WOULD YOU PREFER BRIGHTER HEADLIGHTS IN YOUR OLDER CAR?

BY GRAEME DENNES

Purpose

This article applies to **all** vehicles which use headlights designed to take globes with the older style P45t mounting base, such as my 1987 2CV. The purpose of the article is to explain how to fit the newer and much brighter globes with the P43t mounting base. Today, we have a wide range of P43t globes available with greatly increased brightness and driving range, and this change can be easily done without permanent modification to the vehicle, as explained in the following. Still interested?

Background

The headlights on my 2CV are designed for the older P45t globes, and were previously fitted with 60/55W H4 halogen globes. In comparison, some of the recent, more efficient and much brighter H4 halogen globes, such as those offered by Philips, offer the following benefits when compared to the standard H4 halogen globes:

1. The light output is increased by up to 80 percent (according to Philips).
2. The same wattage globes are used.
3. No additional heat is produced by the globes.
4. No changes are required to the vehicle wiring.
5. No additional current is drawn from the electrical system.
6. No relays or switches are required.

Sadly, the downside of these newer, brighter globes is that they all use the newer P43t base, precluding their fitment to my car, and I'm not prepared to make permanent modifications to the headlights to use them.

Sooooo, is there a way out (he asks knowingly!)?

(In the remainder of this document, I have kept the colour photos at a reasonably large size for clarity, which has resulted in some blank space on some pages, which I'm not concerned about.)

Fig. 1

Fig. 2

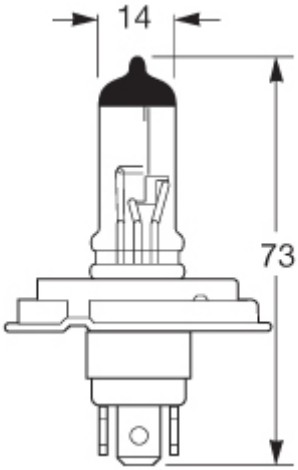

Fig. 3

Referring to the figures above, this globe is the older P45t-base halogen H4 globe, which is the type previously fitted to my 2CV. It has a stepped, dual-diameter mounting base, allowing it to be fitted into either a 41.5mm or a 45mm diameter opening in the headlight reflector, as the dimension show. In my case, the headlight reflectors in my 2CV have the smaller (41.5mm) diameter opening.

Now refer to the figures below. This globe is the newer P43t halogen H4 globe, which has three radial locating tabs extending outwards from its base. In the upper diagram of Fig. 5, the tab pointing to the left is wider than the other two tabs, and the globe also has a flat section along part of its base on the right side, directly opposite the wider tab, with two small index holes at the very right edge.

Fig. 4

Fig. 5

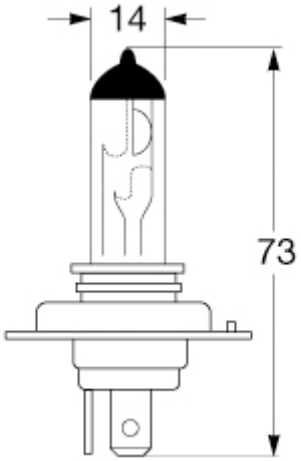

Fig. 6

Unfortunately, because of the dissimilarity of the bases, the globes cannot be interchanged, no matter how hard one keeps trying Baldrick! I can't directly replace the P45t globes with the P43t type. Oh well.

So what should be done? Is there a way out? The way to make use of the newer P43t globes is to utilise a small adapter which fits into the P45t headlight reflector opening, and then insert the P43t globe into the adapter. The globe and adapter are then securely held in place by the standard locking clips. Problem solved, and no permanent change is made. It can all be reverted back to standard form by removing the adapters and refitting the original P45t globes. I do like that.

I've located two sources for such adapters, and both show photos of their adapters on their web pages. These are made from a moulded plastic, and are available from:

1. From UK: Search for the part number BP4543AD about half way down the web page at: http://www.norbsa02.freeuk.com/goffybulbs.htm

2. From Canada:
   http://www.volvosolutions.com/Misc_P45T.html

Caveat: Currently, the adapters provided by these suppliers will only fit headlight reflectors which have the (larger) 45mm diameter opening...

