

**APPLICATION FOR UNITED STATES PATENT**

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**TITLE:**            ~~DESIGNING AND~~  
  
~~MANUFACTURING~~  
  
**VEHICLE FLOOR**  
  
**TRAYSTRAY**

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## DESIGNING AND MANUFACTURING VEHICLE FLOOR TRAYS

### RELATED APPLICATIONS

[0001] This application is a continuation of copending United States Nonprovisional Application No. 12/879,899 filed on September 10, 2010, which is in tum a continuation of United States Nonprovisional Application No. 11/463,203 filed on August 8, 2006, now abandoned, which is in tum a division of United States Nonprovisional Application No. 10/976,441 filed on October 29, 2004, now United States Patent No. 7,316,847. The disclosures and drawings of those applications are fully incorporated by reference herein.

### BACKGROUND OF THE INVENTION

[0002] Motor vehicles are almost always operated in the out of doors and are frequently parked there. It is therefore very common for their occupants to have wet or muddy feet - if the occupants have not just finished an outdoor activity, at least they have had to walk across a possibly wet, snowy or muddy surface to access their vehicles. For decades, therefore, vehicle owners have been attempting to protect the enclosed interiors of their vehicles (cars, trucks, SUVs) from what they themselves track into them. The conventional solution to this has been to provide a vehicle floor mat which may be periodically removed by the owner and cleaned.

[0003] Human beings have a tendency to move their feet around, and foot motion is an absolute requirement in operating most vehicles. This has caused a problem, in that the occupants of a vehicle have a tendency to push around the floor mats with their feet. The floor mats end up not being centered on the area protected, or pushed up so as to occlude the gas, brake or clutch pedals, or bunched up or folded over - all undesirable conditions. One

objective of floor mat manufacturers has therefore been to provide a floor mat that will stay put and which will not adversely affect vehicle operation.

[0004] The foot wells of cars, trucks and SUVs vary in size in shape from one model of vehicle to the next. Floor mat manufacturers have noticed that floor mats which at least approximately conform to the shape of the bottom surface of the foot well stay in place better and offer more protection. It is also common for such floor mats, where provided for front seat foot wells, to have portions which are meant to lie against the firewalls or front surfaces of the foot wells. Even as so extended it is not too hard to provide a floor mat of flexible material that will approximately conform to these two surfaces, as the designer only has to mark a two- dimensional periphery of the mat in providing one which will fit reasonably well.

[0005] More recently, vehicle floor trays have come onto the market. Most front-seat vehicle foot wells are actually three-dimensional concave shapes, typically with complex curved surfaces. Floor trays have sidewalls that offer enhanced protection to the surfaces surrounding the vehicle floor, as might be needed against wearers with very muddy or snowy shoes. Conventional vehicle floor trays try to fit into these three-dimensional cavities, but so far their fit to the surfaces that they are supposed to protect has been less than optimum. A conventional vehicle floor tray is typically molded of a single-ply rubber or plastic material, exhibits enough stiffness to retain a three-dimensional shape, but is also at least somewhat flexible. Fitting such a tray to the complex three-dimensional surface of a vehicle foot well has proven to be difficult, and the products currently in the marketplace have limited consumer acceptance because of their loose fit inside the foot well. There is often, and in many places, a considerable space between the exterior wall of these

conventional trays and the interior surface of the foot well. This causes the wall to noticeably deform when the occupant's foot contacts it. Vehicle owners have a tendency to dislike floor trays which rattle, deform, shift and flop about. A need therefore persists for a floor tray that will have a more exact fit to the vehicle foot well for which it is provided, that stays in place once it is installed, and that provides a more solid and certain feel to the occupants' feet.

[0006] Some vehicle floor mats that are now on the market have fluid reservoirs built into them. Particularly in cold or wet climates, dirty water has a tendency to be shed onto the floor mat, where it persists until it evaporates. If there is enough of it, it will leak off of the floor mat and stain the carpeting of the foot well that the mat was meant to protect. These reservoirs typically are recessed areas in the mats that provide the mats with an enhanced ability to retain snow-melt and the like, until the water evaporates or can be disposed of by the vehicle owner or user. One advanced design places treads in the middle of the reservoir, such that the feet of the occupant are held above any fluid that the reservoir collects. But including such a reservoir within a floor tray that otherwise has an acceptable fit to the surface of a vehicle foot well has not yet been done, since there are problems in incorporating a three-dimensional liquid-holding vessel into a product that ideally conforms, on its lower surface, to the surface of the foot well. Further, a reservoir which collects drip water from a large surface, such as a vehicle floor tray, will exhibit more problems in keeping the collected fluid from sloshing about in a moving vehicle.

[0007] Conventional vehicle floor mats and trays are molded from a single rubber or plastic material. The selection of this material is controlled by its cost, its resistance to shear forces, its tensile strength, its abrasion resistance, its ability to conform to the surface of the vehicle foot well, its sound-deadening properties and how slippery or nonslippery it is relative to the

occupants' feet, with nonslipperiness (having a relatively high coefficient of friction) being advantageous. Often the designer must make tradeoffs among these different design constraints in specifying the material from which the tray or mat is to be made.

#### SUMMARY OF THE INVENTION

**[0008]** According to one aspect of the invention, there is provided a vehicle floor cover, mat or tray which is removably installable by a consumer and which is formed of at least three layers that are bonded together, preferably by coextrusion. The three layers include a central layer whose composition is distinct from a bottom layer and a top layer. Preferably, all three layers are formed of thermoplastic polymer materials. In another aspect of the invention, the top layer exhibits a kinetic coefficient of friction with respect to a sample meant to emulate a typical shoe outsole (neoprene rubber, Shore A Durometer 60) of at least about 0.82.

**[0009]** Preferably, a major portion of the central layer is a polyolefin. More preferably, the polyolefin is either a polypropylene or a polyethylene. Most preferably, the polyolefin is high molecular weight polyethylene (HMPE) as herein defined. In an alternative embodiment, the central layer can be a styrene-acrylonitrile copolymer (SAN) or an acrylonitrile-butadiene-styrene (ABS) polymer blend.

**[0010]** Preferably, a major portion of the top layer is a thermoplastic elastomer, such as one of the proprietary compositions sold under the trademarks SANTOPRENE®, GEOLAST® and VYRAM®. VYRAM® is particularly preferred. In another embodiment, a major portion of the top layer can be an ABS polymer blend. Where ABS is used in both the top and central layers, it is preferred that the amount of the polybutadiene phase in the top layer be greater than the amount of this phase in the central layer.

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