

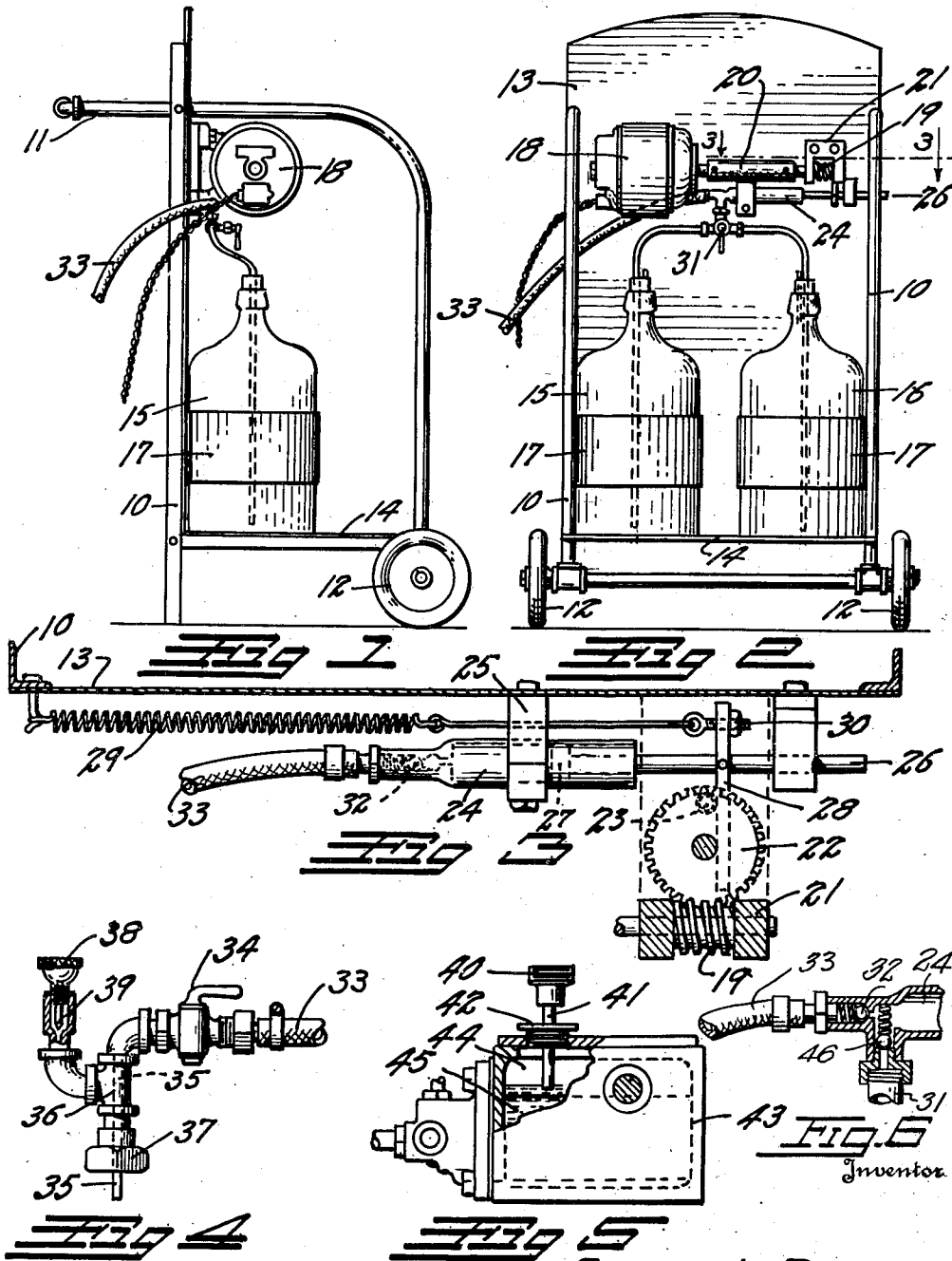
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METHOD AND APPARATUS FOR FLUSHING AND FILLING HYDRAULIC BRAKE SYSTEMS

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METHOD AND APPARATUS FOR FLUSHING AND FILLING HYDRAULIC BRAKE SYSTEMS

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This invention relates to an apparatus and a method for servicing hydraulic brake systems of automobiles and the like. A hydraulic brake system requires at periodic intervals the renewal of the liquid in the system because of evaporation, deterioration, etc. At these times the system should be flushed to remove any deposits of acids, scale, foreign material, etc. In refilling a system with liquid it is essential to the operation that all air between the master piston and the brake pistons be eliminated.

The principal object of this invention is to provide a method for flushing or cleaning the systems and refilling with fresh liquid without admitting air to the system.

