

EXKEM 100

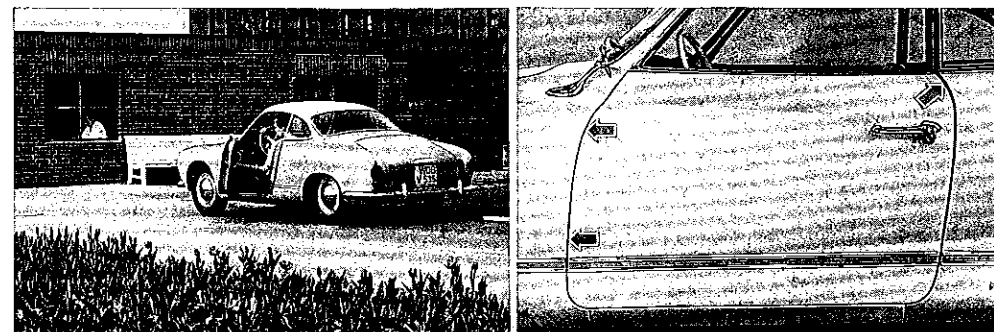
**LOOK
LISTEN
DO IT BETTER**



Body Leaks – Karmann Ghia Models

Slide Series No. 14

BODY LEAKS



14/1 This lady driver's complaint is the reason for this theme:

Elimination of leaks on Karmann Ghia models.

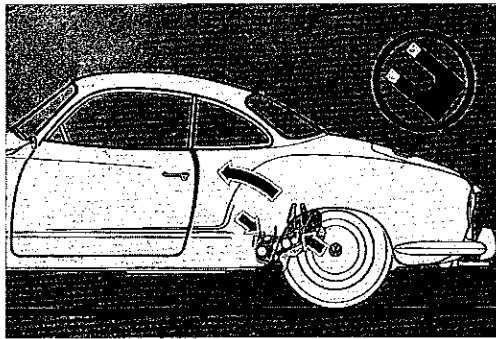
As it often occurs, a lady customer brings her car to the workshop on a fine day. She complains that recently after driving in rain, water leaked into the car.

You are now faced with the task of locating and eliminating the leaks without having the opportunity of road testing the car in the rain. We now turn to the ways and means of satisfactorily eliminating leaks independent of the weather.

14/2 Before spraying the car check whether exterior leaks are visible.

Here you see that the rear door gap is wider in the upper region whereas the gap between door and side panel is parallel. This goes to show that the body has settled at the rear. It would be incorrect in this case to re-adjust the door hinges.

To be on the safe side we remove the striker plate and check whether the door fit alters.

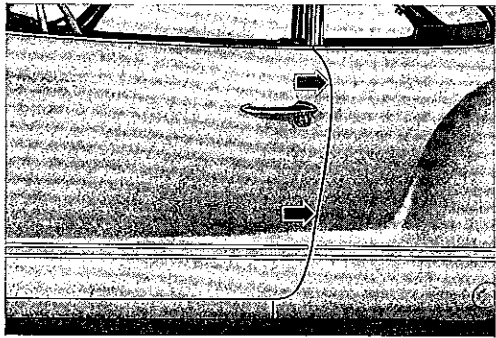


14/3 If this is not the case, the rear of the body must be raised until the gap between door and quarter panel is parallel.

To this end the bolts shown by the arrows should be loosened approximately 5 turns. Insert the synthetic packing shown in the circle into the gap at the right-hand bolt. Finally tighten both bolts to the prescribed torque:

Bolt M 10 to 2 mkg (14 ft.lbs.)

Bolt M 8 to 1.2 mkg (9 ft.lbs.)



14/4 The door gap is now correct and will thus usually eliminate leaks at this location.

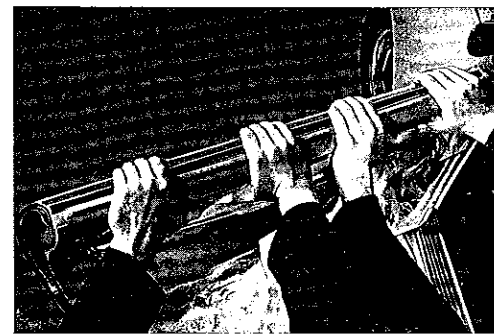
However, other parts of the door can also cause leaks. First check the weatherstrips on the window channel.



14/5 This weatherstrip is wavy and is not seated correctly on the glass. It must, therefore, be replaced. The removal and installation must be carried out carefully to prevent damage to the paintwork.

If the weatherstrip still does not seat correctly, correction should be carried out at the window channel.

This picture shows you how to do this.

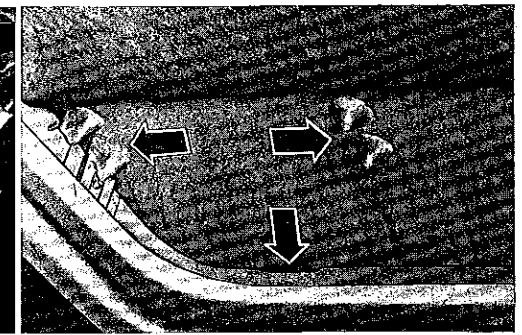


14/6 We remove the weatherstrip and the window glass. Two mechanics press the window channel together. The door must be pressed from the inside to avoid denting the door on the outside.

Check the seating of the weatherstrip on the window after installing the window and weatherstrip. Repeat the procedure if the weatherstrip still is not correctly seated.

