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# AIEVI - AUDI INTELLIGENT ELECTRIC VISION INTERIEUR

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**Initial situation:**
The mechanical module component "forced ventilation" of a passenger compartment in the non-visible area of an interior/trunk enables doors/flaps to be closed easily and with little effort when closing/closing them without air counterpressure from an interior. In simple terms, the "forced ventilation" component in a motor vehicle enables the connection between cabin air and the environment around the motor vehicle by means of atmospheric pressure.
According to the current state of the art, the module of a forced ventilation system is located, for example, in the vicinity of the boot or under the rear apron and consists of "mechanically mounted flaps" - which, comparable to a lamella curtain, open outwards when pressure is applied and close again by gravity.
Air-conditioning/ventilation systems with cabin/active carbon filters operate according to the state of the art with different filter materials and are subject to service changes in order to ensure air quality in a passenger compartment over its service life. Both systems consume electrical energy which reduces the range of an electrically driven vehicle.

The range of electrically/H2/alternatively combustion engine powered vehicles is largely dependent on the extraction of electrical energy. Ventilation/air conditioning systems with state-of-the-art filter technology - i.e. filter-based - are very "range-damaging" in this respect, as they reduce the energy for propulsion in favour of comfort.

**Derivation:**
Electrostatic charged plastics have the property to attract dust and dirt. However, car interiors that are largely made of plastic and are covered in dust contradict the perception of quality and value that is attached to a high-quality vehicle. In addition, the air breathed by the occupants in the passenger compartment is becoming increasingly important - not least because of increasing air pollution and/or aggressive viral aerosols. Increasing proportions of natural materials in a modern interior, some of them visually very appealing surfaces in e.g. brushed or shot-blasted finish, do not always have a positive effect on the easy cleaning of dust/dirt deposits. The finest pores of these surfaces "smear" and are difficult to clean.

**Solution:**
The invention disclosure Audi intelligent electric vision intérieur - AIEVI - describes the method and control for an intelligent "filterless" air cleaning" in a passenger compartment with a forced ventilation and a HV energy from a battery/accumulator charge - and/or an energy from a recuperation of an E-/H2-vehicle.

In summary, AIEVI sees itself as a possible answer to the Vision EQXX research vehicle of a competitor for a planned range record of an e-vehicle of the future.

The focus is on the intelligent handling of electrical energy for the entire vehicle, consisting of drive and comfort, and a more efficient type of associated energy management. For example, the clever use of electrical energy for a specific comfort function, e.g. ventilation/air cleaning variant with a different physical approach can influence the overall energy balance in such a way that a greater amount of electrical drive energy can be saved in certain operating situations, thus increasing the range. The focus is on the component of a forced ventilation module at any location in the passenger compartment.

The aim is the defined arrangement of controllable electrostatically influenced plastic modules in a motor vehicle in the area of a ventilation - in particular forced ventilation of a passenger cell - in order to "suck off" dust/dirt particles from the visible area of an interior in a targeted manner in order to increase a feeling of quality/value.
AIEVI also aims to use HV energy from a battery/accumulator charge of an E-/H2-vehicle and/or recuperation energy for this air/surface cleaning in order to reduce the extraction of electrical energy for a conventional air conditioning/ventilation system to such an extent that the overall energy balance for air cleaning in a passenger compartment/cabin is reduced in order to increase the range of an E-/H2-vehicle.
The aim is also to reduce fine electrically charged particles and aerosols from an ambient air of the passengers in the cabin by means of an electrostatically controlled extraction process using electrical energy from an E-/H2-vehicle in order to increase the hygiene on/at the interior surface.
The aim is also to provide air quality in the passenger compartment through the ventilation/air conditioning filtration system, which is "filterless" and releases the dirt/dust particles into the atmosphere around the vehicle via the "forced ventilation module" of a motor vehicle. The associated control system uses HV energy for an electrostatic charge.

In simple terms, part of the electrical energy of a motor vehicle is used to vent dust/dirt particles from visible surfaces and from the air of the passenger compartment via the forced ventilation with mechanical air flaps/lamellas to a non-visible area of the vehicle (e.g. under a rear apron) when doors or flaps are mechanically slammed (Fig. 1).
The arrangement of the AIEVI package in this, or in deviation from the state of the art new area, has the advantage for the indicated method of a highly efficient mechanical removal of dirt/dust particles from a passenger cell, which positively influences an overall balance of an electrical energy for the vehicle, in relation to drive and comfort requirements, in favour of a range. The "optional new area" of forced ventilation may be located in body components around an occupant seating arrangement, e.g. in a door/sill area, under the associated panelling/design cover.

The material of the ventilation flaps is electrostatically charged by means of the process and the control system via an energy of a HV battery and/or an energy from a recuperation during a journey and cleaned without filters during a passive driving state phase - stop/pause/fuel stop. The electrostatically operated process has a positive effect on air cleaning with regard to dirt/dust/aerosols, relieves an electrically operated ventilation system and leads to an increase in range by shifting the electrical energy from a comfort energy in favour of a drive energy.

**Exemplary position / location of forced ventilation**
Reduction of excess air pressure in the interior when closing doors/flaps. No water ingress from outside behind the rear apron due to protected position and a lamella flap mechanism on the module ventilation flaps.