So before placing your order, unclip and remove the globes from both headlights of your car - just to be sure, then measure the inside diameters of the openings in the reflectors. If the openings in your reflectors are close to 45mm diameter, then the adapters from either of the above sources will fit. Place your order, fit the adapters, and fit the new high performance globes. All done! Now show me the beer fridge Baldrick!

However, if the diameter of the openings in your headlights is approx. 41.5mm, the above adapters won't fit. Well, is that a problem? Yes, because I have not located a source of 41.5mm adapters, which I still need for the headlights of my 2CV.

Ok, Baldrick, what's your cunning plan?

The Solution

I reasoned that as the P43t globes have a 43mm diameter mounting base, and the P45t globes have a 45mm diameter mounting base at the larger diameter, then perhaps the base of a P43t globe may fit just inside a (modified) P45t base. If so, then perhaps I could carefully remove the mounting base from a (sacrificial) P45t globe, and then modify it to fit and correctly orientate a P43t globe. If so, the problem would be solved. The original car headlights would not require any permanent modification. The adapters would be inserted into the reflector's 41.5mm diameter opening (just as the standard globe is fitted now), followed by the P43t globe. If necessary, the original P45t globes could be refitted later on simply by removing the P43t globes and the adapters. It couldn't be easier. Now, if only this cunning plan was possible Percy...

After some head-scratching, several dead-ends, a few hours of workshop R&D time, some metalwork surgery, and the sacrifice of several brand new globes, my reasoning bore fruit. I successfully produced a pair of adapters for my 2CV using the mounting bases removed from a pair of very cheap P45t incandescent globes as below. These are the cheapest globes to buy, being they are going to be "destroyed" (well, they'll never light up again Percy!).

Fig. 7

Fig. 8

I now run a pair of modern H4 halogen P43t globes in Bessie. I almost need to wear sunglasses at night! (well, not quite), but read on for the details of how you too can achieve this.

A suggestion: should you decide to embark on this project, you may wish to print this document in colour to assist you, then either view or read the rest of the document accompanied by your headlight reflector, a cheap sacrificial P45t globe, and a cheap sacrificial P43t globe. Continue to make reference to the photos.

The procedure to make the adapters follows. The photos below will hopefully assist. If you intend to make a pair of these adapters, I recommend that the remainder of this article be read in detail at least a couple of times, to ensure a good understanding of the sequence of events needed to separate the mounting bases from the two P45t globes, and then setting out and filing the locating notches in the adapter. This, in principle, is what we are going to do.

Making The Adapters

a. *Separate the mounting base from the P45t globe body.*

   1. I purchased a pair of the cheapest P45t globes I could find, given that these will be sacrificial, as only their metal mounting bases are needed. Refer to Photo 1. The cylindrical globe-connector unit may be seen, surrounded by the round metal mounting base, which we require. I also purchased one P43t base globe, also the cheapest I could find, as it too is sacrificial. The stock-standard "old" incandescent globes are fine.

I've seen two different construction methods used with P45t globes for attaching the mounting base to the central cylindrical metal body. One type has the base pretty much welded all the way around the central body (and will be harder to deal with), while the other type uses say six very small spot-welded metal "straps" to anchor the base to the body. This latter type is much easier to work with. The job here is to safely separate the mounting base from the central body without damaging it, in spite of the challenges!! For the rest of the process, I'll assume your globes use the metal "straps".

Photo 1

2. The mounting base is held to the globe central body unit by one of the methods described previously. We need the mounting base from which we make the adapter. Refer to Photo 2. If you look carefully, you may be able to see the small metal straps securing the globe body to the mounting base - two straps are visible. (The base is not a "see-through" type - the bright area inside the top of the base is simply light reflecting off the shiny curved inner surface of the base material.)