Finally the pressure of the plastic buffers on the window must be set uniformly.

Make sure that the buffers do not press too heavily on the window as otherwise the glass will become scratched.

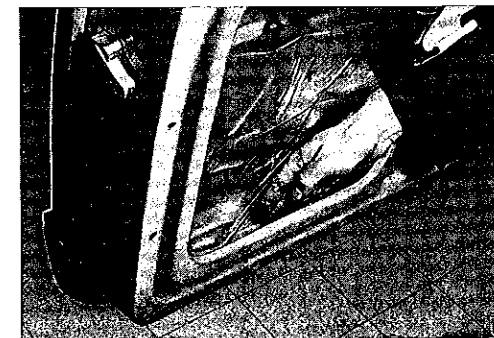


14/7 In the event of door leaks always check whether the three drain holes in the bottom of the door have become blocked by dirt.

Both of the rear drain holes — one of which is shown by the lower arrow — should be cleared and enlarged. The front drain hole should be sealed up with sealing compound, an operation which is now being carried out in current production.

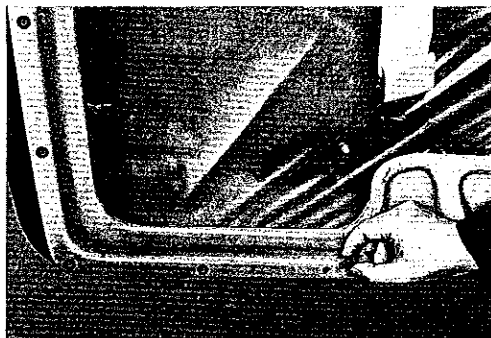
When driving fast, water is sucked up and collects in the front region between scuff plate and door.

Finally check whether the mounting noses for the mouldings on the door — shown by the upper arrows — are correctly sealed.



14/8 The plastic material inside the door directs the water to the door drain holes.

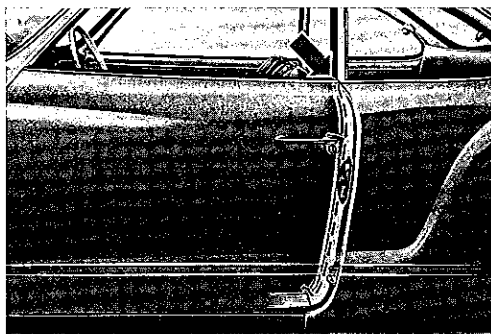
Cement the plastic material in the top portion from the outside against the inner door panel. In the lower portion the plastic material should be cemented to the bottom of the door. This will prevent water from running down between the plastic material and door inner panel.



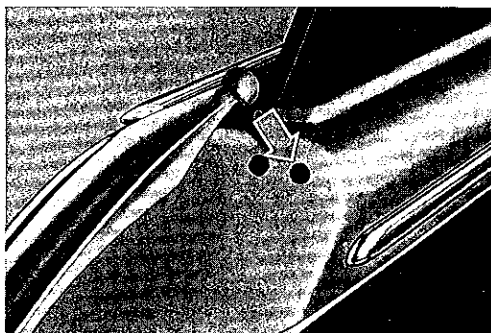
14/9 The holes for the trim panel clips are sealed with rubber caps. These rubber caps are used on the De Luxe Sedan for sealing the mouldings.

This will prevent water, which in heavy rain can collect in the bottom of the door, from reaching the interior of the car through the holes.

Install the door trim panel after carrying out the sealing operations.

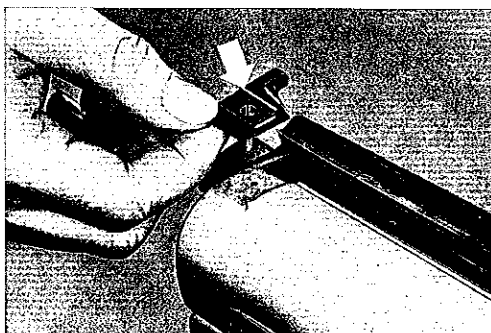


14/10 The small arrows on the lock pillar show the direction water will flow if it enters at the location indicated by the large arrow. If a leak occurs here, the carpet at the end of the scuff plate will become damp.



14/11 Leaks can be eliminated here by repositioning the mounting hole for the weatherstrip 10 mm (.4"). The arrow indicates the newly drilled hole.

This will ensure that the weatherstrip between door and lock pillar will seal correctly in this region.

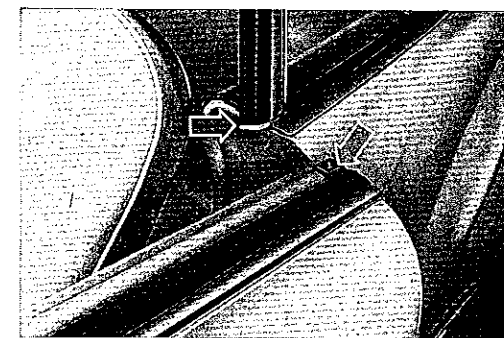


14/12 The Karmann Ghia Convertible is provided with a rubber end piece at the end of the window channel. Cut the rubber piece to the shape shown here when subsequently installing it in the Ghia Coupé. The sealing lip shown by the arrow must be reduced to half length.

After having drilled the hole at the window channel, applied Universal Adhesive D 12 and attached the rubber end piece, close the door and check...

