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AIWAC - AUDI INTELLIGENT WHEEL ARCH CLEANING METHOD AND CONTROL FOR AUTOMATED WHEEL ARCH CLEANING

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AIWAC - AUDI INTELLIGENT WHEEL ARCH CLEANING: METHOD AND CONTROL FOR AUTOMATED WHEEL ARCH CLEANING WITH A VIEW TO REDUCING DRIVING RESISTANCE IN ORDER TO INCREASE THE RANGE OF A MOTOR VEHICLE

Initial situation:
Depending on the weather conditions/snowfall/snow and ice consistency, a large mass of ice and snow accumulates in the wheel arch. An ice wedge often forms between the tyres and the front edge of the sill, particularly in the area of the wheel arch shell at the bottom in the direction of the B-pillar. Often, so much ice and snow accumulates in this area when driving straight that the axle becomes wedged to the body during steering manoeuvres and the ice wedge is forcibly broken.
It is not uncommon for the four wheel arches to carry such large masses, and thus a range-damaging ballast, that a range is considerably reduced - especially in the case of an e-vehicle.

Solution:
The inventive idea focuses on a range/driving comfort and safety-optimised function that influences dirt/ice/snow adhesion to the wheel housing shell. Colloquially, the process and the associated control system aim to keep a mudguard clean on the inside.

The control/activation of the process is dependent on "roadsurface information" and environmental conditions. For this purpose, a wedge-shaped deflector - preferably made of abrasion-resistant elastomer - is automatically moved by an electric actuator from a recess in the wheel housing shell in the x-direction behind the wheel/tyre in the lower area of the wheel housing shell. The wedge-shaped deflector, hereinafter referred to as icebreaker, has the shape of a triangle in the top view - z-direction - i.e. it deflects the ice/snow particles swirled up by the tyre to the side and thus avoids a gradual layer build-up between the wheel arch liner and the tyre.
The two side surfaces of the icebreaker head have the shape of triangles and an inclination of 30 to 45 degrees to the x-axis. The side surfaces preferably have a swirl which is directed laterally downwards towards the road surface and can be described colloquially as a snow plough.
The linear actuator lies behind the wheel housing shell in the sill area and the head of the AIWAC module icebreaker/deflector lies in the envelope curve boundary line of the wheel housing shell and can be moved in the x-direction towards the tyre in the position of use (cf. Fig. 1). The head of the icebreaker/deflector is replaceable in case of wear.

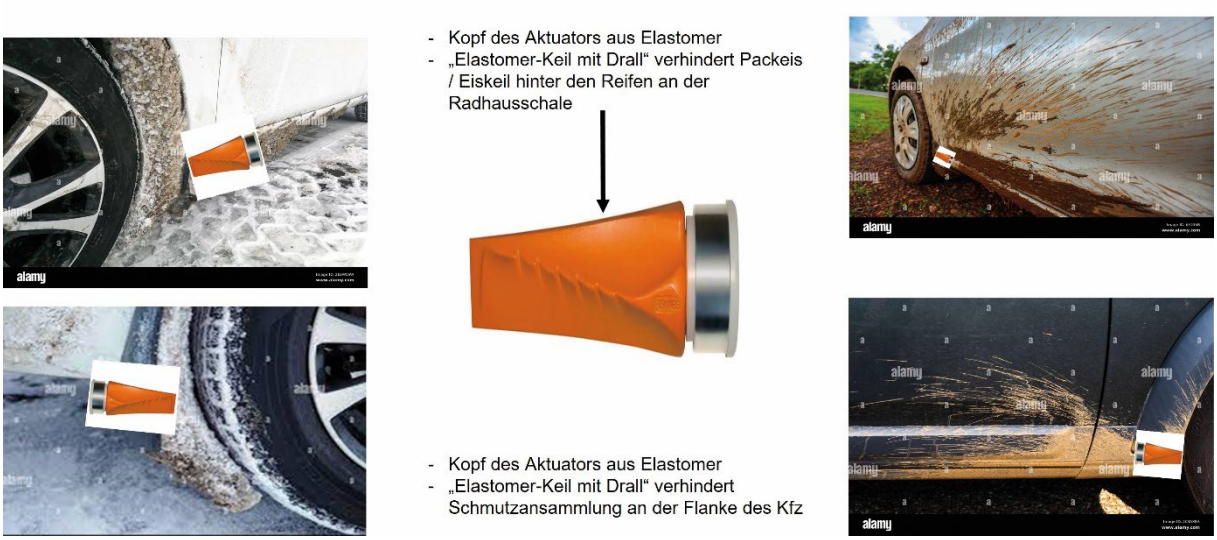
The flexible material properties of the elastomer, the shape of the lateral deflector surfaces and the variable adjustment in the x-direction from a position of non-use to a position of use prevent a successive build-up of dirt/ice/snow behind the ejection area of the tyre.
The wheel arch cleans itself around the lower area and no ice/snow masses are accumulated, which have a detrimental effect on safety and a negative effect on the range.

