



MAIN FAILURES OF THE VEHICLE BRAKE SYSTEM, MAINTENANCE AND REPAIR

Jamshed Sadulloevich Avliyokulov

*PhD, Head of the "Automotive and automobile industry" department, Tashkent State Transport University,
Tashkent, Republic of Uzbekistan*

Magdiyev Shovkat Pulatovich

*Associate Professor of the "Automotive and automobile industry" department, Tashkent State Transport
University, Tashkent, Republic of Uzbekistan*

Murodjon Iskandarovich Rakhmatov

*Senior teacher of the "Automotive and automobile industry" department, Tashkent State Transport
University, Tashkent, Republic of Uzbekistan*

Abstract

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The braking system serves to reduce the speed of a moving vehicle, stop it, and hold a stationary vehicle in place.

The following brake systems are used in modern passenger cars:

- working brake;
- parking brake system.

The service brake system serves to reduce the speed of the car or stop it immediately when it moves in various conditions.

The suspension brake system ensures that a parked vehicle remains in place without moving. Brake systems used in cars, regardless of their function, consist of a power source and one or more brake mechanisms [1].

The main malfunctions of the brake system. This includes wear of friction linings and brake drums (discs), malfunction of the brake force regulator, wear and swelling of rubber cuffs in the hydraulic brake system, wear of the cylinder, piston, brake and protective valves in the pneumatic brake system, perforation of the diaphragm in the brake chamber, an example is the failure of power battery cuffs.

Maintenance of the brake system is mainly carried out during technical service periods.

In the 1st technical service, the tightness of all connections and pipes of the brake system, the pressure generated by the compressor, the quality of the brake operation in the device, the fit of details and connections, the free and working movement of the brake rod are checked [2].

In the 2nd, 3rd, 4th technical service, together with the work in the 1st technical service, brake drums (discs), pads, wheel bearings, fluid level in the hydraulic brake system, circuits in multi-circuit pneumatic systems, and brake power adjusters are checked.

In addition, during daily maintenance, the condensate in the cylinders is drained, and the liquid level in the wet separator is checked in autumn and winter. During the seasonal service, the filter in the pressure regulator is washed with kerosene, and a wet separator is prepared for the beginning of the season (when the temperature drops below $+5^{\circ}\text{S}$, the wet separator holder is put in the upper position) [3].

Below we will separately consider the maintenance work performed on hydraulic and air brake systems.

Maintenance of the hydraulic brake system. Maintenance work on cars with a hydraulic brake system (Fig. 1) includes checking the fluid level in the master brake cylinder and adjusting it, if there is air in the system, removing it, free movement of the brake rod adjustment of the path, clearance between pads and brake drums, cleaning of oil on the surface of brake linings [3-4].

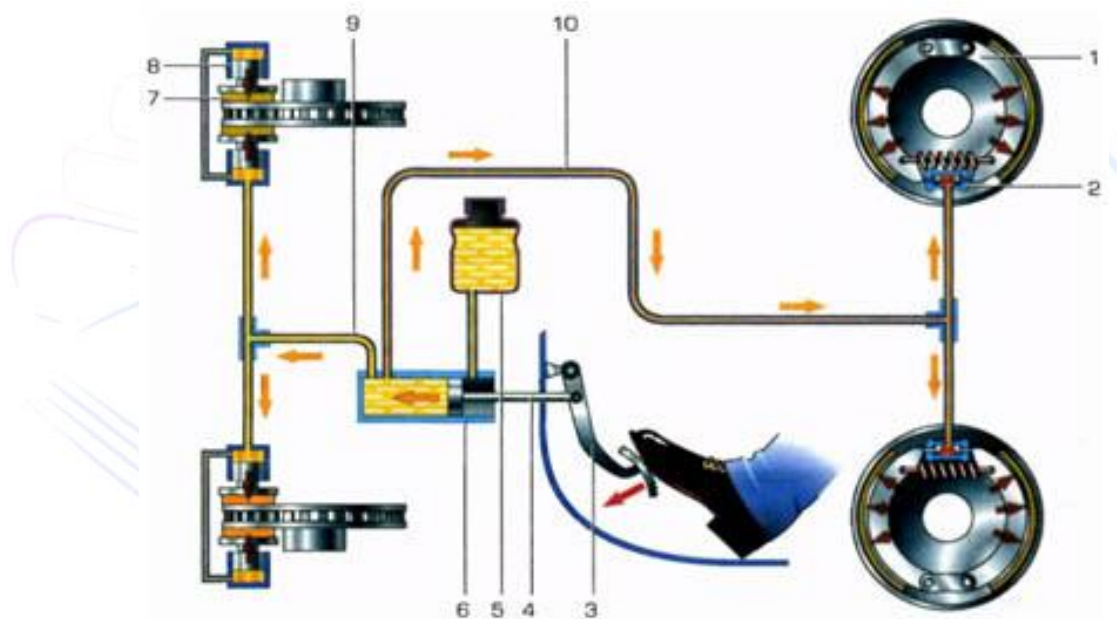


Figure 1. The shape of the hydraulic brake system.