14/13 ... whether the rubber end piece contacts the weatherstrip between quarter panel window and door window. If necessary, the weatherstrip may have to be shortened. Here it is shown in white and the arrow points to it.

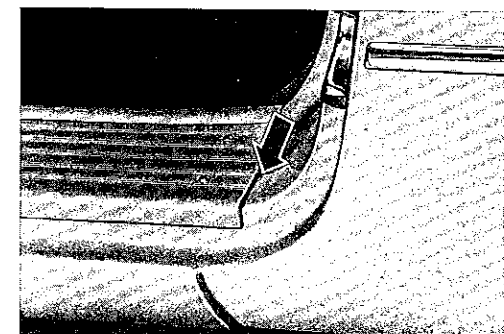
The thickness of the rubber piece under the right-hand arrow does not have to be altered. Both weatherstrips should contact evenly when the door is closed.



14/14 Water which runs down the lock pillar can drain off without entering the interior.

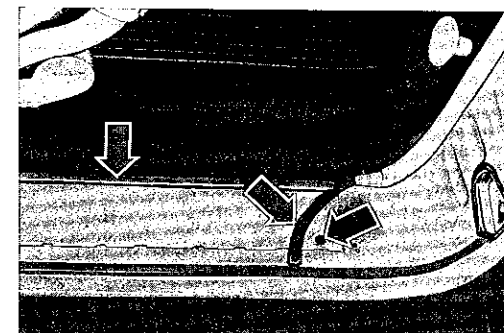
Since there is a drain hole under the scuff plate, the edge of the plate must be raised at the location shown here.

The mounting screws must, therefore, not be too tight.



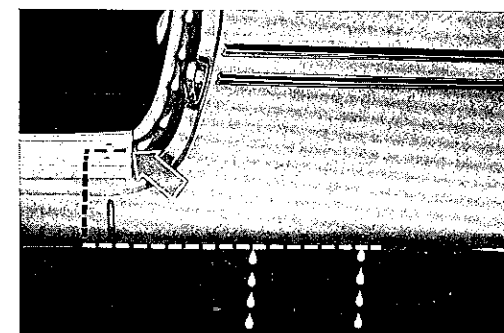
14/15 This can be clearly seen after the scuff plate has been removed: The water runs into the side member through the hole shown by the right-hand arrow. The next picture shows where the water goes to.

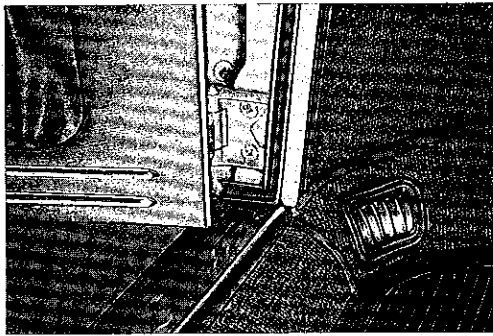
The sealing strip D 19 shown by the two left-hand arrows prevents the water from running under the scuff plate into the interior. It also provides the scuff plate with a slight inclination to the outside. Water which is blown on to the scuff plate when driving cannot enter the car.



14/16 This picture shows the way the water should run when the scuff plate is correctly seated.

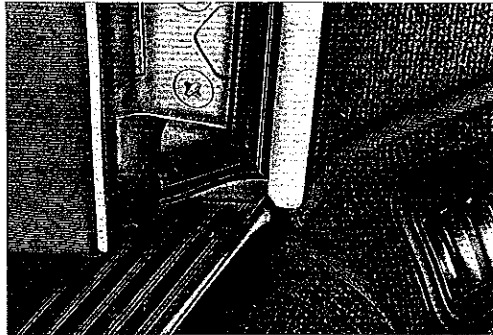
The water flows down the lock pillar, through the hole under the scuff plate into the side member and on to the two drain holes.





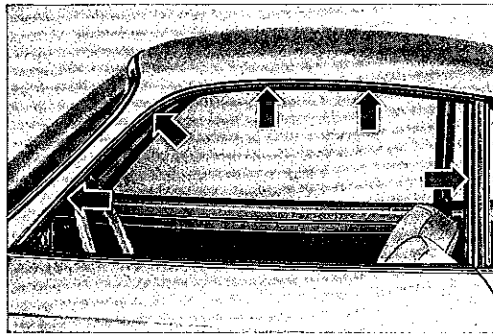
14/17 In this picture you see that the angled part of the weatherstrip is cemented horizontally at the hinge pillar. That is incorrect.

Water entering at the top of the hinge pillar should flow to the outside via this weatherstrip. In this case it is quite the contrary. The water flows from the weatherstrip on to the scuff plate and collects there until it seeps into the interior.

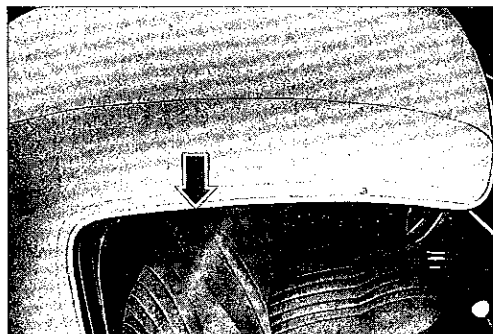


14/18 Cement on the weatherstrip as shown here. It now fulfils its purpose.

Now check this weatherstrip and all others on the body for cracks and wear. Always replace damaged weatherstrips.



