From the Shadow's Corner

by Cal West

Cal West, Product Support Manager at Rolls-Royce Motors, continues his series on recent Rolls-Royce products with this second article. He is not totally wedded to the Shadow, though; his first Rolls-Royce mechanical restoration was a pre-war Ghost, and he has done mechanical restorations on such other cars as two Phantom IIIs. We appreciate both Cal's versatility and his generosity in sharing his knowledge.

Here we are again exploring the mysterious Shadow. In my first article we talked about servicing the engine cooling and braking systems. I also said we would look at the overhaul and setting of the leveling system. Before we can get to that you should understand how the system works. In other words . . . if you don't understand how it works, you should *not* work on it.

Let's first look at all the components that make up the hydraulic system. The hydraulic system can be divided into three circuits: the pressure generation circuit, the braking circuit, and the height control circuit. The following individual components make up these circuits. First, the pressure generation circuit. In this circuit there are three major components: 1) the fluid reservoir, 2) the hydraulic pump, 3) the accumulator sphere and valve assembly.

First the reservoir (See figure G 6). As I said in my first article this should be cleaned every two years. The reservoir provides a head of fluid for the hydraulic system and also the room for the fluid to expand when it heats up. The reservoir is divided into two separate reservoirs which share only the same outer housing. The forward chamber is the number one system, and the rear is the number two system. The reservoir should never be allowed to run dry except when changing the fluid, or air can be introduced into the hydraulic system. It should also never be overfilled, for when the system depressurizes or expands, fluid will be forced out of the top. If the fluid contacts the paint, you know what would happen.

All fluid is returned to its respective reservoir after it has been used in the system. Fluid is gravity fed from the reservoir to each hydraulic pump.

Hydraulic fluid reservoir

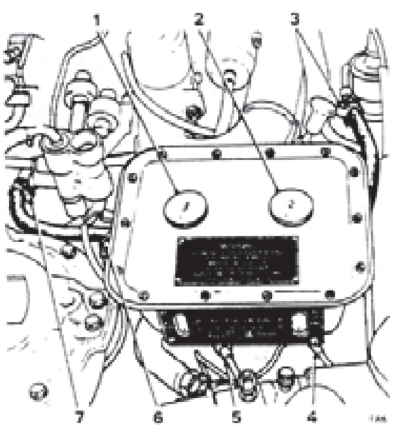

Fig. G6 Hydraulic fluid reservoir - In position
1 Filler cap (No. 1 system)
2 Filler cap (No. 2 system)
3 Hydraulic pump low pressure inlet pipe (No. 2 system)
4 Accumulator return pipe (No. 2 system)
5 Accumulator return pipe (No. 1 system)
6 Resistor - brake fluid level switches
7 Hydraulic pump low pressure inlet pipe (No. 1 system)

Second, the hydraulic pump (Figure G 9). This is the most important part of the system. The pump generates all the pressure for the systems to use, and without the pump we could not diagnose a problem in the rest of the system. Fluid is received by the pump from the reservoir and is held in a cavity between the outer housing and the pump body. The pump is bolted to the engine tappet cover and is driven by a push rod from a special lobe on the cam shaft. When the engine is running, the push rod reacts directly onto a plunger within a barrel held in the pump body. A spring is used to hold the plunger down against the push rod. At the top of the barrel there are two valves, the inlet valve and non-return valve. The inlet valve allows fluid to enter the barrel through the pump housing and fill the space behind the plunger on its down stroke. When the cam pushes the plunger upward, the inlet valve is forced up against the non-return valve. This closes the passage and traps fluid inside the barrel. The fluid starts to pressurize and forces the non-return valve open. This allows fluid to pass to the accumulator. When the plunger reaches the top of its travel, the pressure behind the non-return valve and a spring forces the valve closed, and the cycle begins again.

