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How Drum Brakes Work

by Karim Nice

Drum brakes work on the same principle as disc brakes: **Shoes press against a spinning surface**. In this system, that surface is called a drum.

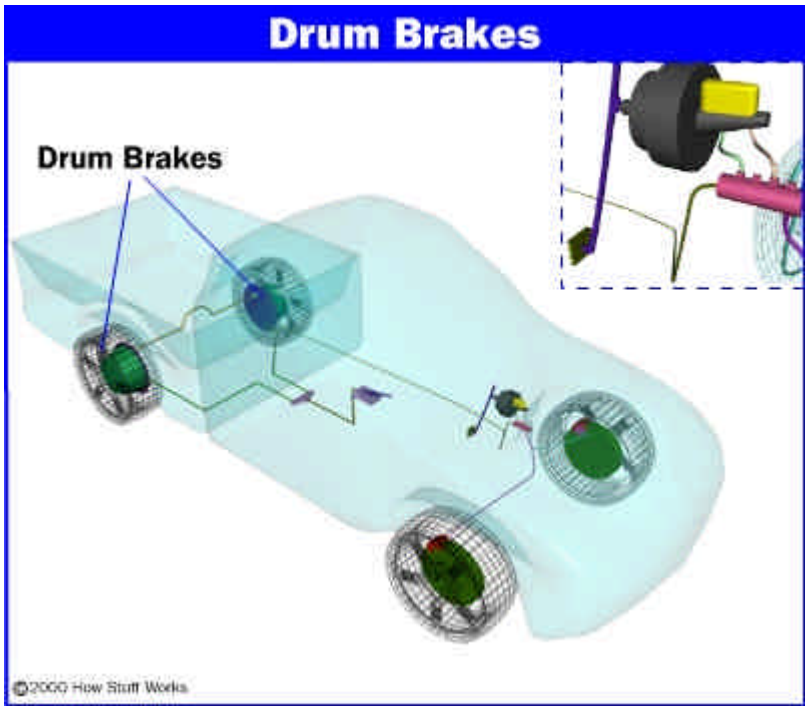

Figure 1. Location of drum brakes

Many cars have drum brakes on the rear wheels and disc brakes on the front. Drum brakes have more parts than disc brakes and are harder to service, but they are less expensive to manufacture, and they easily incorporate an emergency brake mechanism.

In this edition of **HowStuffWorks**, we will learn exactly how a drum brake system works, examine the emergency brake setup and find out what kind of servicing drum brakes need.

Figure 2. Drum brake with drum in place

Figure 3. Drum brake without drum in place

Let's start with the basics.

The Drum Brake

The drum brake may look complicated, and it can be pretty intimidating when you open one up. Let's break it down and explain what each piece does.

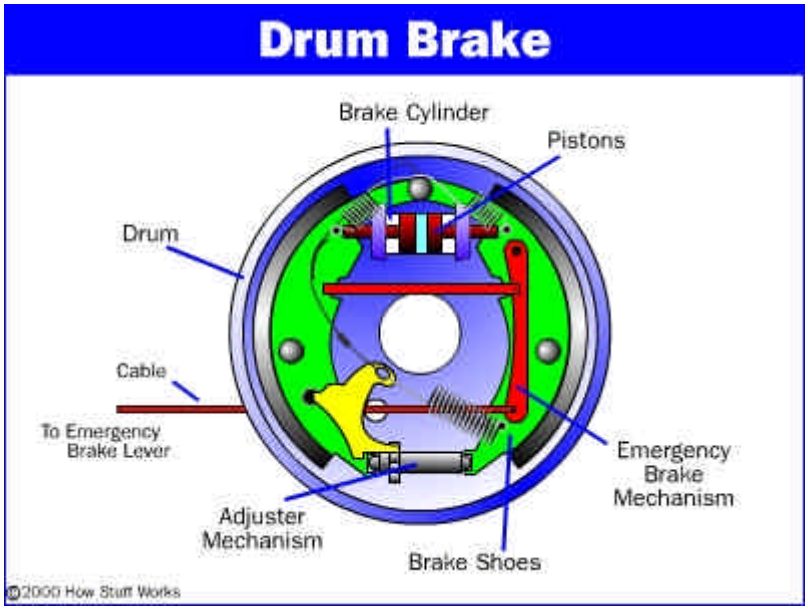

Figure 4. Parts of a drum brake

Like the disc brake, the drum brake has two brake shoes and a piston. But the drum brake also has an **adjuster** mechanism, an **emergency brake** mechanism and lots of **springs**.

First, the basics: **Figure 5** shows only the parts that provide stopping power.

