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(54) **Title:** COMPONENT FOR VEHICLE INTERIOR

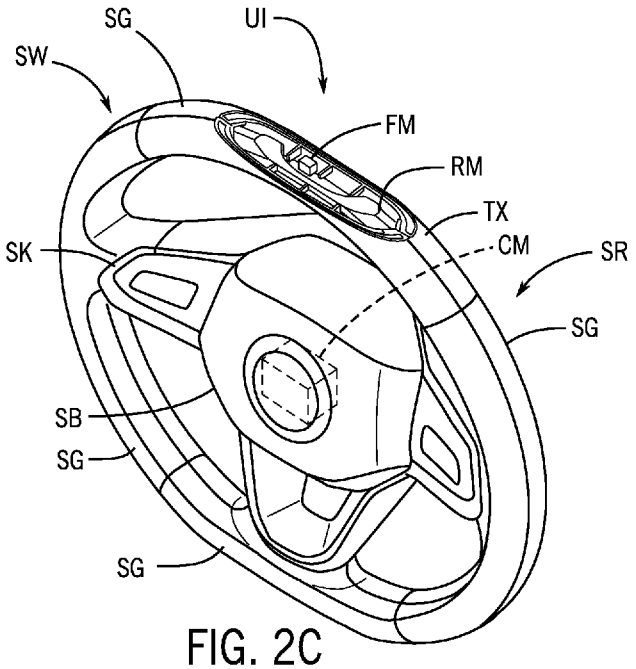


FIG. 2C

(57) **Abstract:** A vehicle interior component may comprise a steering wheel comprising a base and a rim comprising a composite structure and a frame connected to the base. The composite structure may comprise at least one segment comprising an intermediate layer under a cover. The cover may comprise an exterior surface for the rim. The intermediate layer may comprise a soft material, a resilient material, a foam material and/or a spacer material. The component may comprise a carrier layer beneath the intermediate layer. The at least one segment may comprise at least one shell segment comprising an engagement portion. The at least one segment may comprise a set of selectable segments assembled onto the frame. The rim may comprise a multi-segment construction. A cover on a first segment may be different than a cover on a second segment. The composite structure may be configured for mass/weight reduction.

WO 2023/064507 A1

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COMPONENT FOR VEHICLE INTERIOR

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to and incorporates by reference in full the following patent application: U.S. Provisional Patent Application No. 63/262,513 titled "VEHICLE INTERIOR COMPONENT" filed October 14, 2021.

FIELD

[0002] The present invention relates to a component for a vehicle interior.

[0003] The present invention also relates to a component such as a steering wheel for a vehicle interior.

BACKGROUND

[0004] It is known to provide a component for a vehicle interior such as a steering wheel a base and a rim with a frame.

[0005] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure.

[0006] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment.

[0007] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment that is configured for efficient assembly.

[0008] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment that comprises sections configured for efficient assembly.

[0009] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment that comprises sections configured to engage for efficient assembly onto the frame of the rim.

[0010] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment that comprises a set of segments configured for efficient assembly.

[0011] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment comprising a functional layer.

[0012] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment comprising a functional layer in the form of a heating element or hands-off display sensor.

[0013] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment comprising at least one functional segment configured to provide a user interface.

[0014] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment comprising at least one functional segment comprising a functional layer.

[0015] It would be advantageous to provide for a component for a vehicle interior such as a steering wheel that is configured with a rim comprising a composite structure comprising at least one segment comprising at least one functional segment comprising a functional module.