Photo 2

3. Fit safety glasses and a pair of good quality safety gloves for personal protection.
4. Using a Dremel tool with a small grinding tip, cut through the several small spot-welded metal straps holding the mounting base to the central body. When all the straps are cut through, the globe body will be loose in the mounting base.
5. The globe body may then be carefully withdrawn from the mounting base, being careful not to incur damage to the mounting base or breaking the globe. If necessary, gentle force may assist in separating the two items, and a slight rotation and rocking of the globe body may also assist. Once we have removed the mounting base from the globe body, the globe body may be discarded.

b. Enlarge the opening in the mounting base.

1. Note that from here on, because we have separated the mounting base, I'll refer to the mounting base as the adapter. Refer to Photo 3. It shows the globe-connector body after removal from the mounting base. The base at the lower left is the unmodified base as it looks after separating from the globe unit, and the base at the lower right has already undergone surgery to open the central opening out to 28mm diameter, which we do as follows. The first step is to enlarge the central hole in the adapter to a diameter of say 28mm. This is a somewhat arbitrary size, but should allow the glass envelopes of all current and future P43t globes to be used with the adapter. If ever it needs to be enlarged a little in the future, it can always be done so. Continue as follows.

Photo 3

2. Inscribe a circle of 28mm diameter in the centre of the adapter, ie over the original opening. Using a nibbling tool, and taking very small "nibbles" at a time, carefully cut away the inner metal area to within say 1 to 2mm of the inscribed circle. Be careful not to bend or damage the adapter, as the material is quite soft. It's also quite sharp!

3. Refer to Photo 4, which also shows the adapter with the 28mm opening. The two small pressed metal tabs (index markers) visible on the closest side of the adapter (one vertically above the other) are the indexing tabs used to align the adapter with a notch in the headlight reflector to correctly align the adapter (and the original P45t globe) within the headlight reflector for correct light dispersion and high-low beam operation. Correct globe alignment in the headlight is critical for road safety purposes.
4. In Photo 4, see the small upward circular depression at the bottom outer edge of the adapter, nearest the camera, just to the right of the lower index mark? That's something like the type of openings we will be filing in the very same bottom edge of the adapter to fit the three metal tabs of the new globe, except the filed openings will be a little deeper, to provide side edges which positively locate the globe tabs in their openings, stopping the tabs from moving sideways, and thus keeping the P43t globe in perfect position.

Photo 4

5. Using a broad, round file, remove the excess metal up to the inscribed circle. The metal in the adapter is quite thin, and files off quite quickly.
6. Once the necessary metal has been removed from the adapter, gently but thoroughly file the metal edge with a fine file so as to prevent personal injury.

c. *File the three notches in the adapter for the P43t tabs.*

1. For this step, I purchased the cheapest P43t globe I could buy, as it is sacrificial. Its purpose is to assist in marking out the correct locations of the three notches which are filed in the adapters. This globe is going to be handled multiple times. I certainly don't want to subject the new high quality (and costly) P43t globes to this kind of rigor. Once the two adapters have been made, the cheap P43t globe may be discarded.
2. This step requires some accuracy, as the correct alignment of the P43t globe in the adapter is achieved here, and the globe should be a snug fit in the adapter's filed notches, and "locked" in place. We want the new P43t globes to be correctly positioned within the car's headlights to ensure the high and low beam light patterns are correctly positioned. This is an important safety requirement, so don't hurry this step. Refer to Photo 5, which shows the underside of the new P43t globe. Note the three tabs projecting outwards from the mounting base, which are used to locate the globe in its proper position in the adapter, and also note the flat section of the base, positioned at the top of the photo, just below the two indexing holes at the edge. When the P43t globe is finally fitted in the adapter, and in its correct position, the two indexing holes will be evenly adjacent to the small indexing tabs in the adapter as shown in Photo 4. In other words, we require the adapter's indexing tabs, as shown in Photo 4, to be positioned next to the two indexing holes in Photo 5. This is a critical requirement.

In fact, if you briefly step forward to Photo 7, you may see the two indexing holes in the base of the P43t globe on the right, nearest the camera, already aligned axially with the two indexing tabs in the adapter on the left, nearest the camera.