1-drum brake mechanism; 2- rear working cylinder; 3-brake pedal; 4-brake rod;

5-brake fluid hose; 6- master brake cylinder; 7th brake pad; 8-front working cylinder; 9-front and 10-rear brake pipes

We will get acquainted with the technical maintenance of the hydraulic brake system separately:

1. External control of the braking system. The brake system consists of checking that all mechanisms are fixed and tight, as well as determining its light rotation by hanging the car wheel.
2. Checking and adjusting the free travel path of the brake lever (Fig. 2). This work is performed in front of the driver's seat in the cabin or salon of cars. One end of the ruler is placed on the floor, the other side is leveled with the surface of the rod, and the distance is determined. In this case, the reaction is pressed until resistance is formed, and the interval is determined again. Then the difference between the first and second values is calculated and adjusted if it does not match the standard value [5].

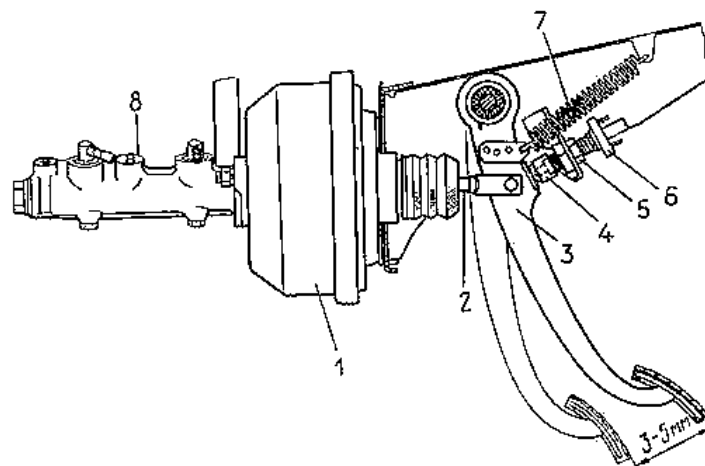


Figure 2. The form of adjusting the free travel path of the brake lever

1-vacuum amplifier; 2- pusher; 3-brake lever; 4. turn on the stop light; 5-fuel nut; 6-stop light switch; 7-kick spring; 8-master cylinder.

3. Adjusting the clearance between the brake lining and the drum. This work is mainly adjusted automatically or with the help of an eccentric finger (Fig. 3).

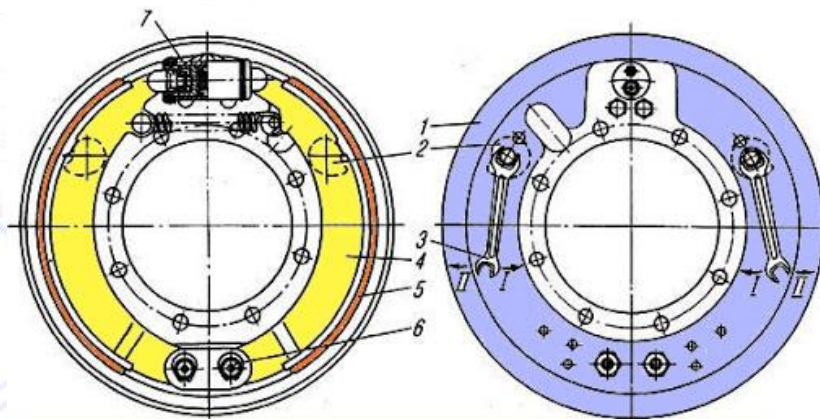


Figure 3. Form of adjustment of the gap between the lining of the brake pads and the drum.

1-brake shoe; 2-Adjusting eccentric; 3-key; 4-brake pad; 5-friction coating; 6-axle of brake pads; 7-working cylinder.

The nut of the support fingers of the front and rear pads is loosened and pressed on the brake rod with a force of 150-200 N. The support fingers are twisted without much effort and the nuts are pulled out. The brake lever is released, and the light rotation of the drum is checked. If the pad rotates touching the drum, the operation is repeated.

The drum is removed, a special measuring drum is installed, and the gap between the pad and the drum is determined using flat calipers. The notch is determined at a distance of 25-30 mm from the tip of the pad on the finger side (0.15 mm), which in turn adjusts the notch on the opposite side to 0.4 mm [6].

