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(56) Documents cited **GB 1118369** **GB 0839306** **GB 0709325** **GB 0516448** **GB 0426944** **GB 0390366** **GB 0361245** **GB A 2091413**
(58) Field of search **F4V** **B7B**
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(54) **Air extraction system for motor vehicles**

(57) A vehicle stale air extraction system includes ducting positioned adjacent the roof and extending longitudinally along the top of the door lines. A fan draws air into the ducting through apertures near the seating positions of each occupant and exhausts same into the boot of the vehicle.

In Figure 5, the flexible duct 50 comprises apertured channel sections 51 and connecting sections 56 which are secured by adhesive strips 53 to an existing vehicle roof 54. Alternatively the duct may be of D-section with corrugated walls so that it may be flexed to fit the vehicle roof curvature.

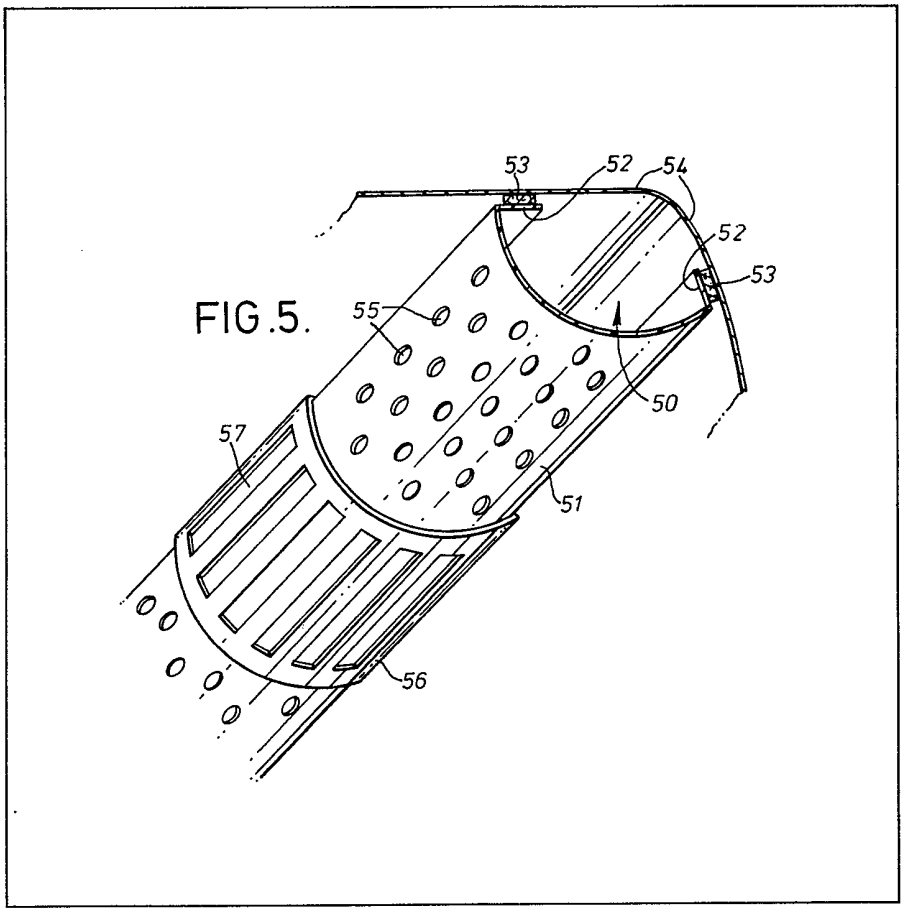


FIG.5.