*This is the **exact** physical relationship we require between the globe and the adapter when both items are eventually fitted to the headlight reflectors. The index holes in the P43t globe base **must** be positioned as close as possible to the indexing tabs in the adapter. I would suggest a five degree angular error is likely to be too great, and would affect the proper high-low beam placements, creating a most serious safety issue! A couple of degrees of error is not likely to be of real concern, but do your utmost best to minimise this alignment error in the following steps. Aim to achieve a perfect result. You can become very good at making the adapters!*

Photo 5

3. Using Photo 6 as reference, position the P43t globe in the adapter as shown, and mark the positions for the notches to take the three tabs on the globe. Check the alignment, and mark out the locations of the three tabs on the edge of the outer rim of the adapter.

   Photo 6 shows the base view of the P43t globe positioned centrally in the adapter, before the notches were cut in the adapter. Note that a small clearance of 1 to 2 mm exists between the outer edge of the P43t globe base and the inner edge of the adapter. (It shows as the blackened ring just inside the outer edge of the adapter.) The aim is to file the three notches in the adapter for the globe tabs so that the globe base is positioned centrally in the adapter as shown, with equal clearance all around between the edge of the adapter and the edge of the globe base, with the two small indexing holes (showing) positioned exactly over the index tabs in the adapter (not showing). If the notches in the adapter are created accurately so as to have nominally zero play at the tabs, the globe will be completely locked in the centre position in the adapter as shown in Photo 6, and will not move from the centre position. It will be positively located in the correct position, and unable to move.

(Also note that the two smaller tabs in Photo 6 have been trimmed slightly to make them shorter, which was done during my experiments. In a new globe, the three tabs are the same length. IMPORTANT: DO NOT trim the tabs on your P43t globes!! Use them in stock standard form, so if you ever have to buy a P43t globe while out on the open road, you will know the purchased globe will correctly fit the adapter, as intended by this article).