SUMMARY

[0016] The present invention relates to a component for an interior of a vehicle comprising a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover and an intermediate layer under the cover. The cover layer may comprise an exterior surface for the rim. The intermediate layer may comprise at least one of a soft material or a resilient material. The intermediate layer may comprise at least one of a foam material or a spacer material. The component may comprise a carrier on the frame. The carrier may comprise a carrier layer beneath the intermediate layer. The intermediate layer may comprise a carrier layer. The at least one segment may comprise at least one shell segment. The at least one segment may comprise an engagement portion. The at least one segment may comprise a set of segments. The set of segments may comprise a set of selectable segments configured to be assembled onto the frame of the rim. The rim may comprise a multi-segment construction comprising the set of segments. The rim may comprise a multi-segment construction comprising the set of selectable segments. The at least one segment may comprise a first segment and a second segment; the first segment may be axially connected to the second segment. The at least one segment may comprise a set of segments; the set of segments may comprise a first segment and a second segment; the cover layer on the first segment may be different than the cover layer on the second segment. The at least one segment may comprise a set of segments; the set of segments may comprise a first segment and a second segment; the first segment may be different than the second segment. The at least one segment may comprise a set of segments; each segment of the set of segments may comprise a segment base. Each segment of the set of segments may comprise an engagement portion. When the set of segments is assembled onto the frame the engagement portion of a first segment may be connected at the engagement portion of a second segment. When the set of segments is assembled onto the frame the engagement portion of a first segment may be clipped to the engagement portion of a second segment. When the set of segments is assembled onto the frame the engagement portion of a first segment may be connected at the engagement portion of a second segment in axial alignment. The engagement portion may comprise a connector and/or a plurality of connectors. The connector may comprise a clip connector. The connector may comprise a snap-fit connector. The engagement portion may comprise at least one of a projection and a receptacle for the projection. The connector may comprise a snap-fit connector comprising a projection and a receptacle for the projection. The at least one segment may comprise a set of shell segments.

The set of shell segments may comprise a first shell section and a second shell section. When the set of shell segments is assembled onto the frame the first shell section may be attached to the second shell section. When the set of shell segments is assembled onto the frame the first shell section may be attached to the second shell section in radial alignment. The at least one shell segment may comprise a first shell section and a second shell section. The at least one shell segment may comprise a first shell section and a second shell section; the first shell section may be radially connected to the second shell section. The first shell section may comprise a first engagement portion; the second shell section may comprise a second engagement portion configured to engage the first engagement portion of the first shell section. The cover layer may comprise a decorative layer. The composite structure may comprise a positioning element. The at least one segment may comprise a positioning element. The cover may be configured to provide a visual effect for the rim. The cover may comprise a cover layer comprising at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material, an opaque material, a light-transmissive material. The cover layer may comprise a no-stitch appearance. The composite structure may be configured to provide a visual effect for the rim. The visual effect may comprise a multi-segment appearance. The visual effect may comprise a multi-section appearance. The visual effect may comprise a multi-tone appearance. The visual effect may comprise a no-stitch appearance. The visual effect may comprise a modular appearance. The at least one segment may comprise a first segment and a second segment; the cover of the first segment may be different from the cover of the second segment. The component may comprise a spoke structure connecting the rim to the base. The component may comprise a functional layer; the functional layer may comprise at least one of (a) a sensor for hands-off detection or (b) heating mat. The base may comprise an airbag module. The frame may comprise an armature. The base may comprise a cover; the cover may provide a logo. The composite structure may be configured for mass/weight reduction.

[0017] The present invention relates to a component for an interior of a vehicle comprising a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover and an intermediate layer under the cover. The composite structure may be configured to provide a visual effect for the rim. The at least one segment may comprise a set of segments. The visual effect may comprise a multi-segment appearance provided by the set of shell segments. The composite structure may be configured to provide