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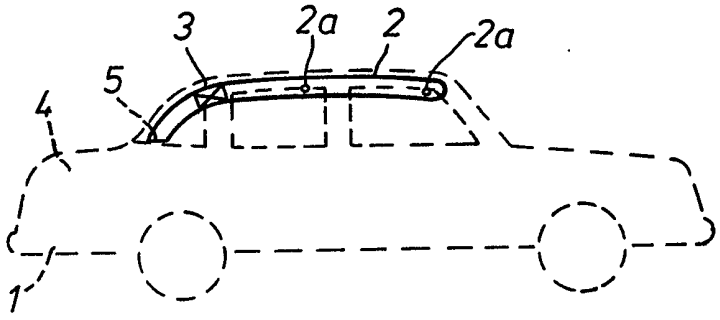


FIG. 1

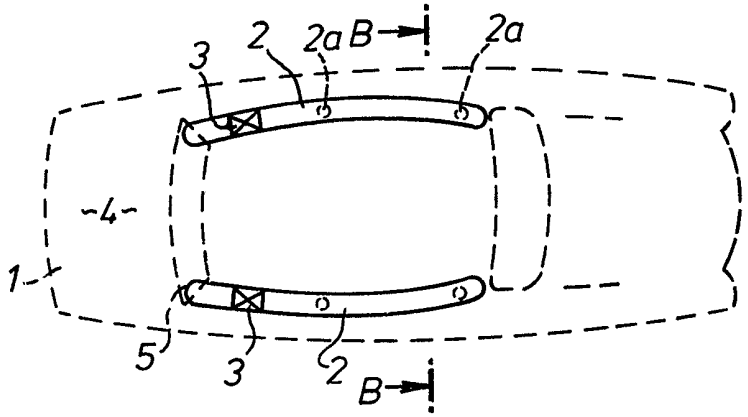


FIG. 2

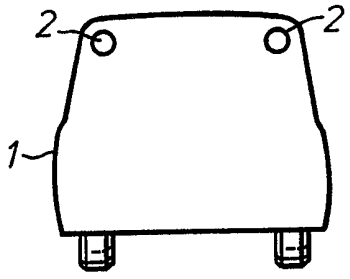


FIG. 3

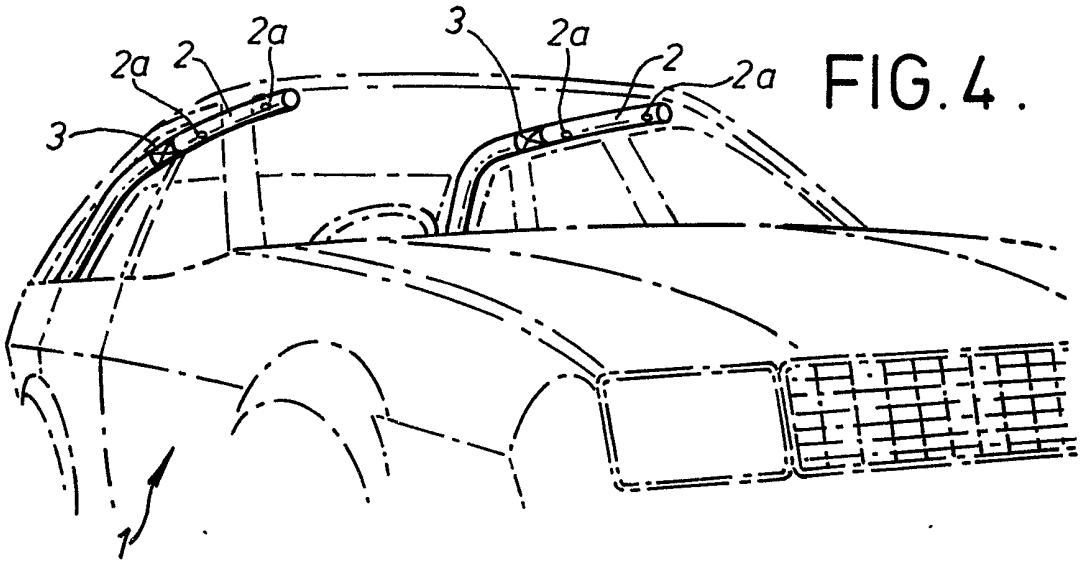


FIG. 4.