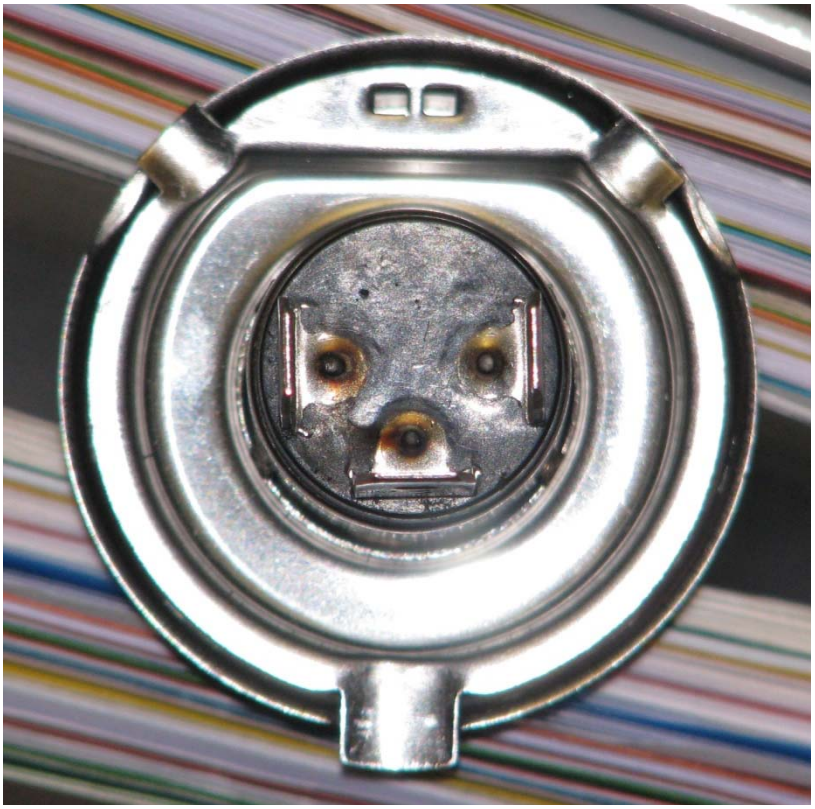

Photo 6

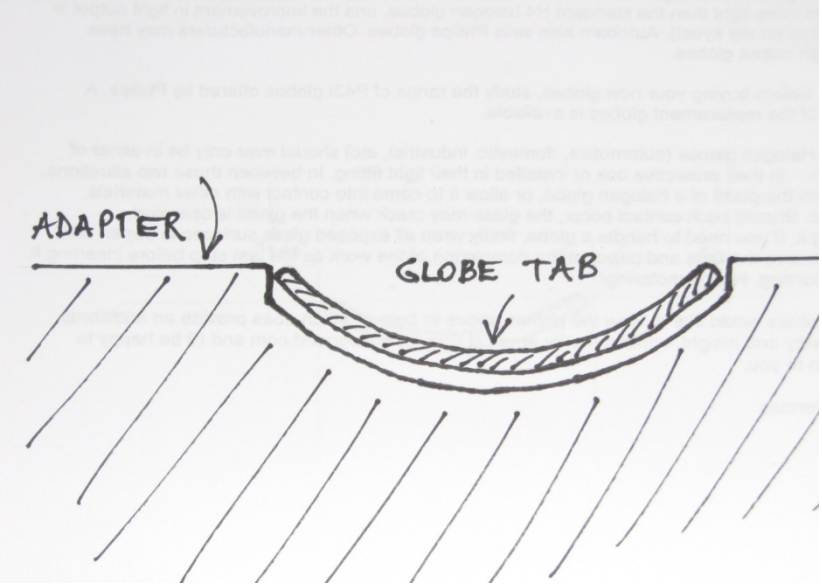

Photo 6A

4. Very carefully, file three small curved notches in the edge of the adapter to accurately accept, with clearance fit only, the three tabs. Refer to Photo 6A. Suggest that the notch for the wider tab is filed first. Note that the tab located at the bottom of Photo 5 (and Photo 6) is wider than the two tabs shown at the top. This ensures the P43t globe will always be correctly orientated in the adapter. As depicted in Photo 6A, with the tabs properly seated in position in the filed notches, we want the upper edges of the tabs to be exactly level with the upper edge of the adapter, with just sufficient depth so that the sides of the notches stop the tabs from moving sideways.
   If one notch in the adapter is filed say a millimetre or two too deep, you will need to do similarly for the other two notches, so as to keep the adapter and globe body in true axial alignment. If this alignment isn't maintained, the globe filament will end up being positioned slightly away from its correct position in the headlight body, thus causing a beam locating error, something you definitely don't want.
   Also, if you should file the notches say more than two millimetres too deep, the only recourse is make another adapter from scratch... It does get easier!!

   (You may note the adapter already has three curved notches around its outer rim, and one of them is visible in Photo 4 at the bottom edge of the adapter rim, just to the right of the two indexing tabs, but because of their location, we cannot make use of them for our purpose.) Remember, the adapters are a once-only job, so it's worth making them as accurately as possible to ensure you obtain the maximum benefit from your efforts.

   Photo 7 shows the P43t globe in position for seating in the P45t adapter. Note that the two small openings in the P43t globe base are already aligned with the two index tabs on the side of the P45t adapter. The notches in the adapter for the three globe tabs had not been filed when the photo was taken.

Photo 7

5. In Photo 8, the adapter is the upper metal ring, while the lower metal ring is part of the permanent mounting attachment on the reflector for the headlight globe. The adapter (and eventually the P43t globe) is locked into the reflector using the two small metal clips shown on the left and right sides of the photo, just touching the adapter. I have placed the adapter at the globe entrance of my 2CV headlight reflector, poised ready to be inserted in the reflector opening by pushing downwards. The adapter is seated by inserting it into the reflector opening, after aligning the adapter's indexing tabs, which can be seen, with the small matching notch in the brown reflector, which can be seen directly below the adapter tabs. The adapter should be a firm fit and fully seated in the reflector opening, with the index tabs properly seated in the reflector notch.