a tactile effect. The set of segments may comprise a set of shell segments. The visual effect may comprise a multi-segment appearance. The visual effect may comprise a multi-section appearance. The visual effect may comprise a multi-tone appearance. The visual effect may comprise a no-stitch appearance. The cover may comprise a cover layer. The cover layer may be configured to provide the visual effect for the rim. The cover layer may comprise at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material, an opaque material, a light-transmissive material. The cover layer may comprise a no-stitch appearance. The intermediate layer may comprise at least one of a foam material or a spacer material. The intermediate layer may comprise a carrier layer on the frame. The at least one segment may comprise an engagement portion. The at least one segment may comprise a set of shell segments. The set of shell segments may comprise a set of selectable shell segments configured to be assembled onto the frame of the rim. The rim may comprise a multi-segment construction comprising the set of shell segments. The set of segments may comprise a first segment and a second segment; the cover on the first segment may be different than the cover on the second segment. The set of segments may comprise a first segment and a second segment; the first segment may be different than the second segment. The set of segments may be assembled onto the frame in axial alignment. The set of segments may be assembled onto the frame in axial alignment at an engagement portion. The engagement portion may comprise a connector for each segment of the set of segments. The connector may comprise a snap-fit connector comprising a projection and a receptacle for the projection. The at least one segment may comprise a first shell section and a second shell section. When the set of segments is assembled onto the frame the first shell section may be attached to the second shell section in radial alignment. The first shell section may comprise a first engagement portion; the second shell section may comprise a second engagement portion configured to engage the first engagement portion of the first shell section.

[0018] The present invention relates to a component for an interior of a vehicle comprising a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover layer and an intermediate layer under the cover layer. The composite structure may comprise a functional layer. The functional layer may comprise at least one of (a) sensor or (b) a transducer or (c) a light. The sensor may comprise at least one of (a) capacitive sensor or (b) an infrared sensor or (c) an ultrasonic sensor (d) conductive sensor or (e) light. The at least one segment may be configured for integration of the

functional layer. The at least one segment may be configured for interconnection of the functional layer. The composite structure may comprise a connector for the functional layer. The base may comprise a control module for the functional layer. The composite structure may comprise a positioning element. The at least one segment may comprise a positioning element. The positioning element may be configured to facilitate connectivity for the functional layer. The positioning element may be configured to facilitate positioning of the cover layer relative to the frame. The base may comprise an airbag module. The frame may comprise an armature. The base may comprise a horn module.

[0019] The present invention relates to a component for an interior of a vehicle comprising a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover and an intermediate layer under the cover. The composite structure may comprise a functional layer. The functional layer may comprise at least one of (a) a sensor and/or (b) a transducer and/or (c) a hands-off sensor and/or (d) a heating element. The transducer may comprise at least one of (a) an audio speaker and/or (b) a microphone and/or (c) a haptic device. The functional layer may comprise a user interface. The cover may comprise a cover layer. The at least one segment may comprise at least one shell segment.

[0020] The present invention relates to a component for an interior of a vehicle configured to provide a user interface for a vehicle occupant in a vehicle comprising vehicle systems comprising a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one shell segment comprising a cover and an intermediate layer under the cover. The rim may comprise a functional module. The functional module may comprise at least one of (a) a sensor and/or (b) transducer and/or (c) a hands-off sensor and/or (d) a heating element and/or (e) a light and/or (f) a display. The functional module may comprise the display; the display may comprise a display panel. The light may comprise a light panel. The light may comprise an LED element. The light may comprise a set of LED elements. The transducer may comprise at least one of (a) an audio speaker and/or (b) a microphone and/or (c) a haptic device. The sensor may comprise a hand-off detector. The sensor may be configured to detect health-related information. Health-related information may comprise a signal representative of at least one of heart rate, blood oxygen saturation, sweat, temperature. The sensor may comprise an ECG (electrocardiograph) electrode to measure heart condition such as heart rate, heart rate variability. The sensor may comprise a PPG

