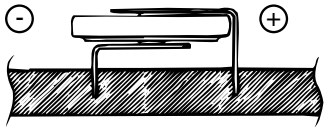
(1) Reduction of battery voltage and deterioration of capacity through contact with antistatic conductive materials

Incidents have been reported where terminal-mounted batteries for memory backup or coin-type lithium batteries have come into contact with antistatic conductive materials, thus forming external discharge circuits and leading to voltage drops or capacity deterioration.

In manufacturing plants using ICs, LSI and other semiconductor components, thoroughgoing antistatic measures are taken. Various protective materials are used to prevent static: most of them have special compounds of carbon, aluminum foil and other metals and are therefore conductive. These protective materials are used, for example, in the form of packaging bags, trays, mats, sheets, films, corrugated boards and resin cases.

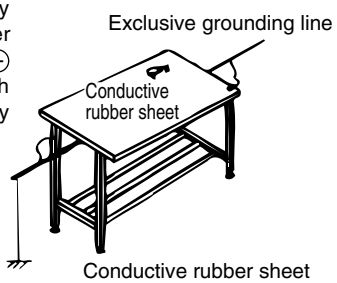
A protective material may have a resistance ranging from 10^3 to 10^6 Ω/cm, for instance. This means that if the ⊕ and ⊖ terminals of a battery come into contact with this material, a current ranging from several milliamperes to several microamperes will flow and the battery will discharge, causing voltage drop and capacity deterioration.

A terminal-mounted battery was inserted into a conductive mat. The battery charge was exhausted in several days.

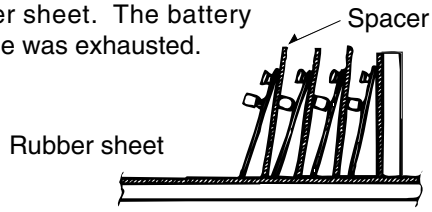


Conductive mat

A battery was placed directly on a rubber sheet spread over a worktable. The ⊕ and ⊖ terminals were in contact with the sheet and the battery charge was exhausted.



Battery-mounted PC boards were inadvertently brought into contact with spacers and a conductive rubber sheet. The battery charge was exhausted.



When batteries are to be used near protective materials, take every possible care to ensure that the ⊕ and ⊖ terminals of the batteries or PC boards, etc. on which batteries are mounted do not touch these protective materials directly.

A battery-mounted PC board was inadvertently brought into contact with a conductive resin case. The battery charge was exhausted.

Conductive resin case

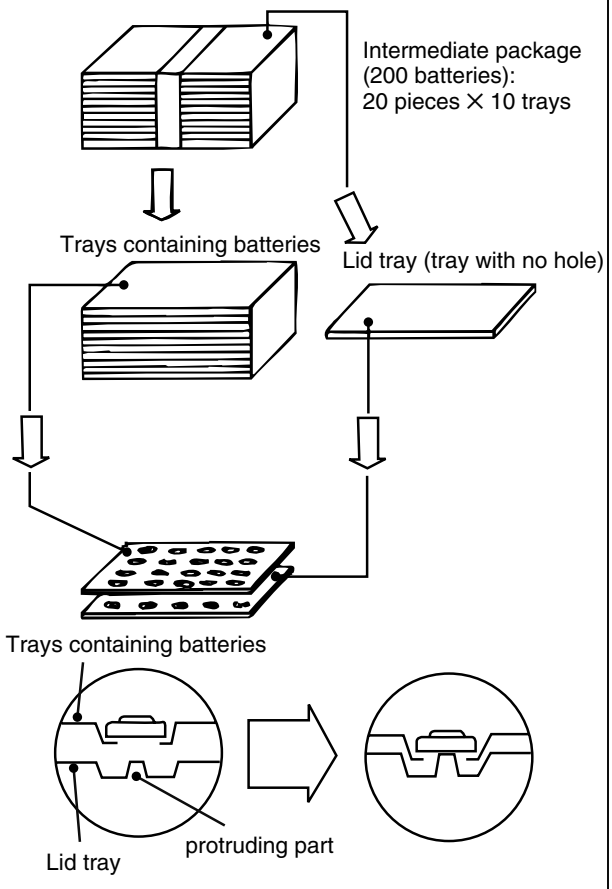
(2) Reduction of battery voltage and deterioration of capacity through contact between batteries

Incidents have been reported where terminal-mounted batteries for memory backup or coin-type lithium batteries have come into contact each other, thus forming discharge circuits (shorted state) and leading to voltage drops or capacity deterioration. Observe the following precautions.

1. Remove the batteries from the tray one at a time.
   If the tray is turned upside down, the batteries will come into contact with each other, forming discharge circuits.
2. Do not place batteries randomly in a parts box or other container.
   Discharge circuits will be formed by multiple batteries coming into contact numbers of the batteries, causing the batteries to discharge and drain.