Third, the accumulator valve and sphere: the function of the accumulator is to regulate and store pressure. On cars up to and including some 1975 models, the accumulators were located at the left rear of the engine just above the sump. On later cars the number one accumulator was moved to the right front of the engine. The sphere is fitted with a diaphragm and is charged with 1000 psi of nitrogen pressure. When the engine is started the pumps begin to move fluid toward the accumulator. A non-return valve in the accumulator valve housing allows this fluid to be directed to the top of the diaphragm (See figure G 12). When the pressure of the fluid

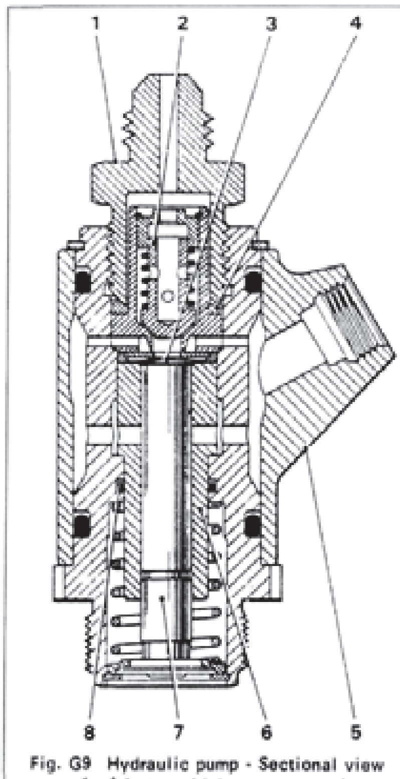

Fig. G9 Hydraulic pump - Sectional view
1 Adapter - high pressure outlet
2 Non-return valve
3 Inlet valve
4 Chamfered ring
5 Outer housing
6 Pump barrel
7 Plunger
8 Sealing ring

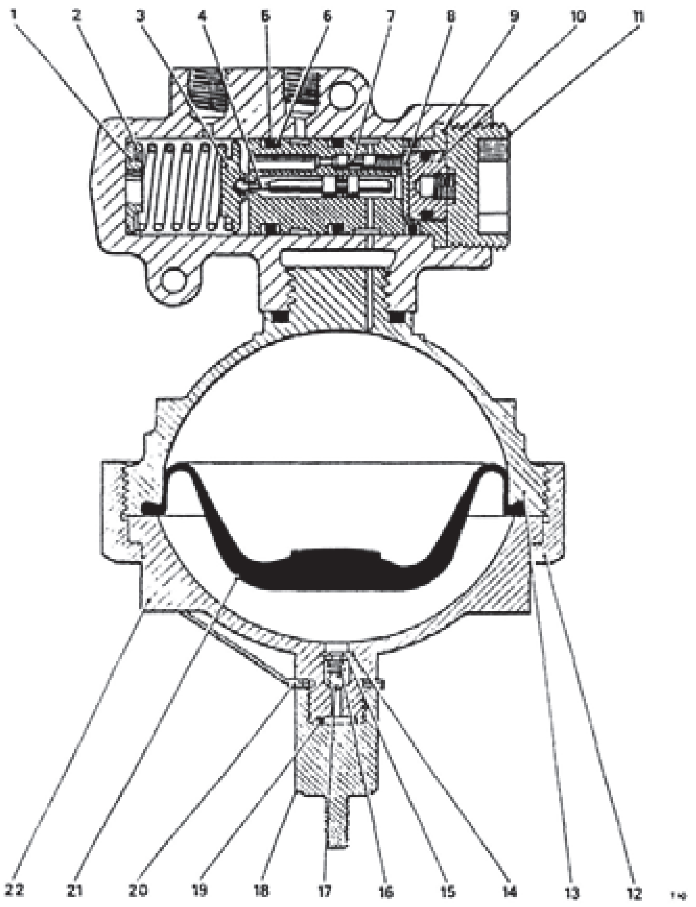

Fig. G12 Hydraulic accumulator
1 Sealing washer
2 Adjusting washer(s)
3 Regulator valve
4 Piston and sealing ring
5 Bobbin sealing rings
6 Fluon washer
7 Non-return valve
8 Sealing disc
9 Valve bobbin
10 Valve sealing plug
11 End plug
12 Clamping ring
13 Sphere upper half
14 Circlip
15 Washer
16 Spring
17 Ball
18 Charging valve cap
19 Sealing ring
20 Washer and warning plate
21 Diaphragm
22 Sphere lower half