(photoplethysmography) optical sensor to measure blood oxygen saturation. The sensor may comprise an EDA sensor to measure skin potential, skin DC conductance, and skin AC admittance. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover. The sensor may be configured to represent a switch. The switch may be configured to operate a vehicle system. The user interface may be connected to at least one vehicle system. The user interface may be connected to a network. The user interface may be connected to a network using telecommunication protocols. The network may comprise the internet. The user interface may be configured to be connected to a device. The device may comprise a mobile device. The mobile device may comprise a telecommunication device connected to a network. The telecommunication device may comprise a smart phone. The functional module may comprise a functional layer for the composite structure. The functional layer may comprise at least one of (a) a sensor and/or (b) a transducer and/or (c) a hands-off sensor and/or (d) a heating element. The functional layer may be configured under the cover. The functional layer may comprise a light source and the cover may comprise a light-transmissive cover layer. The functional module may comprise a light source configured to transmit light through the cover. The functional module may comprise a functional layer. The functional layer may comprise a light guide configured to transmit light. The functional layer may comprise a light guide configured to transmit light through the cover. The functional layer may comprise a light guide configured to transmit light from a light source. The functional module may comprise a display configured to provide illumination at least partially visible at the cover. Operation of the user interface for the vehicle occupant may comprise at least one of (a) an output signal (b) an input signal. The output signal may comprise at least one of (a) light or (b) information display or (c) sound or (d) vibration or (e) haptic output. The input signal may comprise at least one of (a) touch or (b) sound or (c) a signal detected by a sensor. The at least one segment may comprise a set of segments on the frame; the set of segments may comprise a functional segment comprising a functional module. The at least one segment may comprise a set of shell sections; the set of shell sections may comprise a front section and a back section. The at least one segment may comprise a decorative segment. The cover may comprise a decorative layer. The at least one segment may comprise a functional segment. The functional segment may comprise a functional layer. The user interface may comprise an input device and an output device. The user interface may comprise connectivity with vehicle systems and/or a network. The component may comprise a controller for the user interface. The component may comprise a control system for the user

interface. The user interface may comprise at least one of signaling, alerting, sensing, detecting, messaging, reporting. The user interface may comprise at least one of transmission of light, display of information, audio input, audio output, haptic feedback, health-sensing, heating, multi-functionality. The composite structure may comprise at least one of a light source, an LED, a LED arrangement, a display, a display panel. The user interface may be configured for at least one of connectivity to a vehicle system, connectivity to a network, connectivity to a mobile device, connectivity to a component, connectivity to a communication network, connectivity to the internet.

[0021] The present invention relates to a component for an interior of a vehicle comprising a steering wheel comprising a base and a rim. The rim may comprise a composite structure. The composite structure may comprise a frame and a set of segments on the frame. The composite structure may comprise a cover and a positioning layer. Each segment of the set of segments may comprise at least one of a decorative segment and a functional segment. The functional segment may comprise a sensor. The functional segment may comprise a functional layer. The functional segment may comprise a functional module. The functional segment may be configured to provide a user interface for a vehicle occupant with vehicle systems and/or a telecommunication network. The cover may comprise an exterior surface. The functional segment may comprise the sensor. The functional segment may comprise a light display. The functional segment may comprise a functional layer. The composite structure may comprise a positioning layer. The cover may comprise a layer configured to facilitate the transmission of light. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover. The light display may be configured to provide illumination at least partially visible through the exterior surface of the cover. Operation of the user interface for a vehicle occupant may comprise at least one of output from illumination from the display and (b) input detected by the sensor. The composite structure may comprise (a) the cover; (b) the functional layer; (c) the sensor; (d) the positioning layer; (e) the display; (f) a substrate. The positioning layer may comprise at least one of (a) a foam material and/or (b) a spacer fabric. The cover may comprise at least one of (a) textile; (b) fabric; (c) fiber mesh; (d) leather; (e) grained surface; (f) synthetic fibers; (g) natural fibers; (h) artificial leather; (i) polyester; (j) fabric sheet; (k) upholstered material; (l) a fleece material; (m) a woven material; (n) a non-woven material; (o) a sheet material; (p) a perforated material; (q) a composite of multiple fiber materials; (r) a translucent material; (s) a resilient material; (t) a leather material configured to facilitate the transmission of light; (u) a material that is partially transparent and partially opaque; (v) a

