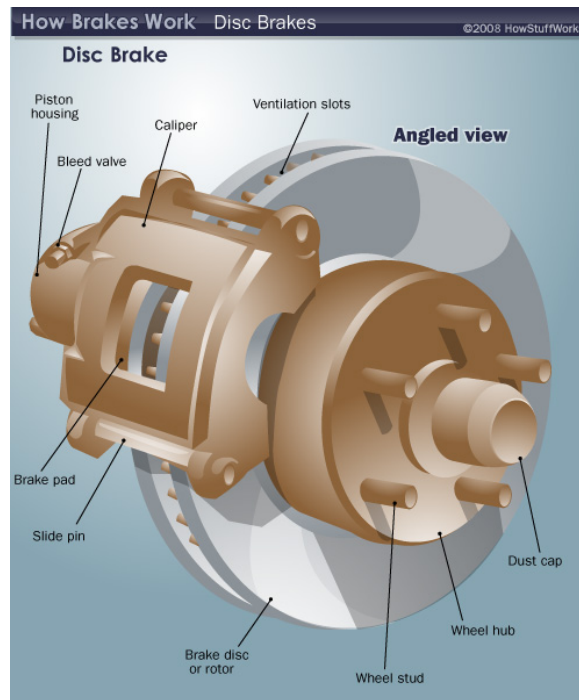


## AUTOMOBILE DISC BRAKES



*Photograph from howstuffworks.com*

Automobile disc brakes are designed to stop a car and are placed on all four wheels. They will bring a car to a stop from any speed and will also slow the car to a slower speed. They were first invented in the 1890's, but were not used in cars until the 1950's (Ceschin, 2009). Disc brakes perform better than regular drum brakes and still work well when wet. They were usually used in performance cars, but are now being used in many types of vehicles. Disc brakes are composed of three main parts, the rotor, the caliper and the brake pads.

### **Rotor**

The rotor, also known as the brake disc, is attached to the wheel and axle. It is made of ceramic or cast iron materials that are highly machined (Nice, 2009). Iron materials are usually lower grade, while ceramic brakes are more powerful and costly. Ceramic brakes deteriorate less and dissipate heat more quickly, which makes them better for racing. Ventilation slots in the rotor allow air to move through the system and cool the rotor during use. The actual discs are also drilled and slotted on the surface to increase surface area for cooling on high performance

brakes. Friction from the brake pads slows the rotor, which in turn, slows the wheel. Rotors vary in thickness and size due to the type of car they will be put on.

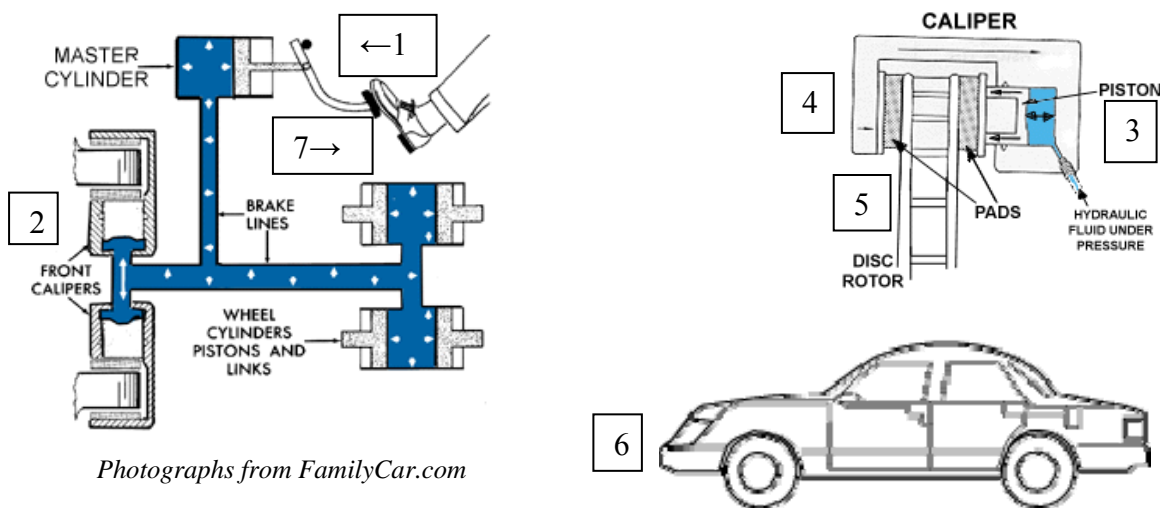
### Caliper

The caliper holds the brake pads and rotor in place. They are usually made from aluminum or steel (Nice, 2009). Anywhere from one to twelve pistons are located on each side of the caliper depending on the quality of the caliper. The number of pistons correlates directly with the amount of force that can be applied and is directly proportional to the stopping distance of the car. In order to stop the car, the pistons start to move and hydraulically push the brake pads into the rotor; this stops the car.

### Brake Pads

Brake pads are installed on both sides of the rotor. They are composed of a metal plate with a protective covering that wears away over time. The pads need to be changed periodically to work properly. A wear indicator is installed on brake pads to show the amount of wear on a brake. Brake pads are pushed against the rotor and produce the friction that stops the car. As the brakes are applied, they produce a fine dust that can corrode metals in the car. Therefore, a car needs to be washed periodically to clean the brake dust off.

### How Disc Brakes Work



Photographs from FamilyCar.com

1. The driver pushes the brake pedal which decreases the volume in the master cylinder (Ofria, 2005). The pressure of the brake fluid is increased due to the smaller volume in the cylinder and therefore travels to areas of lower concentration. The fluid in the master cylinder travels through the brake lines where pressure is less.
2. The liquid in the brakes lines travels to the front of the car and towards each caliper because there is far less pressure near the calipers.
3. The liquid is then forced into the calipers and the pressure builds in the caliper. The fluid wants to lower the pressure in its current surroundings and pushes the pistons outward to increase the volume.
4. The pistons apply a force equal to that of the pressure of the liquid and push the brake pads towards the rotor.
5. The brake pads push against the rotor which causes friction.
6. The rotors start to slow and the car's speed starts to reduce.
7. When the driver has stopped or achieved their desired speed, the brake pedal is released. This increases the volume in the master cylinder which creates a vacuum-like effect and pulls the liquid from the calipers. As the fluid travels to the master cylinder, the pistons retract and the brake pads move away from the rotor. This allows the rotor to travel freely.

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