

**DESIGN AND PRINCIPLE OF OPERATION  
OF THE BRAKING SYSTEM**

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At the heart of every car's preventing energy lie essential factors: the brake mechanism and the brake actuator. When it is necessary without delay to halt the car's movement, the brake mechanism interacts with the brake actuator to provoke the braking system. Regardless of its precise design and implementation, the brake mechanism generally incorporates two critical factors: a movable aspect and a set counterpart. As the wheel rotates, the movable element engages, at the same time as the constant element stays desk bound. It's the friction generated between those elements that enables speed discount and in the long run brings the automobile to a halt. In drum and disk brake configurations, the movable factors are the drum and disk, respectively, while the desk bound elements are the pads [1].

Drum brakes, a century-antique invention, function a drum affixed to the wheel housing pads and hydraulic cylinders that press towards the drum's interior. Despite their age, many automakers still utilize drum brakes for rear-wheel programs.

Disc brakes are found on most vehicles today. They are mounted on the front axle and often the rear as well. To stop a wheel (and your car), a disc brake uses a caliper fitted with brake pads to grab a spinning disc or rotor. In assessment, disk brakes rent a metallic disk set up at the wheel and a caliper geared up with pads. These pads clamp onto the disk, inducing braking force. Introduced in the mid-twentieth century, disk brakes rapidly supplanted drum brakes in passenger motors as a result of their advanced overall performance [1]. Disk brakes offer superior heat dissipation compared to their drum opposite numbers, thanks to stepped forward airflow around the pads and disk. However, they demand extra force software, frequently necessitating the inclusion of an air booster

[1]. The brake actuator serves because the middleman among the brake pedal and the braking gadget, translating pedal input into braking force. Hydraulic systems make use of brake fluid for this cause, whilst mechanical setups hire steel cables. Hydraulic actuation systems function numerous key additives: the brake pedal, fundamental brake cylinder, brake fluid reservoir, wheel cylinders (commonly integrated into calipers for disk brakes), hydraulic strains, and optionally, a pneumatic booster. The operation of hydraulic brake systems is relatively straightforward: when the pedal is depressed, hydraulic pressure is transmitted to the main cylinder, initiating fluid flow to the wheel cylinders. This action activates the brake pads, allowing the vehicle to slow down or stop. Upon releasing the pedal, return springs reset the brake pads, restoring the pedal to its normal position and functionality. Modern vehicles contain diverse supplementary structures to beautify braking efficacy. Prominent amongst those are ABS (anti-lock braking device), EDS (electronic differential lock), ESP (digital stability software), EBD (electronic brake-force distribution), BAS (brake help machine), amongst others. These structures collectively make a contribution to safer and greater controlled braking overall performance. In the eternal brake debate, absolutes remain elusive. Drum brakes, plagued by overheating, sluggish drying, and excess weight, stand in contrast to their disc counterparts. Yet, discs, prone to expansion in heat, forfeit their parking prowess, a critical flaw in their design. This divergence underscores their distinct roles: discs, efficient but confined, and drums, impractical yet indispensable for parking safety. Despite advancements, drum brakes persist in modern cars, often relegated to the rear while discs dominate the front. Even in sportier models, where discs reign supreme, a solitary drum brake lingers, a nod to the essential task of parking [1].

## References

1. Engineering Choice: Drum Brakes Vs Disc Brakes: What's The Difference? [Electronic resource] – Mode of access: <https://www.engineeringchoice.com/drum-brakes-vs-disc-brakes/>. – Date of access: 30.03.2024.

2. Drum Brakes vs Disc Brakes [Electronic resource] – Mode of access: <https://www.spinny.com/blog/index.php/drum-brakes-vs-disc-brakes/>. – Date of access: 30.03.2024.