equals the pressure of the nitrogen, the diaphragm begins to move down and the sphere begins to fill with fluid. In the accumulator valve body there is a sensing valve that reacts on a pressure regulator. When the pressure of the fluid reaches 2,500 psi, the regulator moves back allowing fluid to return to the reservoir. The fluid returning to the reservoir is not pressurized. Also, at this time the fluid coming from the pump is no longer pressurized. The fluid is being drawn from the reservoir and is being passed through the accumulator valve body by the pump back to the reservoir. When the pressure in the accumulator drops to 1850-1900 psi, the regulator moves back and the pump begins to charge again until it reaches 2500 psi. Then the whole thing starts over again.

So far I have not told you how to diagnose or repair any part of this system. First you really need to understand how the system works before you can diagnose a problem. You also need to know how it works before attempting any repairs. A good working knowledge and some special tools are required to work *safely* on this system. I hope you all subscribe to my philosophy: "If it isn't broken... don't fix it". Just keep it serviced and you won't have to fix it.

If you understand the systems, you will be able to speak intelligently about your car to the people who do have the knowledge and the proper tools to carry out repairs or servicing when needed. More importantly, you will be able to tell whether or not your mechanic knows what he is talking about. Most of the problems I have come across have been due to lack of proper service, compounded with misdiagnosis and poor workmanship. If you combine all this in one car it can be a real mess.

Now for some diagnosis. The most important tool for this job is a good high pressure gauge that is easy to read. This gauge must have a working range not less than 3000 psi. All fittings and hoses to this gauge must have a rating higher than 3000 psi. You cannot afford to take a chance. You will also need a bleed hose and a bottle to catch the fluid.

We can test the pressure generation circuit without testing the rest of the hydraulic system. Remember... "If you don't know what you are doing, stop now."

First, depressurize the hydraulic system. With the system depressurized remove the braided steel line that goes from the side of the accumulator valve to the block on the chassis. There is one from each accumulator. Next, make sure the reservoir is properly filled. If you have not already done so, remove the gear change thermal cut out. New screw your gauge into the port from which you just removed the braided line. Remove the return hose from the steel line at the top of the valve and plug the hose with a suitable plug. If this hose is not plugged, all the fluid will drain from the reservoir. Now attach a temporary hose to the steel line and place the other end in bottle. If you are sure you have done everything right, start the engine. Run the engine at 1000 R.P.M. and watch the gauge. It is good to have two people doing this. The gauge should jump very quickly to a reading of 1000 psi or lower. This first indication on the gauge is the amount of nitrogen in the sphere. If the gauge goes to 500 psi and then starts rising from there, that's the amount of nitrogen in the sphere. This is called flick up pressure.

Now the gauge should rise steadily, and as it rises it will rise faster. At 2400-2600 psi the gauge should stop. This is cut out pressure. The gauge should fall back approximately 150 psi. At the point of cut out a small amount of fluid should begin to flow from the hose into the bottle. The flow should follow the pulsing of the brake pump. Now switch off the engine. Fluid should stop flowing from the hose and the reading on the gauge should hold steady. Now connect a bleed hose to the bleeder valve on the accumulator and put the other end in the bottle. Start the engine and slowly bleed off pressure by slowly opening the bleeder and watching the gauge. As the pressure drops to 1850-1900 psi, the gauge should begin to rise again. This is cut in pressure. During this time fluid should not run from the return line. If your car performed like this, do not fix it: it's not broken.

Stop the engine. Disconnect the temporary return line and reconnect the proper hose on the car. Now slowly open the bleed valve and watch the gauge and depressurize the system. The gauge will drop slowly, hesitate, then drop sharply to '0'. The point of hesitation is the pressure in the sphere. This should be very close to the reading you got when you first started the engine. Now remove the gauge. Reconnect the braided hoses and remove the bleeder hose. Top up the reservoir with clean fluid. It is a good idea to bleed the brakes of the system you have just tested.

