# BRAKE MASTER CYLINDER BREATHING RESTRICTION

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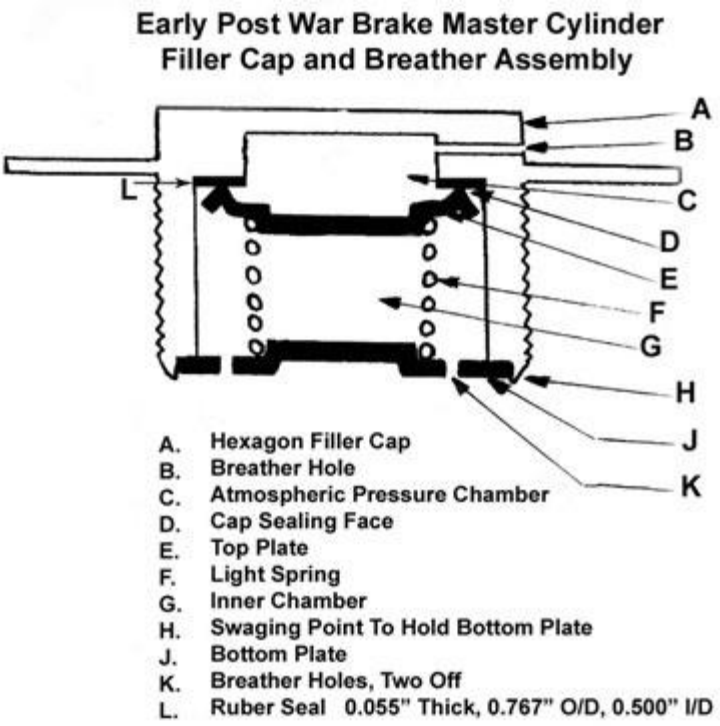
The following may prevent someone having a very nasty experience, which he or she will regret, on an early post war car prior to the Cloud series.

On four different occasions recently I have had reason to dissemble the Lockheed brake master cylinder breather cap and clean out the inner breather chamber and the area where the top plate seats.

In two cases the cars exhibited different brake problems and failures whilst the other two occasions happened when I inspected the breather assemblies on my own cars. These findings were very alarming indeed, especially since the disassembly of the breather section is not normally completed during servicing and owners maybe under the impression, when overhauling a master cylinder, that a quick blow through the breather holes would suffice to ensure the apertures are clean and free flowing. Whilst these breathers would not have caused undue concern when the cars were new, after 50 years service it would seem that alarming potential problems could arise. In the cases to which I refer, the breathers had all but blocked completely and there were positively no signs of the top rubber seal ever having existed.




The breather space, situated within the cap, is not simply a hollow space as might first appear and the description below refers to the accompanying cross section sketch.

In simple terms the breather valve, for it is a spring loaded valve assembly, is an air lock. Any dirt cannot be dislodged by any amount of blowing through the breather holes and stripping is required.

Although it is undesirable to either have a vacuum or excessive pressure build up within a master cylinder reservoir, there is no positive method of releasing excess pressure build up within this master cylinder cap design. When the breather is working correctly it may be possible for any pressure built up, due to fluid expansion, to relieve itself. One car, which had a completely blocked breather showed pressure build up to be taking place. Removing the cap immediately after the car had been run over 150 miles, when the brakes and chassis components were hot, caused fluid to be expelled from the reservoir. Cleaning the breather prevented a reoccurrence. It is probable on this occasion that engine and transmission heat combined with high ambient temperature and heavy braking caused the fluid to expand sufficiently to pressurise the master cylinder.

In the first instance when breather blockage occurs the driver may be aware of excessive brake pedal travel during braking and yet, on the next brake application the brakes may feel normal. Most likely, in the early stages of a breather blockage, slight movement of the spring loaded top plate allows the pressure to equalise and efficient braking to resume, the cycle then repeats as the vacuum starts to exert its influence again. The

feeling from the driver position is that of very erratic brake operation. Variation in pedal movement can be detected, even though the pedal is not directly connected to the master cylinder. The pedal movement is very similar to that which can sometimes be felt from servo judder, when air is present in the hydraulic circuit. Eventually the breather will block solid and the brakes will then be inefficient on each application.