layer configured to facilitate transmission of visible light; (w) a surface material perforated to improve the visibility of light from the display. The cover may comprise a light- transmissive cover comprising at least one of (a) film; (b) resin; (c) polycarbonate; (d) polyurethane; (e) polyvinyl material; (f) TPO; (g) a polymeric material; (h) a polymeric film; (i) a composite of multiple plastic materials; (j) a composite of multiple materials; (k) a composite of fiber material; (l) natural material; (m) metal; (n) a perforated material; (o) a translucent layer. The functional layer may be configured for at least one of (a) positioning; (b) spacing; (c) haptic feedback; (d) tactile feedback such as vibration; (e) audible feedback such as sound; (f) optical enhancement; (g) light shielding; (h) interaction with a vehicle system; (i) cushioning; (j) tactile shear/feel performance; (k) heating; (l) cooling; (m) diffusion of illumination from the display; (n) alerting; (o) messaging; (p) light guiding; (q) flexibility. The positioning layer may be configured to retain positioning within the composite structure for operation of the sensor from input from the vehicle occupant; the positioning layer may comprise at least one of (a) a spacer; (b) a flexible spacer; (c) a spacer fabric; (d) a foam material; (e) a plastic material; (f) fabric; (g) polyurethane; (h) a woven material; (i) a spacer material; (j) a fabric material; (k) a fiber material. The user interface may be configured so that input from the vehicle occupant at the exterior surface of the cover is detected by the sensor. The user interface may be configured so that output from the display is presented at least partially through the exterior surface of the cover. The composite structure may comprise a substrate. The substrate may comprise a carrier. The component may comprise a control system configured to connect the user interface to at least one vehicle system; the control system may be configured to facilitate operation by the vehicle occupant of at least one vehicle system. The component may comprise a control system for the user interface configured for at least one of (1) visible feedback, (2) audible feedback, (3) tactile feedback, (4) haptic feedback to the vehicle occupant. The user interface may be configured for interaction with a vehicle occupant by at least one of (a) touch at the exterior surface of the cover detected by the sensor or (b) gesture adjacent to the exterior surface of the cover detected by the sensor. The sensor may comprise at least one of (a) an array; (b) a grid; (c) a foil; (d) a panel; (e) a touch panel; (f) a flexible panel; (g) a detector; (h) a proximity detector; (i) a capacitive touch panel; (j) a pressure sensitive panel. The user interface may comprise a light display; the light display may comprise at least one of (a) an array; (b) a panel; (c) a flexible panel. The composite structure may comprise a composite surface; the cover may comprise an at least partially translucent cover; illumination from the display at the exterior surface of the composite structure may comprise visible light transmitted through the functional layer and

through the at least partially translucent cover. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover. The functional segment may comprise a functional layer configured for at least one of (a) positioning; (b) spacing; (c) haptic feedback; (d) tactile feedback such as vibration; (e) audible feedback such as sound; (f) optical enhancement; (g) light shielding; (h) interaction with a vehicle system; (i) cushioning; (j) tactile shear/feel performance; (k) heating; (l) cooling; (m) diffusion of illumination from the display; (n) alerting; (o) messaging; (p) light guiding; (q) flexibility. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover from at least one of (a) touch; (b) pressure; (c) proximity; (d) position. The positioning layer may comprise at least one of (a) a spacer; (b) a flexible spacer; (c) a spacer fabric; (d) a fabric material; (e) a foam material; (f) a plastic material; (g) a woven material; (h) a fiber material; (i) fabric; (j) polyurethane; (k) a spacer material. The cover may comprise at least one of (a) textile; (b) fabric; (c) fiber mesh; (d) leather; (e) grained surface; (f) synthetic fibers; (g) natural fibers; (h) artificial leather; (i) polyester; (j) fabric sheet; (k) upholstered material; (l) a fleece material; (m) a woven material; (n) a non-woven material; (o) a sheet material; (p) a perforated material; (q) a composite of multiple fiber materials; (r) a translucent material; (s) a resilient material; (t) a leather material configured to facilitate the transmission of light; (u) a material that is partially transparent and partially opaque; (v) a layer configured to facilitate transmission of visible light; (w) a surface material perforated to improve the visibility of light from the display; (x) film; (y) resin; (z) a composite of multiple materials; (aa) a composite of fiber material; (bb) natural material; (cc) metal; (dd) a perforated material; (ee) a translucent layer.