Another object of this invention is to provide a service apparatus which is portable, can be quickly and easily attached to the hydraulic brake system, and which will act to flush the system with cleansing fluid, remove the cleanser, eliminate entrapped air and refill the system with brake fluid without admitting new air to the system.

A further object of the invention is to provide a pump for the fluid which will maintain a constant pressure and which will cease operating when the pressure in the discharge line reaches a predetermined amount.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which forms a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a side elevation of my improved portable hydraulic brake servicing apparatus.

Fig. 2 is a front elevation of the apparatus.

Fig. 3 is an enlarged section illustrating the pumping mechanism, taken on the line 3—3, Fig. 2.

Fig. 4 is a detail view of the attachment

fitting on the extremity of the service hose.

Fig. 5 illustrates a master cylinder and reservoir of a typical hydraulic brake system showing the method of attaching the servicing apparatus.

Fig. 6 is a detail section through the pump check valve assembly.

The cleanser referred to for flushing out the brake system more particularly applies to the cleansing solution recited in the applicant's co-pending application, Serial No. 220,852.

The servicing machine comprises a supporting frame 10, provided with a handle 11 and wheels 12, so that it can be easily rolled to a position alongside of the automobile which it is desired to service. The frame 10 supports a back plate 13 which carries the pumping mechanism and also may carry suitable advertising designs and lettering referring to the service provided by the apparatus. A floor 14 supports two carboys or containers 15 and 16, held in place by means of bands 17 secured to the back plate 13.

One of the containers, for instance, 15, may contain cleansing fluid and the other, 16, fresh brake solution. Above the containers, upon the back plate 13, an electric motor 18 is secured which drives a worm 19 through any suitable flexible connection 20. The worm 19 is carried in a worm frame 21 from the back plate 13. Suspended from and below the worm frame 21 is a worm wheel 22, from the lower face of which a roller stud 23 projects.

The fluid is pumped from a pump cylinder 24 carried in a pump bracket 25. The pumping is accomplished by means of a pump piston rod 26 extending from a piston 27 within the pump cylinder 24. Secured to the rod 26 is a cam arm 28, which is constantly maintained against the roller pin 23 by means of a spring 29. As the worm wheel 22 rotates the pin 23 will push the arm 28 and the piston 27 to the right so as to draw fluid through a first check valve 46 to fill the pump cylinder. As the pin 23 leaves the arm 28 the spring 29 will return the

piston to force the fluid out of the pump cylinder past a second check valve 37.

Therefore, the pressure on the fluid is determined by the tension in the spring 29. This can be regulated by means of an adjusting nut 30. When the pressure in the cylinder 24 reaches a predetermined degree it will prevent the spring from forcing the piston inwardly and prevent the pin 23 from contacting with the arm 28 thus stopping all operation of the pump.

Fluid is fed from the carboys 15 and 16 through a manually operated two-way valve 31, to the pump cylinder through any desired check valve which will prevent return of fluid to the carboys. It is discharged from the pump cylinder through a check valve such as a spring operated ball check valve 32 into a service hose 33. The check valve 32 prevents return flow from the hose 33 to the pump cylinder. The free extremity of the service hose 33 is connected to a control valve 34 by means of which the fluid, and through it the pump, may be shut off when desired.

After leaving the control valve 34 the fluid is discharged through a central tube 35 which extends through a T 36 and a union coupling 37. Supported from the T 36 is a splash cup 38, the rotation of which closes a needle valve 39. The union coupling 37 is designed to connect to a male union 40, supported on an air tube 41 carried in a cap bushing 42.

In using the apparatus the following method is employed: The apparatus is brought alongside the automobile. The cap bushing 42 is screwed into the filler hole of the master reservoir of the system, such as the reservoir illustrated at 43. This allows the air tube 41 to extend below the top of the reservoir so as to form an air chamber 44 in the top thereof.

The more modern brake systems place a master cylinder 45 within the lower part of the reservoir. In these systems the tube 41 will terminate immediately above the master cylinder 45. It is essential that the air chamber portion 44 be not filled with fluid so as to allow space for the rise and fall of the fluid as the system is used. It is also essential that the level of the fluid be maintained above the master cylinder 45 so as to prevent air being pumped into the system by the master cylinder. By having the air tube extend to a point above the master cylinder the operator is certain that he cannot completely fill the system and that it will be sufficiently filled to cover the master cylinder. The union 37 is now screwed on the male union 40 so that the central tube 35 will extend downwardly inside of the air tube 41.