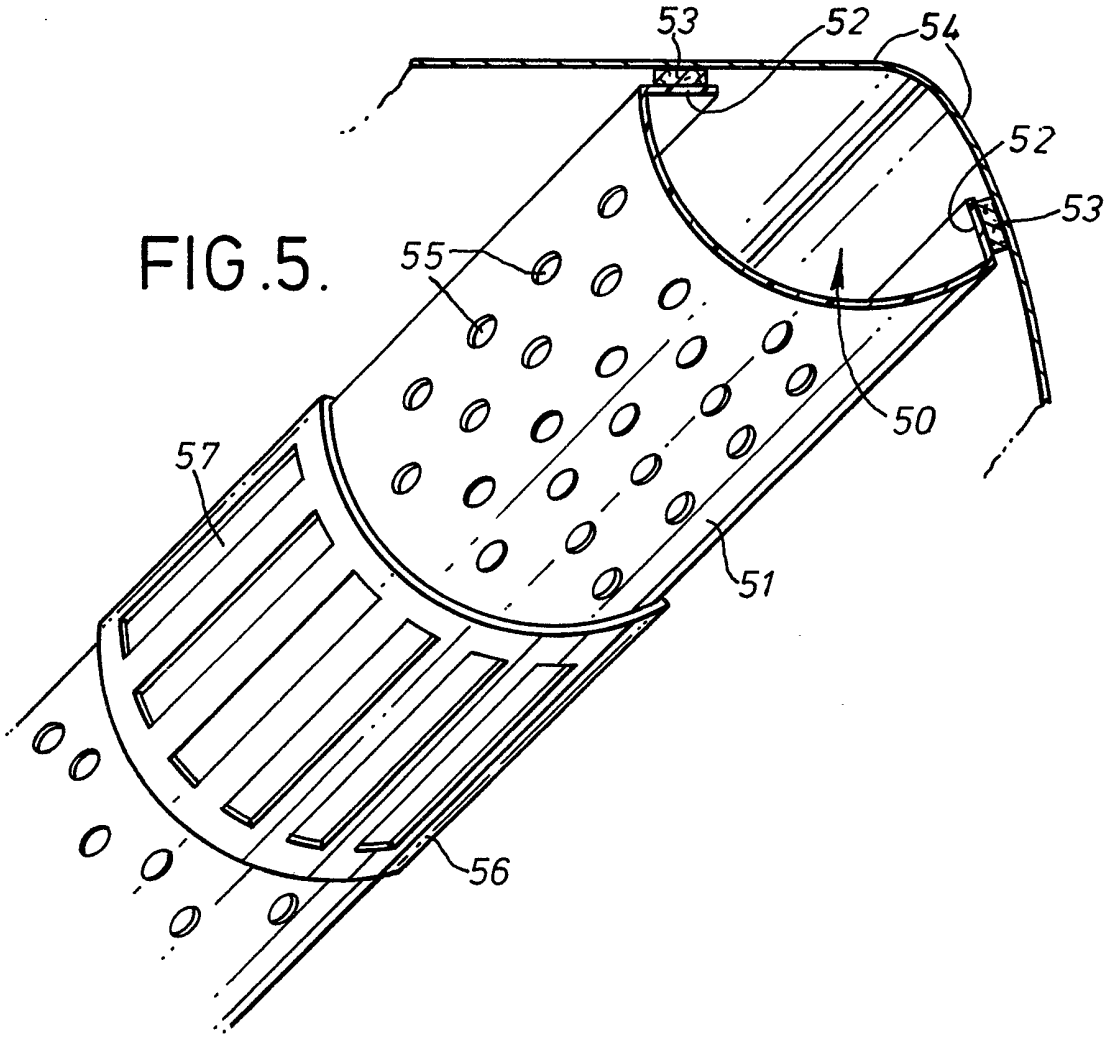
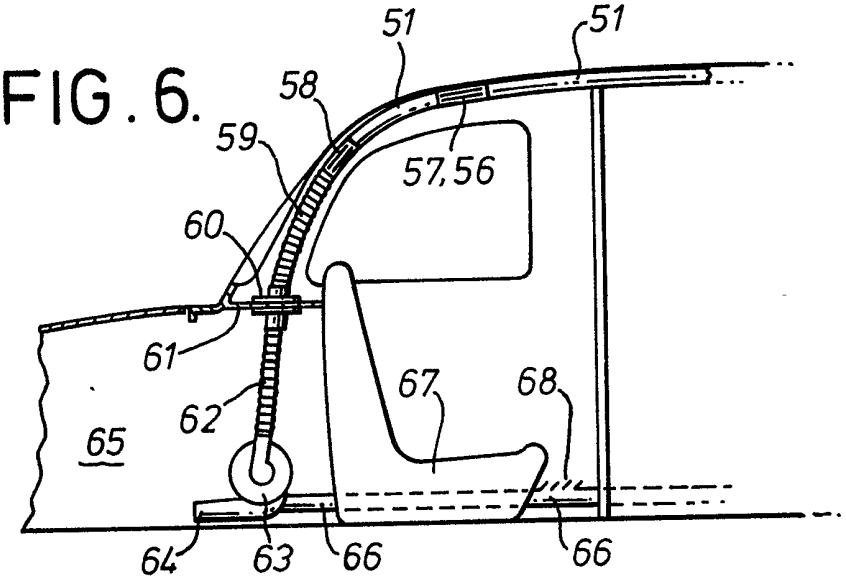