[0022] The present invention relates to a component for an interior of a vehicle comprising a rim configured to be assembled on a steering wheel comprising a frame; the rim may comprise a composite structure; the composite structure may comprise a set of segments to be assembled on the frame; the composite structure may comprise a cover and a carrier; a segment of the set of segments may comprise at least one of a decorative segment and/or a functional segment. The composite structure may comprise a positioning layer. The segment may comprise a manufactured segment and/or replaceable segment and/or an exchangeable segment and/or spare part segment. The segment may be configured to provide a cavity between the frame and the segment; the cavity may be configured to accommodate cables, wires, LEDs or electronic components. The segment of the composite structure may comprise a manufactured element and/or an exchangeable element and/or a replaceable element and/or a selectable element and/or a spare part segment. The segment may comprise

a segment shell section configured to be attached by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding; the segment shell section may be configured to be attached to an adjacent segment shell section by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding. The component may be formed by a method of manufacturing comprising the steps of: forming a base and a rim; providing a frame; providing a composite structure; wherein the composite structure is configured to provide a segmented cover; such that the steering wheel assembly comprises connecting the segmented covers and the frame; wherein the connection comprises at least one of clipping, latching, bonding, or welding.

[0023] The present invention relates to a steering wheel of a type providing a base and a frame comprising a rim comprising a composite structure connected to the base. The composite structure of the rim may comprise at least one shell segment comprising a cover layer and an intermediate layer under the cover layer. The cover layer may comprise an exterior surface for the rim. The intermediate layer may comprise at least one of a soft material or a resilient material. The intermediate layer may comprise at least one of a foam material or a spacer material. The intermediate layer may comprise a carrier layer on the frame. The intermediate layer may comprise a carrier layer on the frame and at least one of soft material or a resilient material or a foam material or a spacer material. The at least one shell segment may comprise an engagement portion. The at least one shell segment may comprise a set of shell segments. The set of shell segments may comprise a set of selectable shell segments configured to be assembled onto the frame of the rim. The rim may comprise a multi-segment construction comprising the set of shell segments. The rim may comprise a multi-segment construction comprising a set of selectable shell segments. The set of shell segments may comprise a first segment and a second segment; the cover layer on the first segment may be different than the cover layer on the second segment. The set of shell segments may comprise a first segment and a second segment; the first segment may be different than the second segment. Each segment of the set of shell segments may comprise a shell segment base. Each shell segment of the set of shell segments may comprise an engagement portion. When the set of shell segments is assembled onto the frame the engagement portion of a first shell segment may be connected at the engagement portion of a second shell segment. When the set of shell segments is assembled onto the frame the engagement portion of a first shell segment may be snap-fit connected at the engagement portion of a second shell segment. When the set of shell segments is assembled onto the frame the engagement portion of a first shell segment may be connected at the engagement