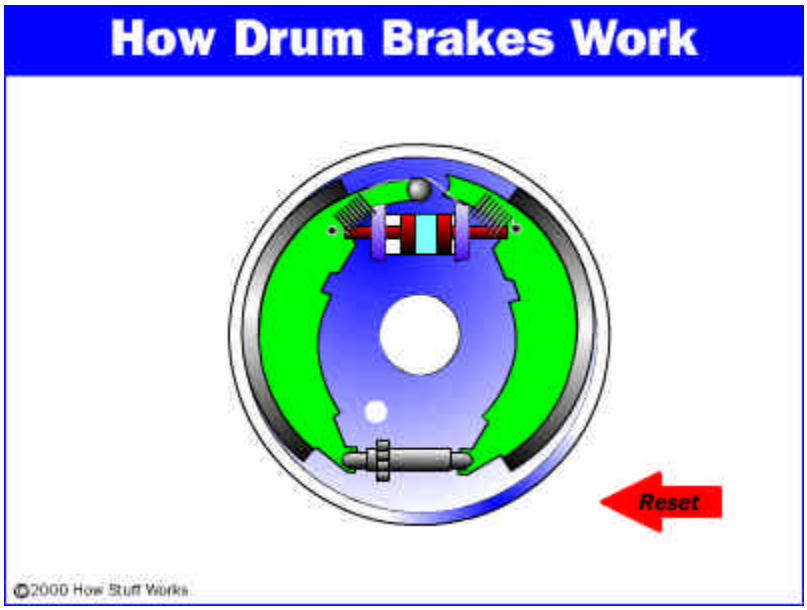

Figure 5. Drum brake in operation

When you hit the brake pedal, the piston pushes the brake shoes against the drum. That's pretty straightforward, but why do we need all of those springs?

This is where it gets a little more complicated. Many drum brakes are **self-actuating**. Figure 5 shows that as the brake shoes contact the drum, there is a kind of wedging action, which has the effect of pressing the shoes into the drum with more force.

More Brakes!

- How Brakes Work
- How Master Cylinders and Combination Valves Work
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- How Power Brakes Work
- How Anti-Lock Brakes Work

The extra braking force provided by the wedging action allows drum brakes to use a smaller piston than disc brakes. But, because of the wedging action, the shoes must be pulled away from the drum when the brakes are released. This is the reason for some of the springs. Other springs help hold the brake shoes in place and return the adjuster arm after it actuates.

Brake Adjuster

For the drum brakes to function correctly, the brake shoes must remain close to the drum without

touching it. If they get too far away from the drum (as the shoes wear down, for instance), the piston will require more fluid to travel that distance, and your brake pedal will sink closer to the floor when you apply the brakes. This is why most drum brakes have an **automatic adjuster**.

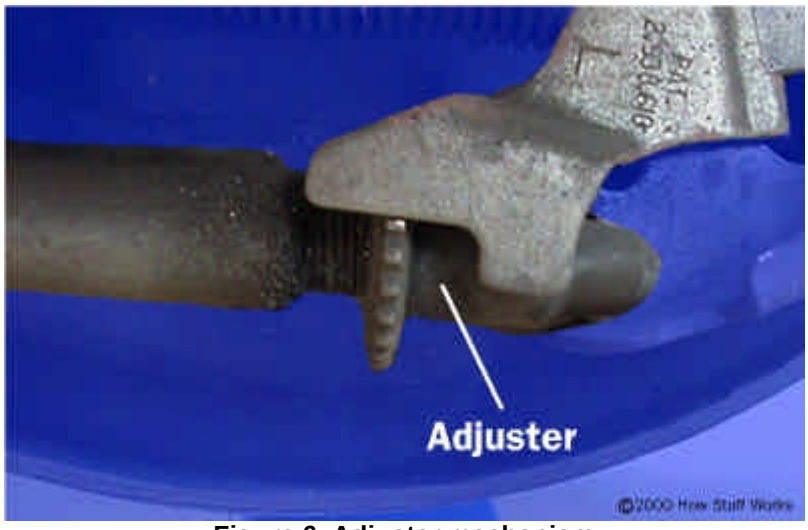

Figure 6. Adjuster mechanism

Now let's add in the parts of the adjuster mechanism. The adjuster uses the self-actuation principle we discussed above.