In the next article we will discuss diagnosis using the testing procedure described here. We will also discuss the braking circuit. The height control circuit will be saved for last. Please remember: if you are not sure, leave it alone.

Floppy Inside Doorhandles

by Stephen Dean

Stephen Dean is a member from Fresno, California, who has both a Springfield P-I Brewster Huntingdon, S358LR, and an early Mark VI saloon, B396BH. He suffered from an all-too-familiar problem with his Mark VI and figured out a good way to fix it. We appreciate his passing along this information, which is specifically applicable to early post-war cars and may apply in general to many other models.

I have a '47 Bentley MK VI. The inside doorhandle on the drivers side—in my case—was indeterminate between "normal" and "locked" position. Often, when I got out and closed the door, the inside handle would flop to the "locked" position. I would have to open one of the other three doors in order to get in, usually the back door on the drivers side, as I could reach forward and unlock the door.

Here is a way to fix the problem, which I found to be a broken spring. Figure 1 shows where the problem was in my case. At the indicated "break point" is a "v" in the spring. This serves as a detent to hold the door handle in the normal position.

We found a similar width (5/32") door handle spring of US make. It was of a different shape. These springs are quite common in 1940s and earlier cars, and possibly later ones as well. In this case it was taken from an assortment of 1940s Chrysler products found at a swap meet. There are other ways of obtaining a similar width of spring steel.

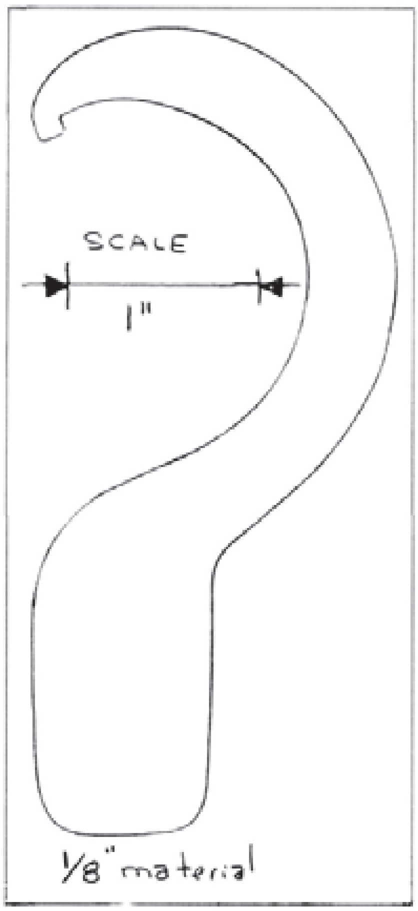

Figure 1. The C-spanner which Stephan Dean made to remove the door handle on B396BH. The pattern is similar to other C-spanners, which have been made for RR products in a bewildering variety of sizes.

A pattern was drawn and the new spring formed to the pattern.

To form the spring, it was first heated and bent to shape. To temper the spring, it was heated red, then quenched in oil. It was re-heated to almost red and then allowed to cool to room temperature.

In order to remove the door handle, a tool [*C spanner-Eds.*]was made. It is shown in Figure 2.

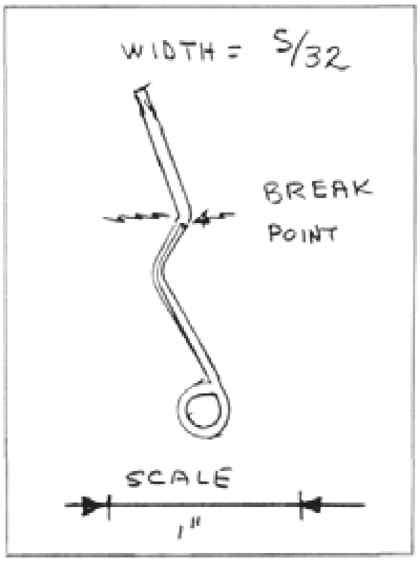

Figure 2. The door handle spring which Dean made of spring steel.