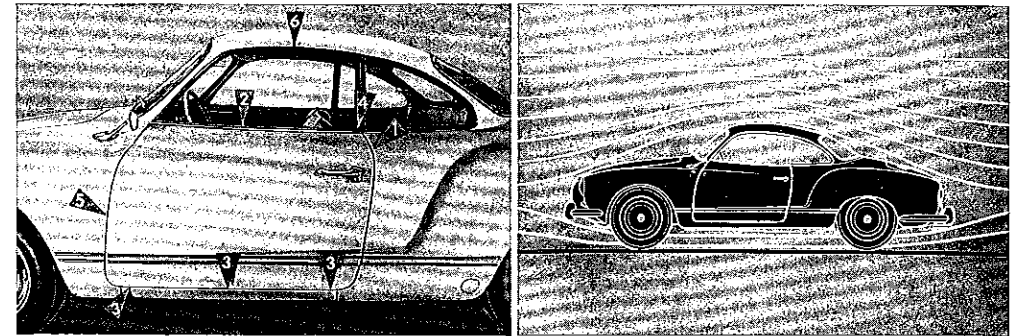
14/19 You remember that we wanted to eliminate the source of exterior leaks. The glass fit in the window weatherstrip is of importance. The glass must bear evenly against the weatherstrips. If this is not the case, the fit of the glass has to be corrected.



14/20 A further source of leaks is the adjustment of the door window on the Karmann Ghia Convertible.

If the window rubs against the top when opening the door, it is necessary to pack the side of the top until the door opens freely.

If, however, the sides of the top have too much packing, leaks can occur at the top frame. In this case remove some packing.



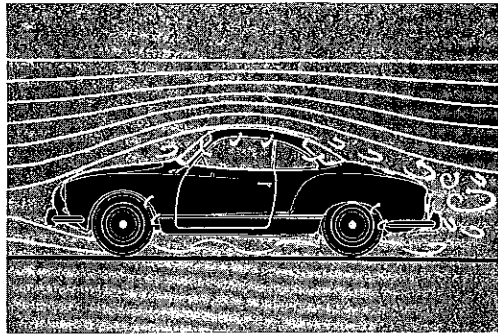
14/21 Now you are sure that all sources of door leaks have been eliminated. Here is a summary of these points:

- 1 - The wedge-shaped gap between door and quarter panel has been eliminated by raising the body at the rear.
- 2 - Then we replaced the weatherstrip on the window channel and pressed the window channel together.
- 3 - We cleaned and widened both of the rear drain holes in the door. We sealed up the front drain hole and cemented the plastic material correctly.
- 4 - The possibility of water entering at the lock pillar was eliminated by installing a piece of rubber at the window channel. Moreover, the seat of the door weatherstrip and the position of the scuff plate were corrected.
- 5 - The weatherstrip on the hinge pillar was incorrectly cemented and a slight correction had to be made.
- 6 - Finally we corrected the glass fit on the door weatherstrips. The top of the Karmann Ghia Convertible was provided with additional packing.

14/22 Before beginning to locate leaks on the vehicle by spraying it, we must consider the various pressures which are created in a vehicle when driven.

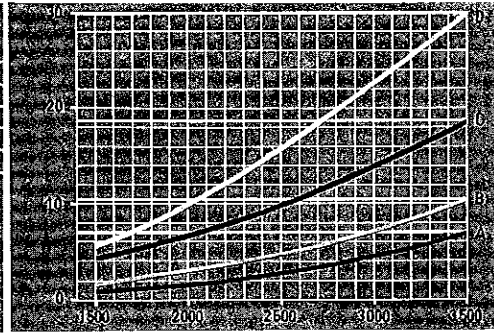
Vacuum builds up in the interior when driving and as a result, water enters the car through every hole in the body or frame in wet weather.

Here you see the ideal air flow round the body of the Ghia Coupé. The air flow is, however, not as ideal as shown here. It is disturbed by various protruding parts, for instance, rear view mirror, door handles and window surfaces.



14/23 All these parts cause the air flow to break off prematurely thus resulting in air swirl. The air pressing along the body has an increasing tendency to extract air from the interior. This results in a vacuum, the extent of which depends on various factors.

The vacuum, for instance, increases considerably when a window is opened slightly. This is particularly the case in wet weather when windows are opened to prevent them from steaming up.



14/24 This picture shows the pressure in the interior under four different driving conditions.

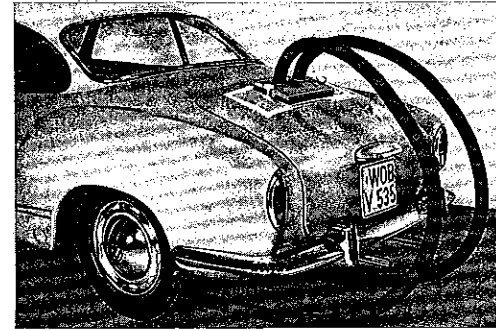
The horizontal figures represent the engine revolutions in 4th gear and the vertical ones the units of pressure measured on a water column.

The lower graph A shows us that at 3,500 r.p.m. with the windows closed and the fresh air ventilation open there is approximately a difference in pressure in the interior of .01 p.s.i.

If the windows and fresh air ventilation are closed the difference in pressure increases to .015 p.s.i. as shown by the graph B.

The graph C illustrates that the difference in pressure becomes considerably higher when the quarter windows are opened.

If, however, both door windows are lowered approximately 4 cm (1.5") we measure a difference in pressure of 0.43 p.s.i. in the interior at 3,500 r.p.m. as shown by graph D.