4. Bleeding the fluid brake system. The main brake cylinder and wheel working cylinders are cleaned of dust and dirt. The cover of the brake fluid container is opened and the fluid level is checked. The level is 15-20 mm from the grooved part of the container. should not be lower than or below the "min" mark. The rubber cover of the exhaust valve (1) in the working cylinder (Fig. 3) is removed, and a rubber hose (2) is inserted in its place, and one end is lowered into a glass container filled with brake fluid in the volume of 1/3...1/2 [7].

The brake lever is pressed and moved frequently until resistance is felt, that is, until the travel path of the lever does not change, then the valve is turned 1/2...3/4 circles while pressing the lever, and when the lever is pressed to the end, the valve is fixed and the reaction is slowly released.

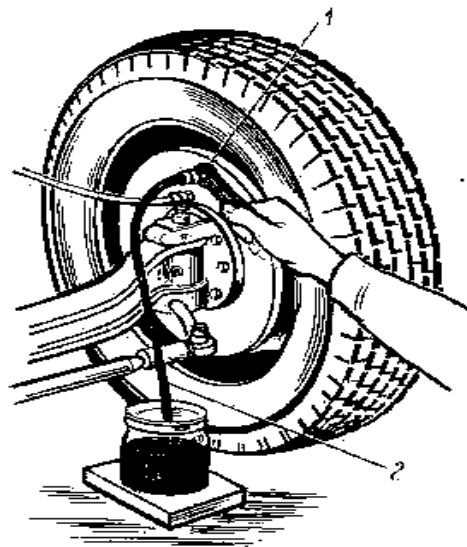


Figure 3. Bleeding the brake system.

This situation is continued until there are no more air bubbles in the glass container. During the operation, the brake fluid level in the tank is periodically checked and adjusted. Finally, the valve is hardened and removed from the hose. This bleeding sequence is performed step by step, starting with the most distant cylinder. In UZDEU passenger cars, the air release sequence is carried out diagonally starting from the rear wheel (rear left-front right, rear right-front left) [8-9].

5. Checking and adjusting the handbrake. The wear of the rear pad covers, the stretching of the cable, the increase of the handbrake lever path. The rear wheels are fully braked when the lever is pulled with a force of 400 N in 2/3 parts of the lever's full travel. To adjust it, it is necessary to reduce the length of the cable for pulling the pads connected under the handle.

During the maintenance of the air brake system, the works performed on the air brake system are listed below.

1. Checking and adjusting the tightness of the brake system. Density is checked in two areas:

A. Compressor - brake valve section: The running engine is turned off and the air pressure drop is monitored using a manometer. When the brake lever is not pressed, the pressure drop during 10-12 minutes should not exceed 0.01 MPa. A rapid decrease in pressure from the norm indicates a violation of viscosity in the "compressor-receiver-brake valve" section.

B. Brake valve - brake chamber section: With the engine not working, the brake lever is fully pressed and the pressure drop is checked using a manometer. In this case, it is necessary to quickly reduce the pressure to 0.10-0.15 MPa and then keep it. A decrease in pressure from the norm indicates a violation of viscosity in the "brake valve-brake chamber" section. The location of the air outlet is determined by hearing or applying a soapy mixture to suspicious areas [2].

2. Determining the technical condition of the compressor and adjusting the tension of the belts (Fig. 4). Before checking the compressor, the belt tension is checked and adjusted. When the belt is pressed between two pulleys with a force of 30-40 N, the deflection should be 4-8 mm.

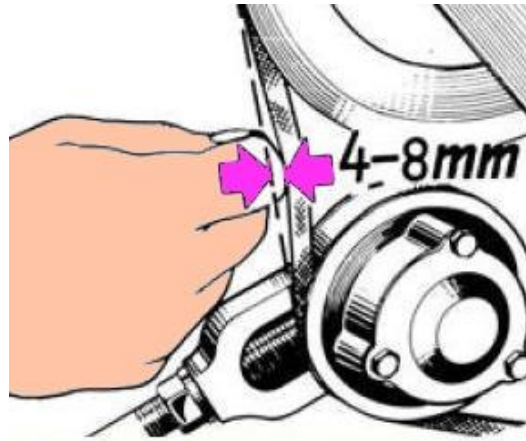


Figure 4. Determining the tension of the compressor belt.

To check the compressor, start the engine and determine the air pressure rise rate. It should take 5-6 minutes for the air pressure to increase from 0 to 0.6...0.7 MPa.

