

# **Technical Definition of Can Opener**

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## **Introduction to the Can Opener**

One should not take for granted the great developments in technology that allow the safe consumption and preservation of food. Throughout history, there has been a need to preserve food to save for later occasions. Due to the unpredictability and confinement of agriculture to factors relating to season, weather, and climate, when harvests do provide food, there has existed a need for it to be saved for when harvests or livestock do not provide. Historically, salt had been used extensively, which caused West Africa to profit extensively from its trade. Additionally, the need to preserve food was the precursor to European explorers to Asia, and to an extent, the European discovery and settlement of America. In modern times, cans are an extremely convenient and widespread method of preserving foods. In emergency bunkers and the likes, cans prove to be reliable, and the backbone of food preservation. The humble can opener is one of the commonplace, and often overlooked, tools in the kitchen, which allow much of our modern food production.

## **History of the Can Opener**

The usage of cans, or the idea of sealing food in containers for preservation, started with military applications, first dating back to Napoleon, who offered a reward for anyone who could develop a way to reliably preserve food. Napoleon began to use



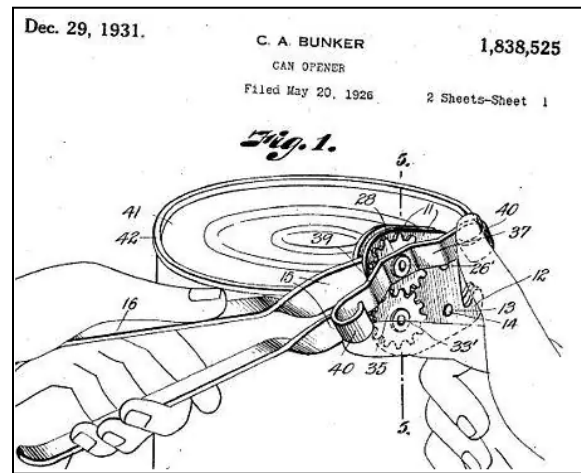
glass containers with food sealed inside in his armies. The development from Napoleon until the nineteenth century was rather stunted, until Peter Durand in England, began using wrought, tin

plated iron to preserve food. This was the first major step towards the invention and use of the can opener. His original cans were extremely thick, and sealed with solder. They thus needed a hammer and chisel to open, much different to the convenient product used today.

Robert Yeates, in 1855, then patented the first can opener, although it did not resemble what we use today. It featured a curved blade to cut around the lid. In the late nineteenth century, Ezra Warner, in the United States, then patented the lever styled can opener, which was utilized in the



American Civil War for soldiers' rations. This design was also used in supermarkets, however employees would open the cans, and serve customers. It did not make it's way into personal, domestic use. This design also had major design flaws, and left cans with an extremely sharp, jagged edge. It was only in 1870 when William Lyman



designed the rotating wheel can opener, which allowed for smoother cutting an easier use, and became the foundation, and continues to be, of modern can openers (White).

While this marks the invention of the can opener, the military used a different version of the can opener, which was extremely compact, and not entirely designed for ease of use. It became a staple of the American military and its culture, even after it's



retirement from service. Some enthusiasts list over ten uses of these military can openers, demonstrating their significance (Armynavyoutdoors).

### **Components, Assembly and Function**

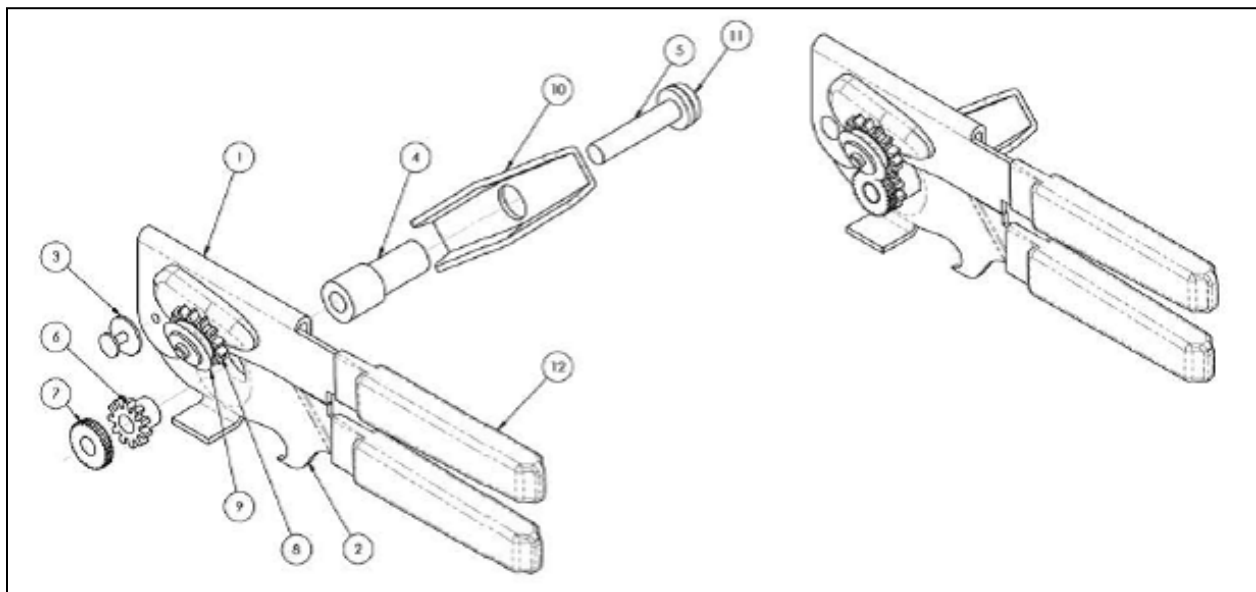
On the market, there are a variety of can openers, with various features and knacks, or a lack thereof. However, the main components of the modern can opener are as follows.