FIG. 5.

FIG. 6.



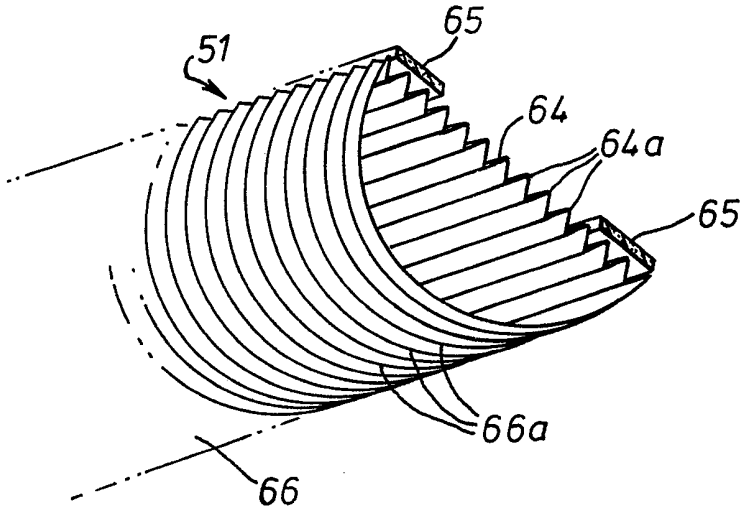


FIG. 7.

SPECIFICATION

Air ventilation and extraction system for motor vehicles

This invention relates to an air extraction or ventilation system for motor vehicles and is primarily concerned with a system for use in private motor cars whereby better extraction of internal air can be achieved than with known systems, especially where the vehicle is intended for use in hot climates with air conditioning or where more efficient extraction of internal air is required, for example when the occupants of the vehicle are smoking.

Extraction systems have been proposed wherein a false roof inside the vehicle provides a duct for extraction of air. These arrangements reduce internal headroom and have to be designed into the vehicle at the outset as they require intake and/or extraction through the vehicle body. G.B. 839306, for example, discloses the use of the roof space for extraction but is concerned generally with overall ventilation by fresh air and does not solve the problem of clearing smoke from localised areas in a passenger compartment, nor does it disclose an arrangement which can be fitted to an existing vehicle. G.B. 516448 shows a venturi powered system, which may include a fan, but involves a complex structure not adaptable to modern vehicles of limited height. Further arrangements provided in double skin roof areas are disclosed in G.B. 361245, 390366 and 426944.