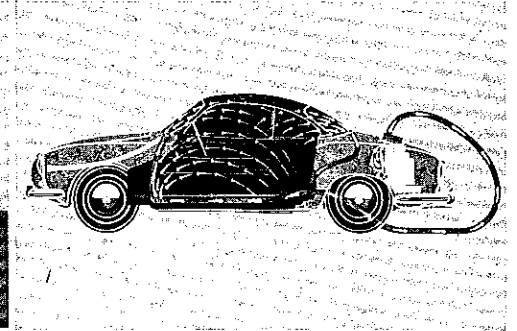


14/25 The previous pictures have shown us, that the difference in pressure or suction in the interior of the car strongly favours the entry of water whilst driving. If a customer complains of leaks, which you in your workshop cannot find by merely spraying the car, an attempt must be made to artificially create the difference in pressure obtained whilst driving.

That is what this exhausting device which is fitted over the cooling slots does.

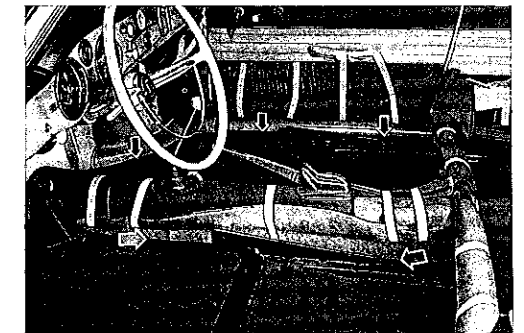
This device can be locally manufactured at a small cost. A drawing can be had from the factory.

We fasten the hoses onto the heating tubes at the rear cross member. Before doing this the heater muffler is removed. The cooling slots at the side of the exhaust device are then sealed.



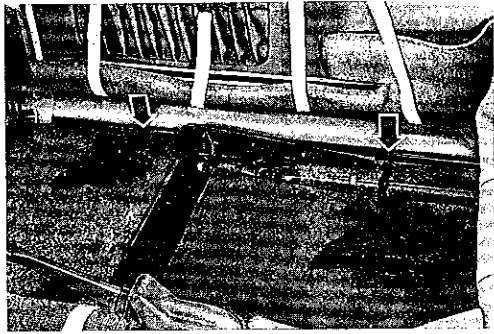
14/26 We run the engine at approximately 1,500 r.p.m. The throttle ring is wedged in the fully open position and the fresh air ventilation and windows closed.

By extracting the air from the interior of the car we obtain the desired pressure difference.



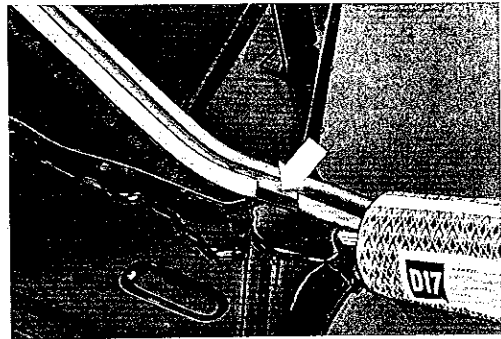
14/27 In order to observe the whole interior of the car during the spraying, the seats and floor mats should be removed and the carpeting turned up.

In addition the positions which are liable to be affected, shown here by the arrows, should be lightly dusted with talcum powder. By this means water entering the car during spraying can be traced exactly to the point of entry.

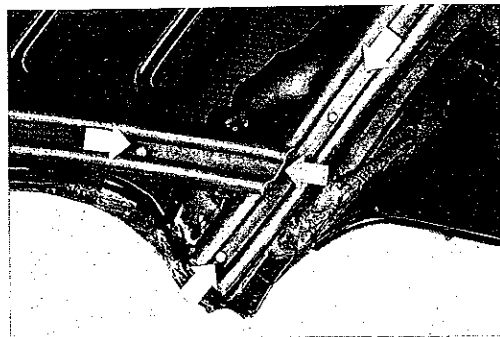


14/28 We start by spraying the weatherstrip between the body and the frame.

After some minutes water can be seen at the two points shown. Sealing the outside or inside with sealing compound has in the long run no lasting effect. The weatherstrip must be renewed.



14/29 After we have raised the body we cut the front cross member weatherstrip to size and nail it in position. A section of the inner lip of this strip is cut out in order that the long weatherstrip around the frame, which is not shown in this picture, can be located in it. We put sealing compound on the long side of the frame immediately in front of the cutaway. The same operations are then carried out on the other side of the frame.



14/30 Now we nail the weatherstrip along the long side of the frame so that the end is gripped in the cutaway section of the front cross member weatherstrip, as indicated by the centre arrow on the right.

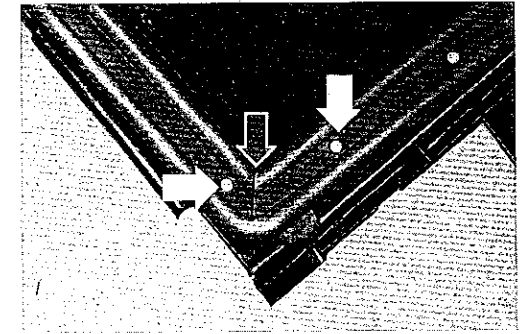
The three outer arrows show the area to which the sealing compound has been applied.

Always bear in mind, it is not the amount of sealing compound which is applied that keep the vehicle watertight, but rather the systematic carrying out of the sealing operations in conjunction with the sensible use of sealing compound.