○ Recommended procedures

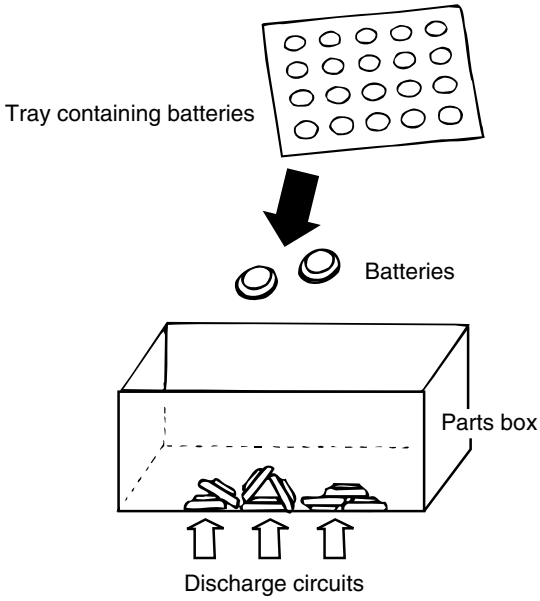
*Utilize the tray lid in taking out batteries

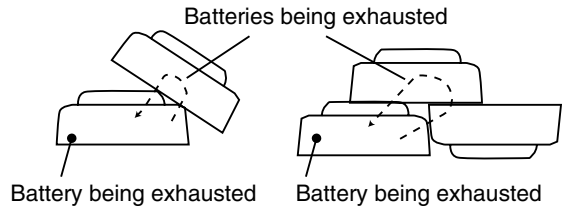


*Lay a tray lid flat and place a tray containing batteries on top of it: batteries are pushed up by protrusions of the lid tray so that they can be easily picked up with fingers.

× Prohibited procedures

*Do not throw batteries randomly into a parts box by turning over trays containing batteries.





*Contact of batteries with each other forms discharge circuits, thus the batteries are drained.

Memory Erasure Problems

Coin-type lithium batteries are often used as the power supplies for memory backup in various equipment. However problems with the erasure of valuable data in the memory due to improper contact between the batteries and equipment have been reported.

1. When batteries are to be used continuously for a prolonged period.
   ●Select tab terminal-mounted batteries, and solder the tabs to the battery connection terminals of the equipment. (See Fig. 1)
   ●When batteries need to be replaced, use a battery holder (see Fig. 2) or battery with lead wire connectors (see Fig. 3). Battery holders made by Panasonic (exclusively for the CR2032 and BR2032, see Fig. 2) are available for use.
2. When batteries need to be replaced in the short term, select batteries with no terminals or lead wire connectors.
   ●Use of Y-shaped terminals (2-point contact) for both the ⊕ and ⊖ poles as the shape of the connection terminals in the equipment helps to achieve a more stable contact. (See Fig. 4)
   The contact pressure of the contacts should be no less than 2 to 10N (approx. 200 to 1000 gf). (See Fig. 5)
   ●To prevent momentary contact failure of several milliseconds in the circuit, the use of a tantalum capacitor, etc. with a capacitance of several microfarads is effective. (See Fig. 6)
   ●For the connection terminals of the equipment, use iron or stainless steel with nickel plating at the very least. Gold-plating is more suitable when the contact resistance must be reduced.

Note: Do not touch batteries with bare hands because perspiration (salt), body oil etc. will increase the surface resistance which may lead to defective contact.

<Reference sample>

Fig.1: soldering

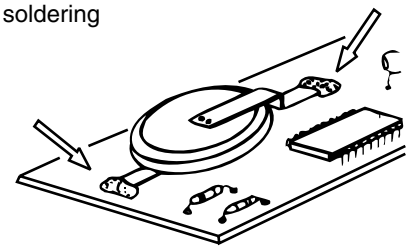


Fig. 2

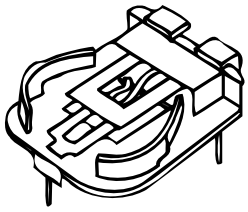


Fig. 3

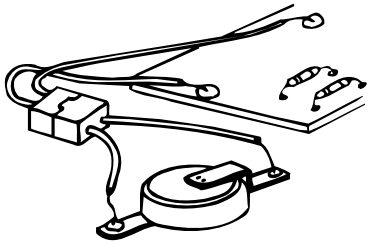


Fig. 4

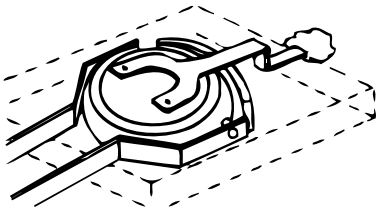


Fig. 5: excessive load

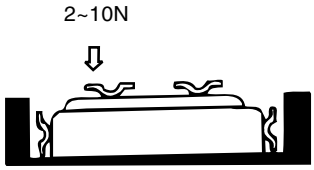


Fig. 6