With modern vehicles having low profiles to reduce drag and lower the centre of mass such double skin arrangements are not feasible and in addition can be easily damaged by deformation of the relatively thin inner skin that would be necessary. Another problem is the connection of the roof cavity with an extractor unit, this involving a complex system of baffles. The proposal in G.B. 839306 involves a complex assembly and requires air-tight box construction to be used, neither of which is obtainable with spot welded constructions without much labour and finishing work.

The problem to be solved, therefore, is to provide roof space ventilation giving advantages inherent therein as obtained with the prior-art known, but without requiring constructional modifications and without unduly reducing headroom within the vehicle. The arrangement nevertheless being able to provide high extraction rates and being independent of any ventilation already fitted.

It is one of the main objects of the present invention to provide such a system which can be incorporated into existing vehicles as an add-on accessory without needing substantial modifications to the structure of the vehicle.

According to this invention a ventilation or extraction system for a vehicle comprises a ducting located closely adjacent the vehicle roof, with air intake means communicating with the ducting and an air impelling means for drawing air in through the intakes and moving same along the ducting for exhaust through a suitable aperture disposed outside the passenger compartment of the vehicle.

Preferably the ducting will comprise a readily attachable and removable moulding which is adapted to be located longitudinally along the junction between the roof and side of the vehicle above the door frames with suitable apertures being provided for intake of air at appropriately spaced locations within the passenger compartment, for example close to the seating position of each person. An electrical fan comprising the air propelling means may be located within the ducting at a suitable point to propel air down the ducting to an exhaust which passes through the vehicle body to dispose of air either externally of the vehicle or into the boot (trunk).

The ducting may be plastics or metal and will be formed so as to be as intrusive as possible and is preferably located beneath the normal fabric finish or other head lining as used in the roof. The ducting may, however, be covered with suitable trim for attachment to the vehicle roof. Apertures are provided in the ducting, conveniently located close to positions of passenger seating so that adequate individual extraction of air from the location of each passenger can be obtained.

The arrangement may be integrated with the vehicle's heating and/or air conditioning system, or alternatively and preferably may be an independently operating arrangement.

The system provides for ready conversion of existing vehicles with the only external modification required being the provision of a suitable aperture or ducting to exhaust the air externally. This may be through the vehicle body, or alternatively the ducting can be run to a convenient point for exhaust, such as into the vehicle boot (trunk) where access can usually be obtained easily. This has the advantage in that external air flow does not affect the extraction.

The ducting may comprise tubing or the duct may be formed by a channel shape moulding forming, in conjunction with existing parts of the vehicle structure a duct. The air intakes may be constituted by perforated or louvred portions which can be made adjustable. A single extractor fan may be provided conveniently installed on the rear parcel shelf of a vehicle and extraction of air can be through suitable orifices into the boot (trunk) of the vehicle. It is preferred to position the intakes at least above the doors of the vehicle.

It can thus be seen that the ducting may be positioned as required to avoid serious incursions into the head room available and is suitable particularly for compact vehicles which otherwise have insufficient space for efficient ventilation. Furthermore, the invention enables an extraction system to be fitted after main assembly of a vehicle as an optional extra if required.

Embodiments according to the invention are shown by way of example only in the accompanying drawings, wherein:-

Figure 1 shows the side view of a motor vehicle incorporating an extractor means,

Figure 2 shows a plan view,

Figure 3 is a section on BB of Figure 2,

Figure 4 shows a perspective view of the vehicle

interior,

Figure 5 shows a detail section through a ducting in a vehicle.

Figure 6 shows a section through the rear of a vehicle with extractor fan, and

Figure 7 shows a part of a further ducting.

As shown generally in Figures 1 to 4 of the drawings, a saloon car 1 incorporates an extractor tube forming a duct 2 within the roof and running longitudinally above the door line of the vehicle. Air intakes 2a are provided at suitable locations in the tube and the rearward end of the tube includes an electrically driven fan 3 serving to draw air in through the intakes and propels same along the tube to be fed into the boot 4 via suitable apertures 5.