14/31 We nail on the weatherstrip for the long sides of the frame and the rear cross member in one piece. By doing this we avoid butt joints at the rear corners.

As you see, it is necessary on the corners to cut a section out from the inside lip and right through to the outer lip. When installed the butts of the inner lip must rest correctly one against another, as shown by the center arrow. So that the weatherstrip at the rear corners is not pushed away when replacing the body, we secure it with two additional nails as shown.

Following this we apply sealing compound to the rear corners of the weatherstrip.



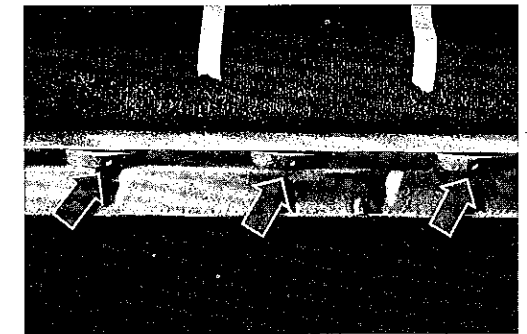
14/32 Before replacing the body on the chassis, straighten the mounting point surface, where, as you can clearly see here, it has become deformed by pulling up the body bolts.

Tighten all body bolts to the specified torque:

Bolts M 10 with 2 mkg (14 ft.lbs.)

Bolts M 8 with 1.2 mkg (9 ft.lbs.)

Whilst tightening watch the weatherstrip. If it becomes deformed do not tighten any further, otherwise you will damage the strip and further leaks will follow.

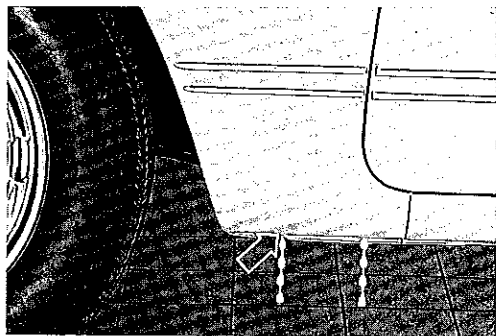


14/33 Next follows the spraying of the front fender.

Here is a view from underneath the front fender. It is mainly the overlapping seam on the hinge pillar cover plate, shown by the two lower arrows, and the top butt end of the chassis weatherstrip which are sprayed.

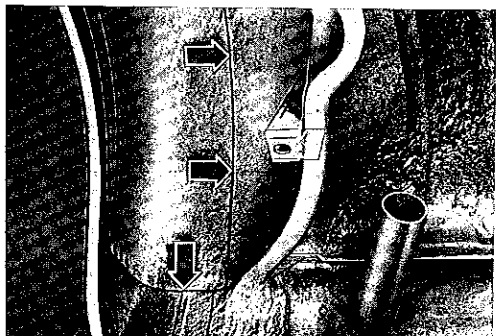
Water that penetrates at these points can run into the car through the welded seams. Leaks at the overlapping seam can be overcome by using sealing compound.





14/34 It is not always possible to make the metal sheets which lay within the spray range of the front wheels watertight.

Water which reaches the back of the hinge pillar cover plates should flow away through both the drain holes. As during construction only one hole is provided, it may be necessary in the case of leaks at the front fender to drill a further 10 mm hole as shown by the arrow.

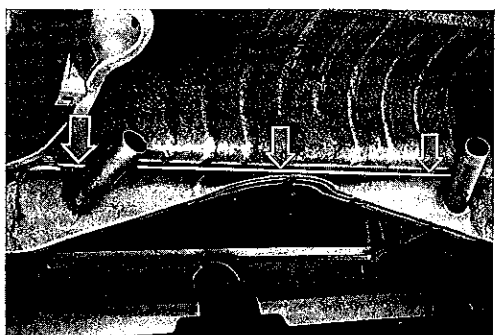
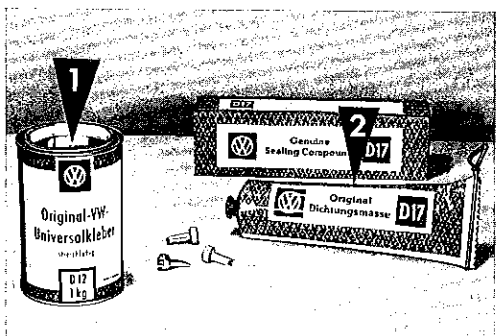


14/35 Here is a view from underneath the rear fender. The arrows show clearly the seams on which the spray should be directed.

The underside of each fender should be sprayed for about 5 minutes. If there are leaks the seams should be thoroughly dried by blowing them out with compressed air. Finally the leaks should be sealed in the following manner.

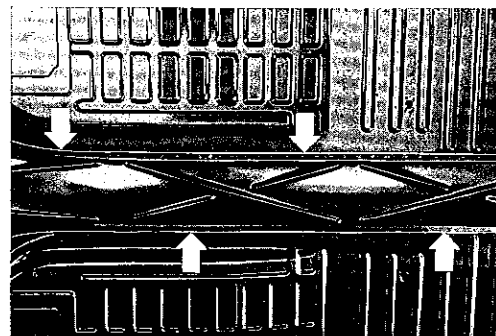
14/36 First apply a thin coat of VW Universal Adhesive D 12 to the seams and allow it dry.

Next seal the seams with Original VW Sealing Compound D 17. Finally apply a further thin coat of VW Universal Adhesive D 12 to all the seams, thus ensuring that the sealing compound will not lift and break away after a short time.