- **Cutting Wheel:** The main purpose of the cutting wheel is to pierce the rim of the cover of the can. Instead of being sharpened to a fine edge and cutting into the can like a razor, instead, through the pressure generated by the clamping arms, the can opener is able to cut through the lid of the can.
- **Drive Wheel:** The main purpose of the drive wheel is to turn the can as the cutting wheel pierces the lid. This notched wheel grips onto the can, and with the same energy used to pierce the top of the can, the underside of the top of the can is pushed in the direction of the spinning drive wheel, causing the can to turn, enabling the lid to come clean off.
- **Turning Crank:** This is the power generator for the can opener. Since the turning crank is larger than the wheels, it allows for more torque to be generated by the operator, which is used to turn the gears. If the crank wheel were smaller, turning it would be much more difficult, and would make the product difficult to use or inoperable. When the crank is turned, both the drive wheel and the cutting wheel turn, and work as intended.



- Clamping Arms: The clamping arms allow the user to grip the device, as well as hold the cutting wheel and the drive wheel in place, to allow the gear to pierce into the can. Utilizing a lever, since the user holds onto the clamp further than the gears are, the user is able to easily hold onto the device firmly.
- Grip Covers: The purpose of the grip covers are solely to make the product easier to hold onto, and more comfortable. They are usually made from rubber. Without grip covers, or a special area to hold onto the device, if the device were to become wet, it would be difficult to use. Furthermore, if the user opens many cans with the device, without a grip cover, they can find it difficult.
- Gears: Gears, in general, are the heart of can openers, and the reason they work. They allow the translation of motion from the hand of the operator to the turning wheel which opens the can. Gears are especially important in a can opener, as if they are precise, the cut will be clean, and usage will be easy. If the gears are not precise, or the ratio is not correct, the cut will not be clean, and usage will be either too difficult, or ineffective and tiresome.
- Ratchets: A ratchet is a mechanism that allows for motion to be produced, and to be useful, in one direction, while preventing movement in the other direction. This is extremely vital in a can opener, as the gears and motion need to be in the correct direction to properly grip the can and open it. Motion in the other direction can, one, confuse the user who does not know the correct direction to turn the device, as well as cause unwanted damage to the can. Ratchets also allow proper tension to be maintained on the other parts of the can opener.

- Springs: In some basic variations of the wheel can opener, springs are not present. However, the impact of springs, and their inclusion in the production of some can-openers, allows for a great amount of wear reduction. Springs maintain tension within the can-opener system, and allow for uniform distribution of load on the components of the can opener. An example of their function is that of a car suspension, which absorbs bumps on the road. Likewise, a can opener's springs absorb minor variation in the can from production, and allow the user with a much gentler experience. Studies have found that by incorporating springs into can openers, wear on gears and ratchets can be reduced by up to half of what they would experience without springs, which results in longer lifespan of the product (Lambert).



### **Materials of the Functional Portion**

Since early can openers were extremely thick, they required a hammer and chisel to open. The materials of these were mainly high-carbon steel and iron, with wooden bodies. Then, with the development of military can openers, they were made solely of carbon steel. Today, can openers

continue to be made with metal, due to its durability and necessity when cutting through cans. However more detail is required, and can openers fall into three categories.

- **Stainless Steel:** Stainless steel can openers are considered the pinnacle of design. They are extremely durable, and resistant to corrosion and rust. This is especially important for chefs and professionals who regularly use and rely on their equipment. This also makes the product resilient if left in a wet environment, such as a sink. Stainless steel is also very easy to clean, an aspect vital in preventing illness and ensuring safety.
- **Aluminum:** Aluminium is the only other major material can openers are produced from. In comparison to stainless steel, they are considered less durable, however cheaper. They are also lighter than stainless steel, making them popular amongst backpackers, campers, or in other outdoor activities where weight is important.
- **Other Rare Materials:** Any other material is an anomaly, however have some benefits. Titanium, for example, is much more resilient than both stainless steel and aluminum, while also being lighter. Such materials are used mainly by small startups and niche companies (Lambert).