The control signals of the method are based on roadsurface information, e.g. wheel speed sensor signals and their intelligent mathematical evaluation with the NIRA method, which indicates a road surface, e.g. an icy road. Signals from environmental data, outside temperature, precipitation sensors supplement the control of the automated triggering.

Special embodiments:
In a particular embodiment, the control is activated when a sill/fender area is laterally soiled by the tyre spray in dirty road conditions - without ice/snow, for example in muddy road conditions. The swirl surfaces of the WAC module direct the tyre spray laterally inwards or outwards, away from the flank of the side wall frame.
This significantly reduces visual contamination and the adhesion of dirt particles and minimises air friction, which describes a driving resistance.
In a very special embodiment, the AIWAC process can also take over the function of a parking brake, for example, if a "applied handbrake/activated EPB" gets rusty during ship transport/overseas loading and brake pads have to be renewed at the port of destination.

Advantages:
- Increase of the cleaning effect in/on a wheel housing shell.
- Increase of the cleaning effect on the sill/fender/vehicle sidewall
- Reduction of a mass accumulation of dirt/ice/snow and thus reduction of a driving resistance
- No visual compromises in terms of design when not in use
- Increased range, especially of an e-vehicle
- Reduction of C02 emissions

Technical implementation:
The icebreaker with the rubberised splitting wedge, which has two swirl surfaces, can be described as the head of an actuator. If the activation requirements are met, the actuator moves out of a recess in the wheel housing shell in the lower area of the wheel housing shell, i.e. directly behind the tyre shedding area, in the x-direction into the position of use. Material thrown off by the tyre, which is lying on the road or has been stirred up, is discharged laterally downwards. Functioning analogous to a snow plough's clearing blade. An ice wedge can no longer build up between the wheel housing shell and the tyre.



Ice breaker/deflector in position of use

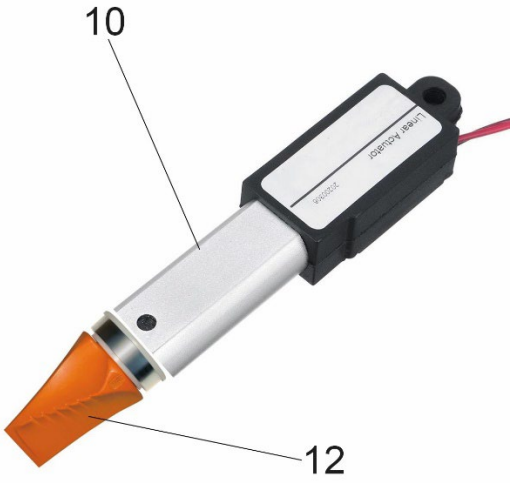


Fig. 1 Linear actuator (10) with ice breaker/deflector (12).

Distinction from SDT:
Statically fixed splash flaps on wheel arch liners and other protruding spoilers have a detrimental effect on aerodynamics and are incompatible with modern design and attractive styling.

The task is solved with

- a wheel speed sensor
- a roadsurface information analysing system (NIRA system)
- Sensors for environmental data / precipitation / outside temperature
- an AIWAC control unit signal
- a wedge-shaped icebreaker module/working/cleaning head (12)
- an electric actuator/linear actuator (10)