The arrangement described does not require any structural alteration to the body of the vehicle and the ducting connection can generally be easily passed through the rear parcel shelf, which in most instances is of a purely cosmetic construction. Not only does the arrangement provide for a rearward extraction of fumes, but in addition the air intakes can be positioned as convenient according to the vehicle construction and as best adapted to the internal air flow characteristics. The arrangement further obviates the disadvantage of known rear extraction systems wherein the whole of the air flow must pass from the front to the rear of the vehicle to be extracted, with attendant discomfort to rear passengers. In the construction described extraction is at convenient points relating to each individual passanger and, by means of the fan extraction, is not dependent on vehicle speed.

The fan 3 may be positioned in the boot and with such an arrangement connection to the ducts is simple and furthermore noise, which is a considerable problem with impellers of high capacity, can be much reduced due to the physical separation from the passenger compartment.

The exhaust of air into the boot provides several advantages. The flow is generally unaffected by air flow external to the vehicle and the fan ensures that fumes cannot be introduced from the rear of the vehicle due to flow reversal which can occur with passive systems if, for example, a window is opened to create a back draught overcoming the extraction suction. There is a steady extraction regardless of vehicle speed enabling the extraction to be balanced more satisfactorily with existing ventilation and air conditioning systems. The extractor fan may be physically large producing less noise and can be acoustically screened from the vehicle. The arrangement can be added to existing vehicles by a non-expert.

Figures 5 to 7 show embodiments mainly intended for use with a fan unit mounted in the boot and for fitting to existing vehicles. In Figure 5 the duct 50 is formed from a channel section 51 of a flexible plastics material having flanges 52 running longitudinally and including an adhesive coated foam plastic strip 53 by which the channel edges may be secured to the roof 54 of a vehicle. The channel 51 may have vents 55 formed therein for intake of air, or alternatively additional sections may be provided which couple two channels together, these sections 56 having suitable apertures 57 which may be of variable dimension and adjustable. Sections 56 may be dimensioned to overlap the ducting or to fit inside same with appropriate seals being provided. The front end of the ducting can be closed by means of a cap (not shown). Other sections can be provided to enable angular joints to be made between sections of ducting.

Connection to the fan unit may be made by means of the coupling passing through to the vehicle boot, as shown in Figure 6 wherein the channel 51 connects via a coupling 58 with a flexible hose 59 connected with a pipe flange 60 passing through the rear parcel shelf 61, and connected by a further hose 62 with an impeller fan unit 63. Exhaust air may be discharged at 64 into the boot 65, or conveyed via a further pipe (not shown) externally of the vehicle. A manifold provides for both sides of the vehicle to be served by a single fan unit 63.

Figure 7 shows a further section of ducting 51 and in this arrangement a D-shape section is provided with a base 64 thereof having longitudinally extending corrugations or convolutions 64a, so that it may be readily flexed to fit the curvature of a vehicle roof and secured by adhesive strips or pads 65. The outer profile 66 of the ducting may be convoluted radially at 66a to allow flexing in a longitudinal direction. Here again various vents and connecting pieces can be provided as in Figures 5 and 6, with suitable sealant or foam plastics being used between the joints.

The arrangement thus enables a number of basic units to be selectively assembled and fitted to a vehicle according to requirements, by selecting appropriate lengths of ducting and connectors to join same through various angles.

The extracted air can be filtered and recirculated if required and where heat conservation is important. The air may be conditioned in a separate or integral unit and returned to the vehicle.

In the embodiments of Figures 5 and 6 the fan unit can be mounted on the rear parcel shelf 61, or within the ducting, by means of a suitable enclosure to form an arrangement similar to that of Figure 4.

If an air conditioning unit is used with the fan 63 of Figure 6, then return conditioned air can be fed back into the passenger compartment through further ducts 66 passing beneath the rear seats 67 and having suitable events 68 at floor level.