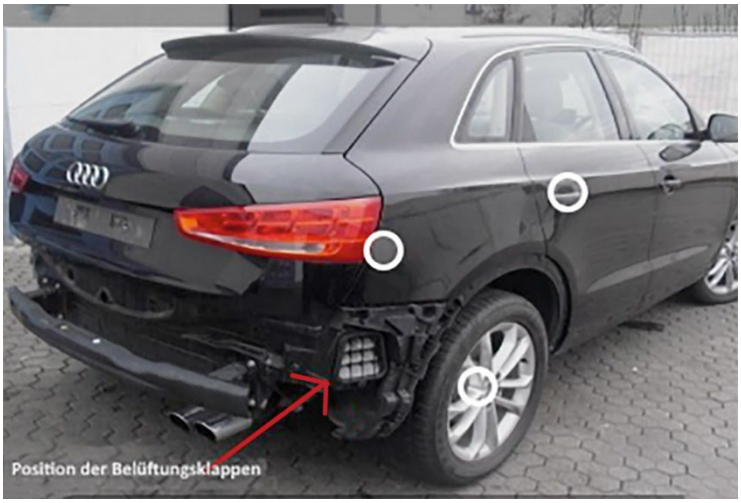



**Fig. 1**

**Advantages**:

- Ensuring high-quality, dust-repellent and attractive plastic surfaces in the interior of a motor vehicle.
- Reduced dusting behaviour of plastics and all surfaces in a passenger compartment / interior
- Ensuring increased "low dust/aerosol" hygiene in a passenger compartment compared to the state of the art
- Innovative, filterless system based on a future-oriented, combustion-free form of drive with efficient electrical control
- Extension of service intervals for conventional recirculating air filters of the ventilation system
- Saving of electrical energy for comfort in a motor vehicle in favour of electrical energy for the drive system
- C02 reduction and increase of a range through the "relief of an air conditioning/ventilation system according to the state of the art".

**Technical Implementation:**
In a first processing step, the AIEV plastic lamella module is electrostatically charged by the HV battery at the start of driving with "ignition/ready to drive on".

In a second processing step, air from outside is supplied to the passenger compartment by the air conditioning/ventilation system in the area of the AIEV module. The electrostatically charged plastic surface of the AIEV module acts in a similar way to a passenger compartment/cabin filter - and "catches" the finest dirt/dust particles via the electrostatic effect and deposits them on the absorption surface of the module. The electrostatic charge acts on the ventilation flaps of the AIEVI module for forced ventilation of a passenger compartment - cf. Fig. 1.

In a third processing step, the AIEV plastic module is electrically "neutralised" with "ignition off", i.e. the electrostatic charge of the louvres is "switched off", during an interruption of the journey/fuelling/break stop.

In a fourth processing step, the module is transferred to "self-cleaning mode". I.e. by neutralising the plastic surface, the dirt/dust particles can naturally be removed via the forced ventilation when doors/boot lids are slammed shut, without any additional energy expenditure. Cf. Fig. 3

**Special embodiments:**
In a special embodiment, the controllable electrostatically charged plastic module of the AIEVI control unit can be "knocked off" by a "vibration device/vibration mechanism" in the driving mode "ignition off/driving mode off", analogous to a "shaking grate" and thus be freed even more efficiently from dust/dirt (cf. Fig. 3, picture below with eccentric). The surface of the AIEVI plastic module is designed in such a way that it is not smooth but fissured and/or with a grid structure in order to provide a large absorption surface (Fig. 3, picture above).

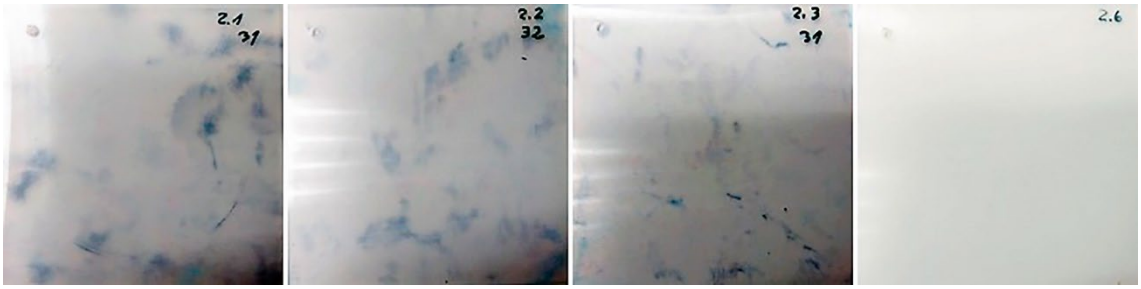
In a further advantageous embodiment, the ventilation system of an e-vehicle according to the state of the art is switched passively depending on operation, i.e. range-oriented, and the entire air purification is temporarily taken over by the AIEVI module in order to ensure unrestricted target achievement.

The task is solved with ...

- a forced ventilation system for a motor vehicle with louvres/flaps
- an electrostatically chargeable louvre/flap material
- a HV energy from a battery/accumulator charge of an E-/H2-vehicle
- an AIEVI control unit with interface drive CAN and optionally
- a device for an "electromechanical shaker frame" (cf. Fig. 3)

The electrostatic shaker frame cleans the air of dirt/dust/aerosols, reduces the load on an electrically operated ventilation system and increases the range by shifting the electrical energy from comfort energy to drive energy.

**Fig. 2 Detailed image of electrostatically charged flaps/blades**




The illustration shows dust-laden, electrostatically charged surfaces of an AIEVI modular panel for cabin air cleaning. It shows in detail the dirt/dust/aerosol particle adhesion depending on the electrostatic charge of different "plastic surfaces/materials of the lamellas".

**Exemplary constructive design / AIEVI package**

**Fig. 3 Forced ventilation module with electrostatically charged flaps/blades**

Electrostatic HV energy charged flaps/blades of an AIEVI forced ventilation. Controlled and concentrated dirt/dust removal from a passenger compartment into an external area of the motor vehicle behind a skirt/panelling of a vehicle, e.g. rear skirt, door/sill panelling, ect.

**Fig. 4: Electr. / mech. shaking frame for "knock-off function" e.g. eccentric drive**

**Fig. 5: Block diagram**