14/37 Should water enter the vehicle at the point shown above the rear cross member the seam should be sealed with VW Universal Adhesive D 12 and VW Sealing Compound D 17.

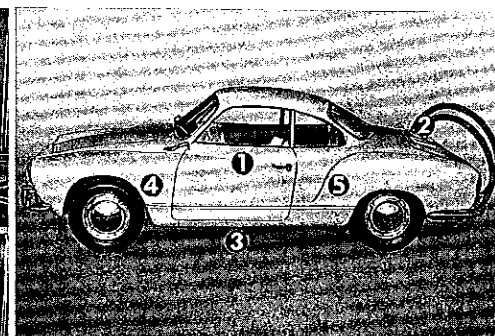
In order that the seam can be clearly seen, the photograph has been taken from underneath a body which has been removed from the frame.



14/38 Next check the seams between the floor plates and frame tunnel. For this purpose the vehicle must be raised and a second mechanic equipped with a torch should watch the interior of the vehicle.

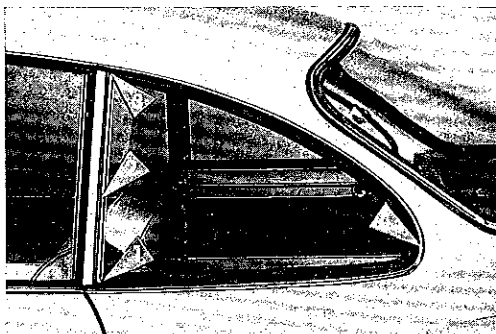
Leaks at the seams should be sealed from the outside with adhesive D 12 and then with sealing compound D 17.

The following points should be noted: The water should not be allowed to strike the foot plate as a hard jet, but should be adjusted to give a fine spray, thereby reproducing the same conditions as apply when driving in rain.



14/39 We will now summarize all the sealing operations on this Karman Ghia Coupé:

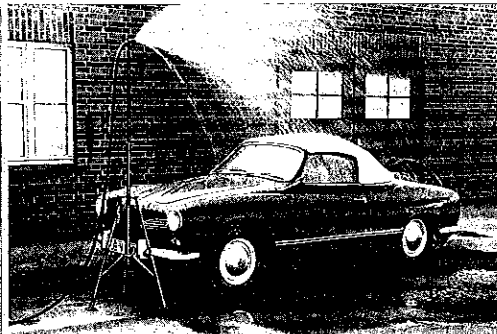
- 1 - If a vehicle comes into the workshop first of all establish the cause of all leaks which can be recognised from the outside. These faults mainly occur at the doors.
- 2 - If we cannot find a leak by merely spraying the vehicle, we use a device which, with the aid of the running engine, we reduce the pressure in the interior of the vehicle, thereby producing approximately the same conditions as by driving the vehicle in rain.
- 3 - By spraying we ascertained that the weatherstrip between the frame and body was not watertight. The weatherstrip was renewed.
- 4 - Then followed the spraying of the front fender and the sealing of the leaks from the inside.
- 5 - Lastly we ascertained that there were leaks at the rear fender and the seam above the rear cross member. These seams were sealed with VW Universal Adhesive D 12 and VW Sealing Compound D 17.



14/40 Now we turn to the upper portion of the body. For leaks at the rear side windows various points must be sprayed separately for about 5 minutes, in order to determine the actual location of the leak.

Here you see the correct sequence. Each of these points must be sprayed with a weak stream of water, care must be taken that the water does not run over to the next point, otherwise it will not be possible to locate the exact position of the fault.

If a leak is found at one of these points it should be sealed accordingly. Further information can be found in the 1958 VW Workshop Manual, volume 2.



14/41 Now that we have dealt with possible leaks on the Karmann Ghia Coupé we will finally have a look to see what can be done about sealing leaks on the top of the Karmann Ghia Convertible.

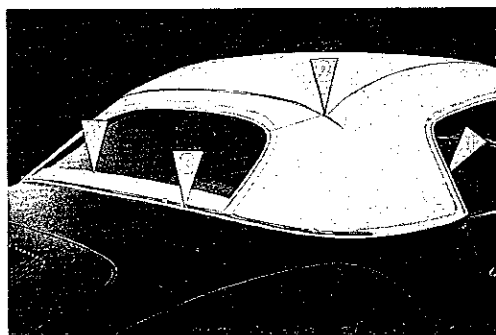
As can be seen here, the vehicle is sprayed from above. It is practicable to attach the hose to a stand approximately 6 ft. high.

The customer complained of leaks on the top of this car. Even after half an hour's spraying we were unable to find any leaks. We therefore fitted the exhauster device over the cooling slots fastened the hoses, and let the engine run at 1,500 r.p.m.

14/42 After about 20 minutes the top showed signs of leaks at the following points:

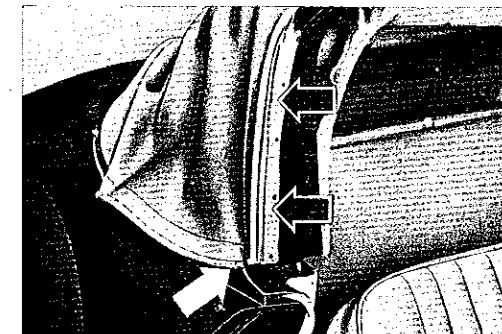
- 1 - The main bow
- 2 - The moulding over the rear window
- 3 - The rear support and
- 4 - Around the stitching of the rear window

In this case it is not merely sufficient to seal up the leaks from the outside.