The motor 18 is started and the two-way valve 31 turned to open the carboy 15 of

cleaning fluid to the pump. The splash cup 38 is unscrewed to open the needle valve 39 and the control valve 34 is opened to allow the pump to operate and force cleaning fluid into the system.

When that part of the system above the present brake fluid has been filled with cleaning fluid to the bottom of the air tube 41, it cannot rise further in the reservoir 43 against air pressure in the air chamber 44. It is, therefore, forced to rise in the air tube 41 around the central tube 35, thru the T 36 and spout from the splash cup 38. The operator then knows that the system has been completely filled to a point above the master cylinder 45 and that sufficient space has been left at 44 for effective operation of the system.

The needle valve 39 is now closed and the bleeder valves, which are provided at the brake cylinders of all hydraulic brake systems, are opened. The pump is now allowed to operate to force cleansing fluid from the carboy 15 through the brake system and out of the bleeder valves. When the discharging liquid appears sufficiently clear at each of the brake cylinders, the bleeder valve is closed at that cylinder.

When all of the brake cylinders show clear liquid, the two-way valve 31 is operated to connect the pump to the carboy 16 so as to pump fresh brake fluid into the system. This fluid will force the cleansing fluid from the system. Each bleeder valve is individually opened and kept open until the color and viscosity of the discharging fluid indicates that the cleansing fluid has been displaced in that cylinder by the brake fluid. When all of the bleeder valves have shown brake fluid and are closed the pump automatically stops and the operator knows that the entire system is filled with brake fluid and that the cleansing fluid has been discharged.

At no time has the fluid level descended below the operating parts of the system so that no opportunity has been presented for entrapping air.

The air chamber 44 acts as a pressure head or cushion on the pump since it is under pressure at all times when the pump is operated. It also prevents overflowing of the reservoir 43.

As the operator closes each bleeder valve the pressure in the system and service hose 33 prevents the spring 29 from drawing the arm 28 against the pin 23 so that the pump immediately ceases functioning until the next bleeder is opened. This feature allows the operator to move around under the automobile opening and closing bleeder valves without requiring him to control the operation of the pump. When the entire system is filled, the valve 34 is closed, the union 37

unscrewed, and the bushing 42 replaced by the usual filler cap of the brake system.

There will be some admixture of the incoming brake fluid with the cleansing fluid in the brake reservoir. But in the small lines connecting the various parts of the system there will be but little mixture as the incoming fluid must of necessity force the cleanser ahead of it. This mixture of fluids, however, does not interfere with the operation since the incoming fluid will soon have displaced all of the cleanser from the system.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what I claim and desire secured by Letters Patent is:—

1. A method for servicing hydraulic brakes comprising: forcing cleansing fluid into said system at a first point; allowing air to escape from said system as said cleansing fluid flows into said system; thence removing said cleansing fluid by forcing brake liquid into said first point and allowing said cleansing fluid to discharge at a second point.

2. An apparatus for servicing hydraulic brakes comprising: a supporting frame; a container for cleansing fluid; a container for brake fluid; a pump; a two-way valve for connecting either of said containers to the intake of said pump; and means for connecting said pump to said system, said means comprising a fluid pipe adapted to enter said system; an air valve and a passage for the air from said system to said air valve.

3. Means for injecting fresh fluid in a hydraulic brake system comprising: an air pipe adapted to be sealed to said system and extend below the highest point thereof; an air valve arranged to allow air to discharge from said air pipe; a fluid pipe extending downwardly within said air pipe and a pump adapted to pump fluid through said fluid pipe.

4. Means for coupling a fluid pump to a hydraulic brake system having a filling opening, so as to fill said system with fluid to a predetermined level and allow air to escape therefrom comprising: a bushing adapted to close said opening; an air pipe extending through said bushing to said predetermined level; a coupling carried by said air pipe; an attachment fitting arranged to engage said coupling; a fluid pipe extending from said attachment fitting downwardly within said air pipe, there being an air passage about said fluid pipe; an air valve opening said air passage to the atmosphere; a control valve admitting fluid to said fluid pipe; and means for connecting said fluid valve to a pump.

5. A method for servicing a hydraulic brake system comprising: forcing a cleansing solution into one point of said system and allowing it to discharge from another point thereof; discharging said solution by forcing brake liquid into said system at said first point so as to discharge the cleansing fluid therefrom at the second point.

6. A method for servicing a hydraulic brake system containing brake liquid comprising: forcing a cleansing fluid into said system at one point; allowing air to escape from the highest point of said system as said cleansing fluid fills said system; thence, removing said cleansing fluid by forcing new brake liquid into said first point and allowing said cleansing fluid to discharge from a second point.

In testimony whereof, I affix my signature.

ARTHUR L. PATTON.