CLAIMS

1. An air ventilation or extraction system in a vehicle, comprising a ducting adjacent the roof and extending longitudinally thereof within the passenger compartment, one or more air intake means communicating with the ducting and each positioned adjacent a seating position, and impelling means for drawing air in through the intake or intakes and moving same along the ducting, the rear of the ducting passing through an aperture to exhaust air externally of the passenger compartment.

2. An air ventilation or extraction system as claimed in Claim 1, wherein the ducting comprises a

shaped moulding which is formed to be located longitudinally along the juncture between the roof and side of the vehicle, the air intake apertures being provided at spaced locations along the ducting within the passenger compartment, the rear of the ducting following the roof line down to a position behind the rear-most seats and passing through an aperture to the vehicle boot.

3. An air ventilation or extraction system as claimed in Claim 1 or 2, wherein an electrical fan comprising the air impelling means is located within the ducting to propel air down the ducting to an exhaust which passes through the vehicle body to dispose of air externally.

4. An air ventilation or extraction system as claimed in any preceding Claim, and including any one of the following features alone or in combination with any other feature:-

a) the ducting is of plastics or metal,

b) the ducting is located beneath the normal trim of the vehicle interior,

c) the ducting has apertures positioned close to the vehicle seating positions,

d) the ducting is integrated functionally with the vehicle heating, ventilating or air conditioning system,

e) the extractor fan is located at or in the rear part of the vehicle,

f) the extractor fan is located in the vehicle boot (trunk),

g) the air intakes associated with the ducting are positioned above the doors.

5. An air ventilation or extraction system as claimed in Claim 1, wherein the ducting comprises a moulding secured to the vehicle roof above and adjacent the side doors and extending from front to back, the rear of the ducting curving downwardly and secured to the vehicle frame between side and rear windows, and passing through the rear shelf below the rear window, the ducting being connected with an air impelling fan positioned within the boot (trunk) structure, whereby air is either exhausted into the boot, conditioned and recirculated to the passenger compartment, or further ducted externally of the vehicle.

6. An air ventilation or extraction system as claimed in Claim 5, wherein the ducting comprises a resilient flexible plastics material of channel section the edges of which have flanges forming means to secure the ducting to the vehicle roof.

7. An air ventilating or extraction system as claimed in Claim 6, wherein the flanges carry an adhesive coated foam plastics strip material.

8. An air ventilation or extraction system as claimed in any preceding claim, wherein the ducting is formed from sections which are sealingly interengaged, the sections being profiled whereby a ducting run may be assembled to fit a vehicle.

9. An air ventilation or extraction system as claimed in Claim 8, wherein one or more of the sections have apertures therein forming the intake means.

10. An air ventilation or extraction system according to any preceding Claim, wherein a part at least of the ducting is convoluted whereby it may be curved to conform with the vehicle roof contour.

11. An air ventilation or extraction system as claimed in Claim 10, wherein the ducting has a D-shape cross-section, the flat surface having longitudinally extending corrugations or convolutions enabling said surface to be curved about a longitudinal axis to conform with a vehicle roof contour.

12. An air ventilation or extraction system as claimed in any preceding Claim, wherein the ducting has a D-shape cross-section, the outer curved surface having radial corrugations or convolutions whereby the ducting may be curved to conform with the vehicle roof contour.

13. An air ventilation or extraction system according to any preceding Claim, wherein the air impelling means is positioned within the boot (trunk) of the vehicle and is an integral part of an air conditioning system, conditioned air being returned to the passenger compartment by further ducting at floor level.

14. A kit of parts for constructing an air ventilation or extraction system for a vehicle in accordance with any preceding Claim, and comprising lengths of ducting, angular and straight connecting members for the ducting, air intake units for connecting with the ducting, an air impeller means, hosing for connecting the air impeller means with the ducting, the ducting including means for securing same to a vehicle roof.

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