3. Checking and adjusting the air conditioner. The air regulator should disconnect the compressor from the system at a pressure of 0.7-0.74 MPa and connect it at a pressure of 0.55-0.6 MPa. High pressure is adjusted by increasing or decreasing the number of gaskets, and low pressure by tightening or loosening the cap [10].
4. Checking and adjusting the brake valve. The free travel path of the brake lever is adjusted using a bolt fastened with a limit nut. The free movement of the brake rod (30...60 mm) corresponds to the free movement of the upper lever of the brake valve (1...2 mm). When the brake lever is pressed, that is, when the pressure is equalized in the brake chamber and the receiver, its rear side should not reach the cabin floor by 10...30 mm. If this condition is not met, this distance is adjusted using a plug attached to the axle.
5. Inspection and adjustment of brake cam shaft path. The length of the stock path is determined using a ruler; this distance should be 15...25 mm for the front wheels, 20...30 mm for the rear wheels. The travel of the stock is adjusted by turning the plug on its end forward or backward. During the adjustment period, it is ensured that the working path of the rod of the brake chamber on the left and right wheels is the same [11].

The length of the rod of the brake chamber and the gap between the lining of the pad and the drum is adjusted in an additional step using the worm adjustment mechanism (Fig. 5).

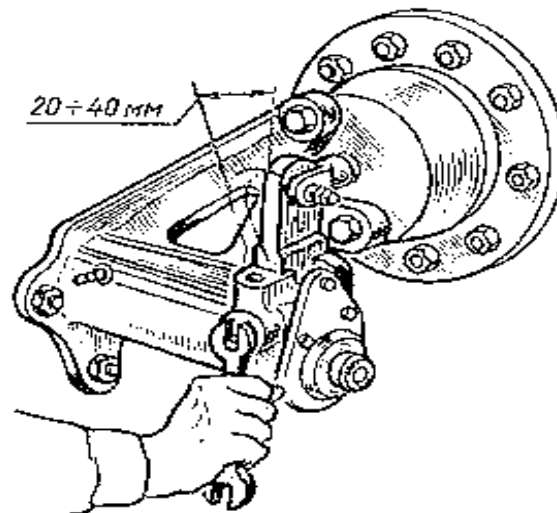


Figure 5. Adjustment of the stroke of the brake chambers.

Current repair of brake system connections. In this case, the broken components of the brake system are separated into pieces, the worn parts are replaced with new ones.

During the 2nd, 3rd, 4th technical service and current repair of the brake system of cars, the covers of the worn brake pads are removed with the help of R174 type equipment or by drilling rivets. New coatings are hardened using non-ferrous rivets or VS-10T glue. Gluing reduces the amount of work by three times, saves non-ferrous metals, increases the friction surface and service life of coatings. before gluing, the pads are cleaned to the metal, degreased with acetone and left for 10 min. during drying. a layer of 0.1...0.15mm thickness is applied to the surface of the glue and 10...15 min. is held (if the thickness of the glue layer is more than 0.5 mm, the strength of the joint decreases), then the second layer is applied and dried again. The coating is combined with a pad and installed on a special device (Fig. 6) and compressed with a pressure of 0.2...0.4 MPa and dried at a temperature of 175...185°S for 1.5...2 hours. After that, 50...60 min. until the furnace temperature drops to 100°C and it is cooled in the air for 2...3 hours. During such cooling, the residual stress in the glued joint decreases [2-5].

There is another method of gluing, in which the cotton paper tape is soaked with VS-10T glue using special devices and dried.

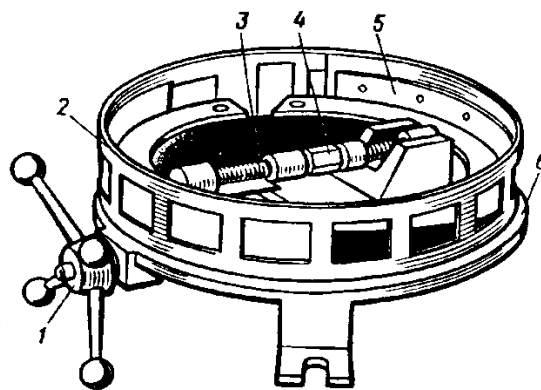


Figure 6. A device for gluing the coating to the brake pad.

1-holder; 2-limiting ring; 3-screw; 4-delimiter; 5-brake pad; 6-heater

At the time of gluing, a tape of the required size is cut, placed between the pad and the coating and compressed with a pressure of 0.2...0.3MPa, kept at a temperature of $180 \pm 5^\circ\text{C}$ for 1.5 hours. gluing quality is checked for displacement using a press under a pressure of 7.5...8MPa.

The radius of the working surfaces of the pads must match the size of the brake drum. To do this, brake pads are removed in R114 or R117 type equipment. The same equipment can be used for brake drum repair. When installing the pads on the brake drums, it is necessary to ensure that the working surfaces are completely connected to each other. The gap between them should be very small, but it should ensure the free rotation of the drum [12].

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