6. Then insert the P43t globe into the adapter so the globe tabs are properly seated in and aligned with the filed notches in the adapter. With the globe properly seated in the adapter, and this is important to do, holding the globe in position with one hand, snap each of the two spring clips in turn so they over-centre and lie against the globe base, pressing down onto the base. These lock the P43t globe and the adapter into the reflector housing. The headlight may then be returned to the car In Photo 8, the notches had not been filed in the adapter ring. In Photo 9, the filing of the notches has been completed, and the adapter is ready to be seated in the reflector opening, prior to the globe going in.

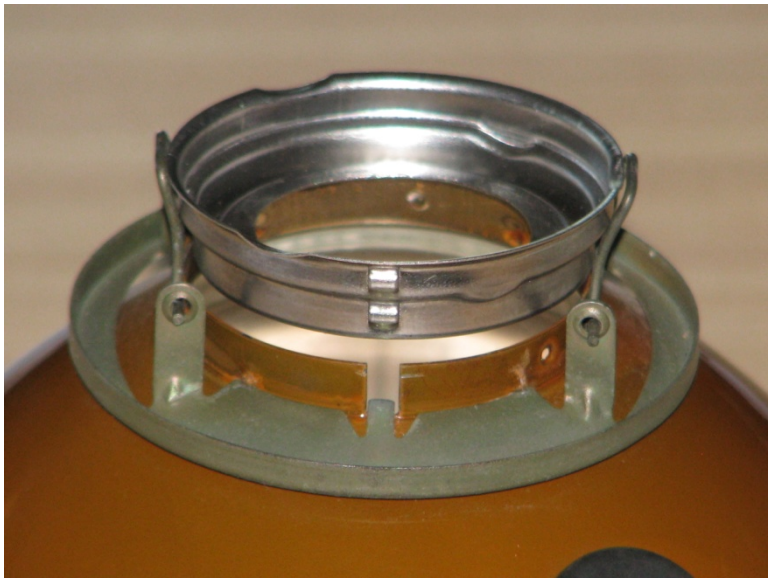

Photo 8

Photo 9

7. All done!

Conclusion

Using a pair of the adapters, I fitted a pair of **Philips 60/55W X-tremePower H4** halogen headlight globes to my 2CV. Autobarn is one supplier selling the range of Philips P43t high brightness globes. Other manufacturers and retailers may have similar globes with the P43t base.

However, before buying your new globes, study, eg, the range of P43t globes offered by Philips as a good reference. A brochure of their globes is available, which shows the differences between their globes. The differences include properties such as colour temperature, range, angle of coverage, and near-brightness, which are all worth considering before making your buying choice.

Caution: Halogen globes (automotive, domestic, industrial, etc) should ever only be in either of two places - in their protective box or installed in their light fitting. In between those two situations, never touch the glass of a halogen globe, or allow it to come into contact with other materials, liquids, dust, etc. Should such contact occur, the glass may crack when the globe is operated, destroying it. This is why I suggested you buy a sacrificial P43t globe for use during the making of the adapters. If you need to handle a good P43t globe, firstly wrap all exposed glass surfaces in tissue paper, and tape it. Remove the tape and paper at the completion of the work as the last step before inserting it into the adapter in the headlight.

Below are a number of additional photos to assist in the project. After buying the pair of the cheapest P45t base globes and the cheapest P43t base globe, I recommend that you study all photos in detail, with the two globe types and a headlight reflector held in your hands, and note the nature of the steps to be followed. If you read this file on your computer, zoom right in on all the photos to make them even larger, so the detail can be seen. I also recommend not proceeding until a clear picture is in mind of exactly what is being done. Also, if you do end up sacrificing an extra globe or two along the way, perhaps the impact is small anyway, as our goal is to produce a pair of accurately made adapters, and they only have to be made once.

Photo 10: Shows a standard P43t globe.

