

Rayovac Value Bright Heavy Duty LED Flashlight

Disassembly Process and Parts List



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Intro to Industrial Design

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September 3, 2013

Homework #1

This paper will cover the assembly, disassembly, and part-by-part production of a Rayovac Value Bright Heavy Duty LED Flashlight. This is a very simple, single LED standard flashlight. This particular product consists of only 14 parts. These parts are produced using several different techniques including vacuum metalizing, metal stamping, and Injection molding.

Parts List:

1. Bulb power contact spring
2. Spring contact cap
3. 1.5v .2w single LED Bulb
4. 1.5v Rayovac Battery
5. Plastic window
6. Chrome reflector
7. Lens & reflector housing/cover
8. Grey transition ring
9. Metal switch track
10. Metal switch grounder
11. Plastic switch
12. Plastic flashlight body
13. Metal ground plate
14. Big ground spring



Assembly:

This product can be assembled by hand in roughly one minute. It does not consist of any screws or extra fasteners and requires no tools to take apart or put together. The entire Lamp part of the flashlight is held together by threads on the spring contact cap (green) and the chrome reflector. The ground spring was welded (red) to the metal switch track and slipped down into a very tight slot in the body so it does not move. The plastic trigger has a triangle shaped bottom tongue (yellow) that was forced through a small opening in the switch grounder. Teeth in this opening keep the switch from coming loose. This also keeps the switch and the switch ground plate in place on the body and track. After that is complete the battery is placed (negative side down) inside the flashlight and the transition plate is slid onto the top of the body. Finally the lamp is screwed down onto the threaded part of the body.

(See picture on page #2)



Part-by-Part Manufacturing Process:

Injection molding was used to create the majority of this product's parts. This includes:

- Plastic body
- Plastic switch
- Plastic spring contact cap
- Plastic window
- Plastic reflector
- Plastic Reflector housing/cover
- Plastic Transition ring

Injection molding is the process in which molten plastic or metal is injected into aluminum, ceramic, or steel molds (shaped like the end product) and squeezed under high pressure. Once the plastic cools the mold is opened and a solid form of the empty space in the mold is left behind. Injection molding is almost always used in the production of solid parts. An example of another product that is often produced using injection molding is plastic interior car parts. The mold even leaves a fake leather-like texture on some parts.

Press stamping is the second most common manufacturing process in the making of this product. This includes:

- Metal switch track
- Metal switch grounder
- Metal ground plate

A stamping press is a common piece of equipment that is used for various tasks that involve shaping metal. In this product's case it is used to bend thin metal connectors that help to ground the flashlight's battery. These machines are usually hydraulic and can do many more tasks than just bend metal.

This product consists of two different springs:

- Ground spring (large)
- Contact spring (small)

These springs were most likely made using some kind of machine that twists steel wire into coils. Steel is the most common material used to make springs because it does not bend or break easily.

Vacuum Metalizing is the process that was used to give the plastic reflector part its shiny chrome-like appearance. This process is where evaporating metals inside a vacuum chamber bond to the desired substrate to create a uniform metalized layer. This process is often used to give plastic parts the appearance that a metal would have.

The LED bulb is something that has its own manufacturing process. A light emitting diode is soldered to a small circuit board. Then an aluminum shell with and a clear plastic cover are put around the circuit board and diode. The clear plastic cover works as a lens and as protection for the LED. The aluminum body is used to make the bulb usable in a flashlight and serve as a place for the positive part of the battery to make contact with the diode. (best guess)

A battery's positive end is called the cathode and its negative end is called the anode. These connect via a conductive pass way in the flashlight. This pass way conducts electricity when 3 components, two electrodes and an electrolyte, interact. The manufacturing process begins by cutting nickel plated steel into oval pieces. Then shaping each piece into a tube called a consol. The consol will eventually contain graphite, silver catalyst, magnesium dioxide, barium sulfate, zinc, gelling agent, and potassium hydroxide. A press shapes the cathodes powdered chemicals into hallow pallets. Three pallets are inserted into each consol. Then a machine makes a ridge on one end of the consol to help seal it. Nozzles then apply sealant to the negative end of the consol. Separators (a thin roll of paper) are then placed in the center of the consol. Then all of the other chemicals are injected into the battery where they belong. A welding machine fuses a 4 cm nail to the cap of the battery (where current collects). That cap is then pressed onto the battery. A crimping machine makes another ridge to seal the cap and prevent leakage. Once the batteries are tested they are complete.

Citation page:

Description: *How It's Made* episode clip featuring flashlights (aka torches in the UK)

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Description: *How It's Made* episode clip featuring alkaline batteries.

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Description: Vacuum metalizing process explanation.

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Description: Metal stamping press explanation.

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