portion of a second shell segment in axial alignment. The engagement portion may comprise a connector and/or a plurality of connectors. The connector may comprise a snap-fit connector. The connector may comprise a snap-fit connector comprising a projection and a receptacle for the projection. The engagement portion may comprise at least one of a projection or a receptacle for the projection. The at least one shell segment may comprise a first shell section and a second shell section. When the set of shell segments is assembled onto the frame the first shell section may be attached to the second shell section. When the set of shell segments is assembled onto the frame the first shell section may be attached to the second shell section in radial alignment. The at least one shell segment may comprise a first shell section and a second shell section. The first shell section may comprise a first engagement portion; the second shell section may comprise a second engagement portion configured to engage the first engagement portion of the first shell section. The cover layer may comprise a decorative layer. The composite structure may comprise a positioning element. The at least one shell segment may comprise a positioning element. The cover layer may be configured to provide a visual effect for the rim and/or a tactile effect for the rim. The cover layer may comprise at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material. The composite structure may be configured to provide a visual effect for the rim. The visual effect may comprise a multi-segment appearance. The visual effect may comprise a multi-section appearance. The visual effect may comprise a multi-tone appearance. The visual effect may comprise a modular appearance. The at least one segment may comprise a first segment and a second segment; the cover layer of the first segment may be different from the cover layer of the second segment. The steering wheel may comprise a spoke structure connecting the rim to the base. The steering wheel may comprise a functional layer; the functional layer may comprise at least one of a (a) sensor for hands-off detection or (b) heating mat. The base may comprise an airbag module. The frame may comprise an armature. The base may comprise a cover; the cover may provide a logo.

[0024] The present invention relates to a steering wheel of a type providing a base and a frame comprising a rim comprising a composite structure connected to the base. The composite structure of the rim may comprise at least one shell segment comprising a cover layer and an intermediate layer under the cover layer. The composite structure may be configured to provide a visual effect for the rim. The at least one shell segment may comprise a set of shell segments. The visual effect may comprise a multi-segment appearance provided by the set of shell segments. The visual effect may comprise a multi-

segment appearance. The visual effect may comprise a multi-section appearance. The visual effect may comprise a multi-tone appearance. The cover layer may be configured to provide the visual effect for the rim. The cover layer may comprise at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material. The intermediate layer may comprise at least one of a foam material or a spacer material. The intermediate layer may comprise a carrier layer on the frame. The at least one shell segment may comprise an engagement portion. The at least one shell segment may comprise a set of shell segments. The set of shell segments may comprise a set of selectable shell segments configured to be assembled onto the frame of the rim. The rim may comprise a multi-segment construction comprising the set of shell segments. The set of shell segments may comprise a first segment and a second segment; the cover layer on the first segment may be different than the cover layer on the second segment. The set of shell segments may comprise a first segment and a second segment; the first segment may be different than the second segment. The set of shell segments may be assembled onto the frame in axial alignment. The set of shell segments may be assembled onto the frame in axial alignment at an engagement portion. The engagement portion may comprise a connector for each shell segment of the set of shell segments. The connector may comprise a snap-fit connector comprising a projection and a receptacle for the projection. The at least one shell segment may comprise a first shell section and a second shell section. The set of shell segments may be assembled onto the frame; the first shell section may be attached to the second shell section in radial alignment. The first shell section may comprise a first engagement portion; the second shell section may comprise a second engagement portion configured to engage the first engagement portion of the first shell section.

[0025] The present invention relates to a steering wheel of a type providing a base and a frame comprising a rim comprising a composite structure connected to the base. The composite structure of the rim may comprise at least one shell segment comprising a cover layer and an intermediate layer under the cover layer. The composite structure may comprise a functional layer. The functional layer may comprise at least one of (a) a hands-off sensor or (b) a heating element. The at least one shell segment may be configured for integration of the functional layer. The at least one shell segment may be configured for interconnection of the functional layer. The composite structure may comprise a connector for the functional layer. The base may comprise a control module for the functional layer. The composite structure may comprise a positioning element. The at least one shell segment may comprise a positioning element. The positioning element may be configured to facilitate connectivity for

the functional layer. The base may comprise an airbag module. The frame may comprise an armature. The base may comprise a horn module.

FIGURES

[0026] FIGURE 1A is a schematic perspective views of a vehicle according to an exemplary embodiment.

[0027] FIGURE 1B is a schematic perspective views of a vehicle interior according to an exemplary embodiment.

[0028] FIGURES 2A through 2D are schematic perspective views of a component shown as a steering wheel with rim according to an exemplary embodiment.