14/43 The rubber seal on the main bow must be removed and the top cover re-mentented at the points shown by the arrows on the right.

It is also necessary to see that the top cover overlaps the rubber seal on the quarter panel when the top is in the closed position as shown by left hand arrow.



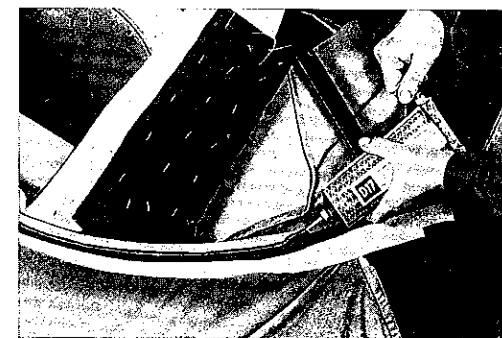
14/44 The rubber seal must be made to fit the wind up window correctly. We applied VW Universal Adhesive D 12 to the cover on the main bow. As the lower end of the rubber seal did not fit correctly against the window glass we stuck an additional rubber wedge over the edge of the cover on the main bow. Next we applied adhesive D 12 to the rubber wedge and then screwed the rubber seal back into place.

We again checked the rubber seal to ensure that it was seating correctly against the window glass.



14/45 Secondly we will rectify the leak on the rear support. The cover must be completely removed from the rear support. In order to avoid damage to the paintwork, it is recommended that the rear of the vehicle be covered with a soft sheet. We next fill the gap between the rear support and the panelling with VW Sealing Compound D 17.

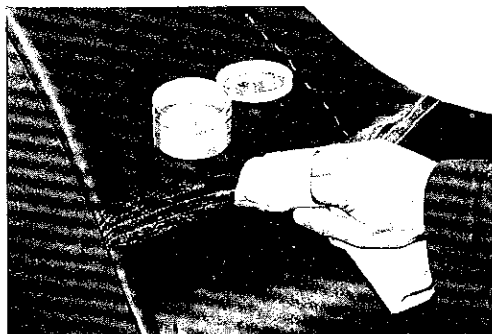
It is most important for this operation firstly to ensure that the rear support is screwed up tight.



14/46 On this vehicle we must renew the rear portion of the top, because the seams around the rear window were leaking. In a case like this there is no possibility of repair.

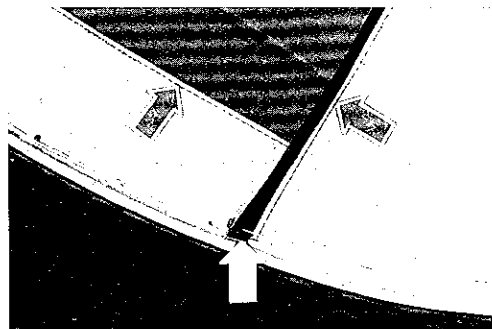
After we have nailed on the new rear portion we apply adhesive D 12 all along the row of nails on the rear bow above the rear window. In order to stop the top cover from sticking at this point we apply a strip of linen over the adhesive.





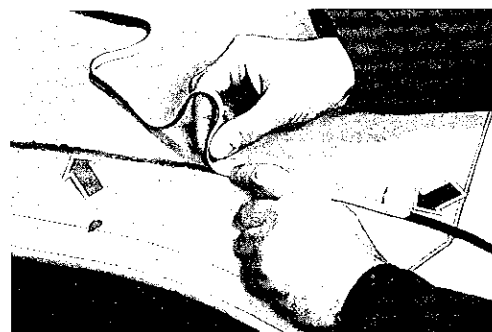
14/47 On the inside of the seams we apply two or three thin coats of seam preservative.

So that the top cover does not stick at these points, we dust the seams with talcum powder.

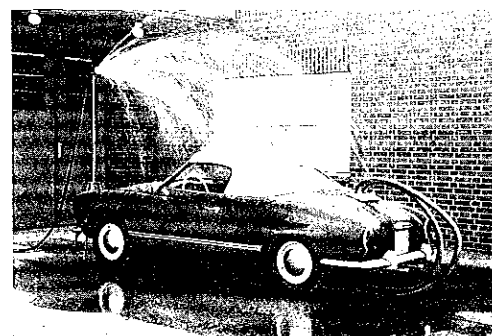


14/48 Make sure when nailing on the covers that the weatherstrip extends over the beading on the rear support, as shown by the centre arrow. If this is not done the water which is forced against this point can enter the car.

A further piece of important advice: Take care when removing spots from the top cover that the grease solvents do not come in contact with the seams.



14/49 After we have nailed the rear portion and cover onto the rear support we seal the top cover from the outside above the rear bow. Adhesive D 12 is applied along the row of nails, as shown by the left-hand arrow. So that new leaks do not occur when nailing on the moulding we first stick a sealing strip over the adhesive. The right-hand arrow shows the white protective backing which must be peeled off before the moulding is nailed on.



14/50 With the foregoing pictures we have endeavoured to point out to you places on the Karmann Ghia models where leaks can occur. Furthermore, showing you how one can find and effectively eliminate them in the shortest possible time.

Before you hand the vehicle over to your service adviser prove to yourself that the vehicle is in fact watertight by spraying it again.

If the rectification of leaks is gone into systematically your work will be crowned with success.