Any vacuum in the cylinder can distort the outer sealing cup in the master cylinder and allow quantities of brake fluid to leak out into the rubber bellows. A simple test I tried showed that that fluid would leak out of an otherwise new master cylinder, if the centre of the breather valve became solid with dirt, causing a high vacuum in the reservoir. When humidity has already caused rusting of the cylinder bore outside of the second seal resting position, the lifting of the seal off its contact with the cylinder bore and intake of air may well draw rust and any dirt under the rubber cup sealing face.

Removing the breather / filler cap, cleaning out and replacement can be accomplished in under 30 minutes with only simple facilities. The breather / filler cap is available new under part number RG 7049 whilst the fibre sealing washer under the cap flange is RG7054 both are still available for an approximately total of £7 GBP. These part numbers are not listed in the parts manuals and the archive drawing of the RG 7049 cap does not show the internal valve details.

The valve is retained in the alloy cap by a brass closure or bottom plate (J). The plate is held into position by the inner end of the filler cap having been swaged over the edges (H) of the plate. The centre of the plate has a depression, which locates the internal spring and is also drilled with two holes (K) to allow air to communicate with the inner chamber.

Internally, at the top of the hollow cap is a sealing face (D), formed so that a raised section of the top brass plate (E) can seat against a rubber washer (L), which is trapped against the face. This top cap also has a centre depression, mirror imaged to that in the bottom cap, so that the internal spring (F) is positively located between the two plates.

The internal light spring (F), which is approximately half inch diameter and a half inch long, pushes against the fixed bottom plate (J) and forces the top plate seating (E) onto the rubber seal (L).

Above the top plate (E) is a space (C), which communicates directly to atmosphere through a single breather hole (B), which is drilled through one of the hexagon faces of the filler cap.

An air space (G) is formed between the top and bottom plates in the area where the spring is located.

In the normal course of events, if any depression exists in the reservoir, air will enter through the single (B) external breather hole, lifting the top plate (E) off its rubber seat (L) passing through the air space (G) and then via the holes (K) in the bottom plate. This will prevent any vacuum condition acting on the brake fluid and also prevent any interaction with the master cylinder internal residue pressure valve, which is situated against the fluid outlet hole face leading to the brakes.

This latter valve is important as it allows an internal residue pressure to persist in the front brake circuit and expands the front wheel cylinder rubbers onto the sides of the wheel cylinders. If this residue pressure drops, (and it sometimes does when the cars have not been used for some time) under the influence of internal vacuum, the wheel cylinder rubbers will lift off their seats allowing the ingress of air into the hydraulic circuit. At the same time air is likely to enter the master cylinder directly through the influence of the secondary master cylinder rubber lifting off its face with the bore of the cylinder. In both instances fluid loss is possible, and certainly very inefficient brakes would be the result.

These operating principles are defeated once dirt or parts of the old rubber seal accumulates around the cap sealing face (D). The amount of dirt and the remains of the rubber seal can be quite incredible and in one case I found not only the top space full, but also the inner chamber. This inner chamber had so much dirt it was completely preventing the spring from moving. Any excess of dirt, old rubber and fluid residue around

the seal face can stick the top plate and in effect the breather is completely inactive. The potential situation is very dangerous and front brake inefficiency very likely indeed. It follows that the uninitiated will presume that either the master cylinder or servo have developed a fault.

Stripping this valve assembly for cleaning is fortunately very easy. The filler cap is positioned lightly in a vice, heated to expand the alloy a little, and a sharp tool is inserted in one of the breather holes of the bottom plate to encourage it to withdraw by prising carefully. The plate will bend a little but this is rectified upon assembly. The rest of the components can then be withdrawn and cleaned. Make sure that the spring and top plate do not jump out when the bottom plate is prised out of the bottom of the alloy filler plug.

Reassembly is straightforward, making sure the centre depressions in the top and bottom plates are facing each other and the spring is inserted. The bottom plate is positioned and pressed back into the aperture of the filler cap, in a vice, by using a socket which will just contact the outer rim of the bottom plate. This pressing action will straighten any slight bending of the bottom plate that may have occurred during removal. The bottom plate is finally held securely into position by lightly swaging the bottom tapered outer section of the filler plug at position (H) onto the bottom plate.

Do not, under any circumstances, remove and leave out the internal valve assembly as the return of brake fluid to the reservoir upon brake release causes a jet of fluid to hit the underside of the breather cap. If the bottom plate is not on position it is possible to experience extensive amounts of brake fluid loss through the external breather hole.

Note that it is extremely important with this design of master cylinder NOT to overfill the cylinder reservoir and ideally the fluid level should be 0.500 inch (12mm) below the filler neck.