Photo 11: Shows a completed adapter, facing downwards for insertion into the headlight reflector. You may note the two small indexing tabs nearest the camera (for correctly positioning the adapter into the headlight reflector), the wide notch filed in the upper edge of the adapter at the rear (the one on the right. The one on the left is made by the manufacturer - it serves us no purpose.), and you may just make out the two narrower notches filed in the adapter on either side of the indexing tabs.

Photo 12: Shows a view of the adapter looking down into it. The three filed notches are just visible. The wide one is at 3.00 o'clock, and the narrow ones are at 10.30 and 7.30.

Photo 13: Shows the relative orientation of the three filed notches and the indexing tabs.

Photo 14: Shows the adapter with the three filed notches visible, giving an indication of their depths. You'll also note that the tweezers holding the adapter for the photo are positioned right at the location of the indexing tabs. In conjunction with Photo 13, this means the single wider notch is directly opposite the indexing tabs, at the top of the photo, while the two smaller notches are located on either side of the indexing tabs.

Photo 15: Shows the P43t globe and the adapter sitting in the reflector opening, before the two locking clips are activated to keep both items locked in place in the reflector.

Photo 16: Shows the assembled globe and adapter with the locking clips activated, ready to be fitted back onto the car.

Photo 17: As 16.

Photo 18: As 16.

Happy and safe(r) motoring!