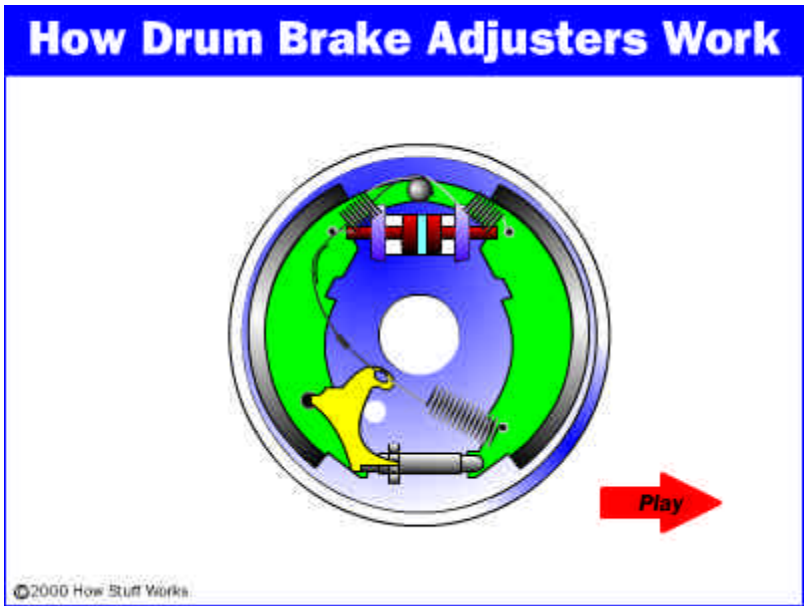

Figure 7. Drum brake adjuster in operation

In **Figure 7**, you can see that as the pad wears down, more space will form between the shoe and the drum. Each time the car stops while in reverse, the shoe is pulled tight against the drum. When the gap gets big enough, the adjusting lever rocks enough to advance the adjuster gear by one tooth. The adjuster has threads on it, like a bolt, so that it unscrews a little bit when it turns, lengthening to fill in the gap. When the brake shoes wear a little more, the adjuster can advance again, so it always keeps the shoes close to the drum.

Some cars have an adjuster that is actuated when the emergency brake is applied. This type of adjuster can come out of adjustment if the emergency brake is not used for long periods of time. So if you have this type of adjuster, you should apply your emergency brake at least once a week.

The Emergency Brake

The emergency brake on a car has to be actuated by a different power source than the primary braking system. The drum brake design allows for a simple **cable** actuation mechanism. Click here to see an emergency brake in action.

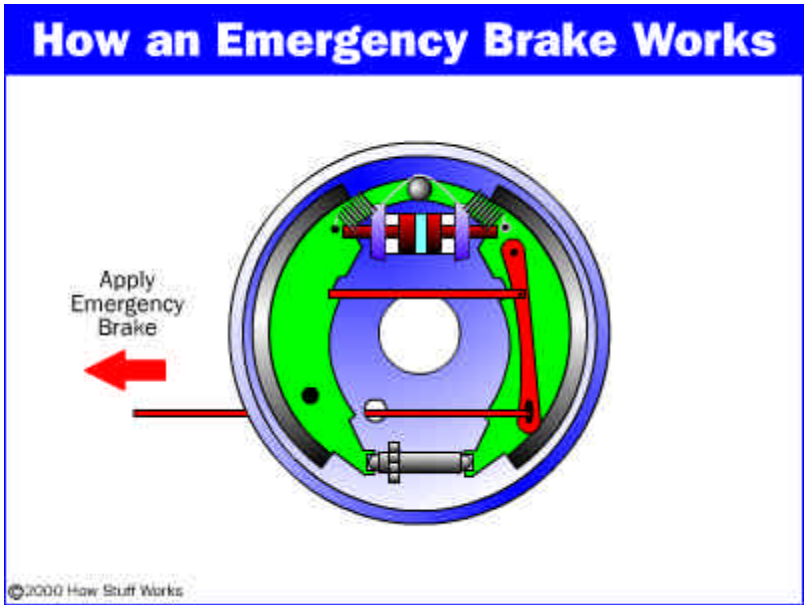

Figure 8. Emergency brake in operation

When the emergency brake is actuated, a cable pulls on the lever, which forces the two shoes apart.

Servicing

The most common service required for drum brakes is **changing the brake shoes**. Some drum brakes provide an inspection hole on the back side, where you can see how much material is left on the shoe. Brake shoes should be replaced when the friction material has worn down to within 1/32 inch (0.8 mm) of the rivets. If the friction material is bonded to the backing plate (no rivets), then the shoes should be replaced when they have only 1/16 inch (1.6 mm) of material left.

Photo courtesy of a local AutoZone store

Figure 9. Brake shoe

Just as in disc brakes, deep scores sometimes get worn into brake drums. If a worn-out brake shoe is used for too long, the rivets that hold the friction material to the backing can wear grooves into the drum. A badly scored drum can sometimes be repaired by refinishing. Where disc brakes have a minimum allowable thickness, drum brakes have a **maximum allowable diameter**. Since the contact surface is the inside of the drum, as you remove material from the drum brake the diameter gets bigger.

Figure 10. Brake drum

For more information on all different kinds of brakes, check out the links on the next page!

Lots More Information!

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- How Brakes Work
- How Master Cylinders and Combination Valves Work
- How Disc Brakes Work
- How Power Brakes Work
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