### **The Handle**

The main purpose of a can opener, or any piece of technology, is to be useful to humans, and convenient. If a product is difficult to use, non-ergonomic, or dangerous, it does not matter how well the functional part of the product is. With this, the importance of the handle should not be overlooked as trivial, or unimportant to understanding the design of can openers.

Ergonomic design plays a crucial role in can openers. Some basic can openers do not contain any consideration for ergonomic design, and simply feature a metal handle, which is an extension of

the lever mechanism. This can make it very difficult for a chef who has slippery hands to grip the product effectively, and can lead to an increased risk in injuries.

There are three main materials handles are made of, each of which come with their advantages and drawbacks:

- **Plastics:** Plastics are considered the middle-path in grip-materials, as they combine between ease of cleaning, lightweightness, as well as both durability and affordability. Plastics are extremely common on most modern appliances, due to their cheap production costs. They are, however, a byproduct of petroleum, and their usage should be considered in light of environmental friendliness.
- **Rubbers:** From the materials used, rubber provides the strongest grip. This makes them popular in appliances that are designed for people with disabilities, or difficulties gripping, such as arthritis. One major drawback is, as rubber ages, it's grip decreases, reducing effectiveness.
- **Woods:** Wood is the least common grip material, especially on modern, mass-produced can openers. They are mainly used for aesthetic design, for matching kitchen sets. Despite this, they are also relatively ecologically friendly compared to the former two materials (Lambert).

### **Production Process**

The production process of a can opener involves 8 main steps, some of which are shared throughout the world of engineering.

1. **Design and Prototyping:** The first step of the production of any technology is the design and prototyping. Before a product is produced in mass, it's design must be codified and refined. The dimensions of the product are designed, as well as its features and materials.

Here, engineers choose between different designs, and weigh cost and quality. Engineers today use CAD 3D modelling softwares to accurately design the can opener.

2. **Selection of Materials:** After the design is determined, and prototypes have been made, an engineer must decide which materials to use. As discussed previously, the main functional components of the can opener are either made from stainless steel or aluminum. An engineer must consider production cost, the quality of the final product, the safety of the material, and its sourcing. Price point plays a heavy factor in this step.
3. **Metal Cutting and Stamping:** After the raw metals are determined, the actual can opener now gets produced. Different parts of the can opener are molded out of steel using laser cutters and water jets. A common method of production is having the components stamped from a steel sheet, allowing for ease of scaling and mass production.
4. **Handle Production:** As previously discussed, handles are often made from different materials than the rest of the functional parts of the can opener. If the handle is made from rubber, it likely goes through a process called injection molding. Plastic pellets are heated until forming a liquid, and injected into the molds for the handles.
5. **Sharpening:** To sharpen the blade of the can opener, the piece undergoes heat treatment. In this, the steel is heated and rapidly cooled, which toughens the steel and makes it more resilient against wear and tear.
6. **Assembly:** After all the parts have been processed, the final product is put together. Both automated machines and workers are needed to finish the product, and assemble it.
7. **Quality Control:** All products in the modern day market have to go through quality control. This ensures, for a company, that the products that reach the customers are up to standard. This builds trust between the company and the customer. Another benefit from

quality control is the company saving money from potential returns. If a product does not function correctly, customers will be unsatisfied and return their products, and the company will have to eat their costs.

8. Packaging and Distribution: After quality checks have been passed, the product is ready to be sent from its production facility to the consumer. The can opener is packaged with an appropriate label, an instructions manual, as well as any applicable warnings. From there, they are shipped out through the world thanks to globalization (Eralkanmetal).

### **Maintenance and Points of Weakness**

Like all products, there are points of weakness for can openers and common breaks, and solutions for them. Some of the most common failures within a can opener are the following:

- Stripping or Slipping of Gears Under Pressure: The common solution and prevention for this issue is regular lubrication of the device. Any stripped gears should be replaced to prevent further damage to the can opener.
- Dulling or Chipping of Cutting Blades: Blades on the can opener should be sharpened, if possible. As some can openers are serrated, it may be difficult to sharpen the blade. In such a case, the blade should be replaced. This allows for safety of the user, as well as reduces the risk of contamination of food with fragments of metal.
- Slipping or Lack of Grip of the Drive Wheel: Likewise, lubrication should be regularly applied to the can opener. If slipping persists, the drive wheel should be replaced (Schempro).

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