Graeme Dennes
6 August 2012

Photo 10

Photo 11

Photo 12

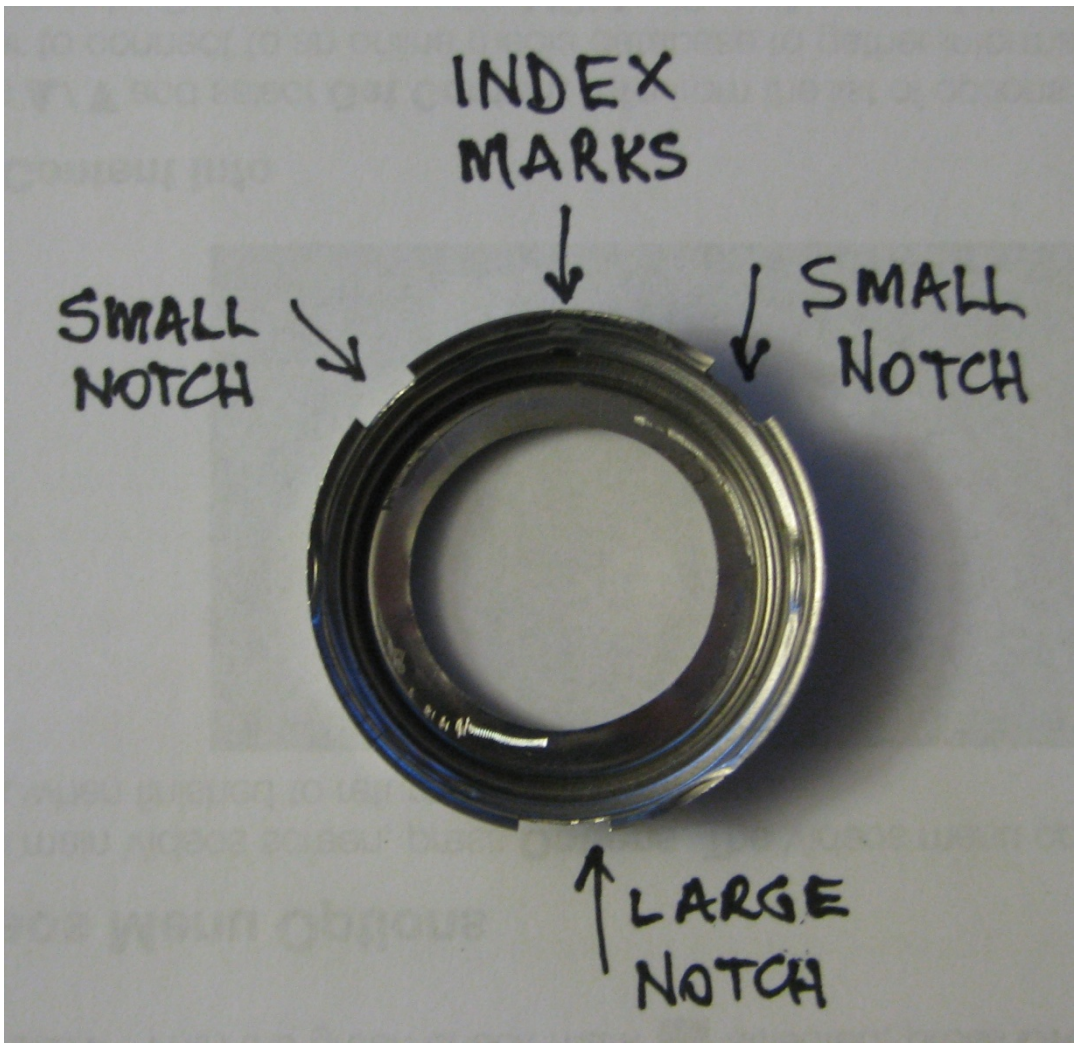

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

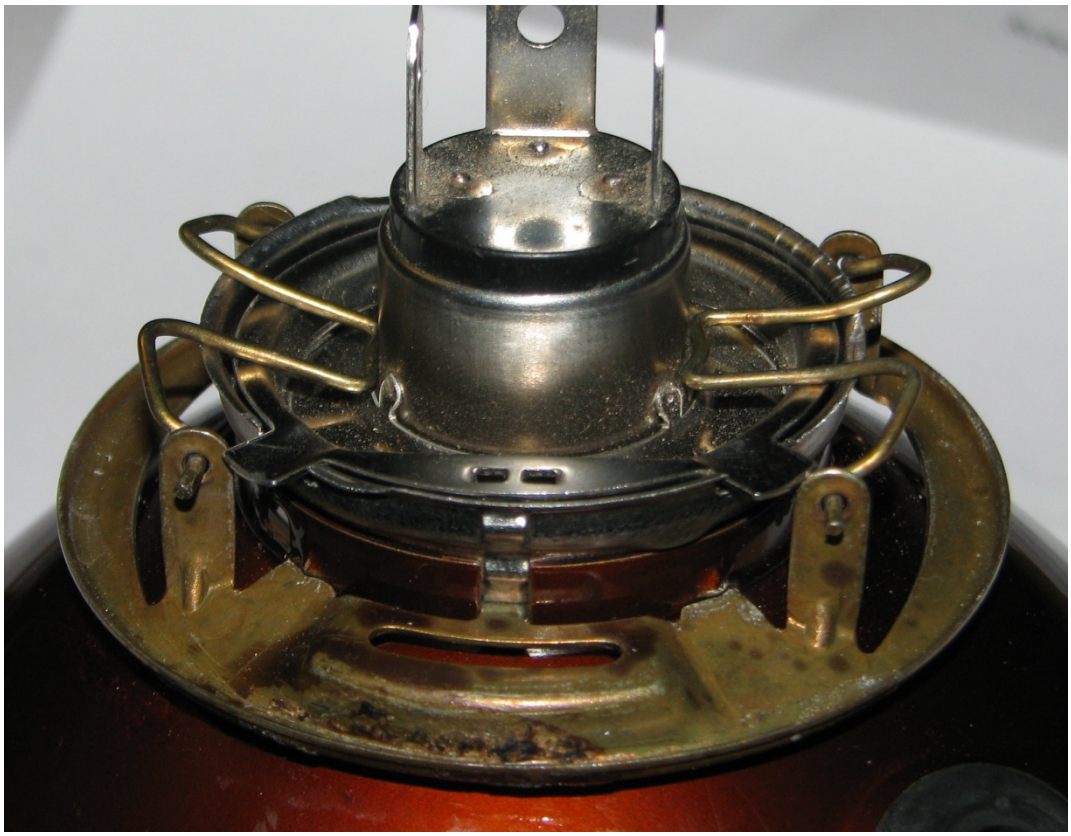

Photo 18