[0029] FIGURES 3A through 3L are schematic diagrams of a component shown as a steering wheel according to an exemplary embodiment.

[0030] FIGURES 4A through 4I are schematic diagrams of a component shown as a steering wheel according to an exemplary embodiment.

[0031] FIGURES 5A through 5L are schematic diagrams of a component shown as a steering wheel according to an exemplary embodiment.

[0032] FIGURES 6A and 6B are schematic perspective views of a component shown as a steering wheel with rim according to an exemplary embodiment.

[0033] FIGURE 7 is a schematic exploded perspective view of a component shown as a steering wheel with rim according to an exemplary embodiment.

[0034] FIGURE 8A is a schematic perspective view of a component shown as a steering wheel with rim according to an exemplary embodiment.

[0035] FIGURE 8B is a schematic exploded perspective view of a component shown as a steering wheel with rim according to an exemplary embodiment

[0036] FIGURES 9A through 9C are schematic fragmentary perspective views of a component shown as a steering wheel with rim according to an exemplary embodiment.

[0037] FIGURES 10A through 10C are schematic fragmentary perspective views of a component shown as a steering wheel with rim according to an exemplary embodiment.

[0038] FIGURE 11A is a schematic diagram of a component shown as a steering wheel according to an exemplary embodiment.

[0039] FIGURES 11B through 11D are schematic cross-section views of a rim of a steering wheel according to an exemplary embodiment.

[0040] FIGURES 12A and 12D are schematic cross-section views of a rim of a steering wheel according to an exemplary embodiment.

[0041] FIGURES 12B and 12E are schematic fragmentary perspective views of a rim of a steering wheel according to an exemplary embodiment.

[0042] FIGURE 12C is a schematic perspective view of an element of a rim of a steering wheel according to an exemplary embodiment.

[0043] FIGURE 13A is a schematic exploded perspective view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0044] FIGURE 13B is a schematic exploded cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0045] FIGURE 13C is a schematic exploded partial cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0046] FIGURE 13D is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0047] FIGURE 14A is a schematic exploded perspective view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0048] FIGURE 14B is a schematic exploded cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0049] FIGURE 14C is a schematic exploded partial cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0050] FIGURE 14D is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0051] FIGURE 15A is a schematic exploded perspective view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0052] FIGURE 15B is a schematic exploded cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0053] FIGURE 15C is a schematic exploded partial cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0054] FIGURE 15D is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0055] FIGURES 16A through 16F are schematic partial perspective views of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0056] FIGURES 17A and 17B are schematic exploded views of a steering wheel with a functional module and control module according to an exemplary embodiment.

[0057] FIGURES 18A and 18B are schematic exploded views of a steering wheel with a functional module and control module according to an exemplary embodiment.

[0058] FIGURE 19A is a schematic exploded perspective view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0059] FIGURE 19B is a schematic exploded cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0060] FIGURE 19C is a schematic exploded partial cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0061] FIGURE 19D is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0062] FIGURES 20A through 20E are schematic partial perspective views of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0063] FIGURE 21A is a schematic exploded perspective view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0064] FIGURES 21B and 21D are schematic exploded cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0065] FIGURE 21C is a schematic exploded partial cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0066] FIGURE 21E is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0067] FIGURES 22A and 22B are schematic partial perspective views of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0068] FIGURE 22C is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0069] FIGURES 23A and 23B are schematic partial perspective views of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0070] FIGURE 23C is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0071] FIGURE 24A is a schematic cross-section view of a composite structure for forming for assembly on a rim of a steering wheel according to an exemplary embodiment.

[0072] FIGURES 24B and 24C are schematic cross-section views of operation of an apparatus for forming a composite structure into a rim for a steering wheel according to an exemplary embodiment.

[0073] FIGURE 24D is a schematic perspective view of a composite structure for forming for assembly on a rim of a steering wheel according to an exemplary embodiment.

[0074] FIGURES 25A through 25E are schematic cross-section views of operation of an apparatus for forming a composite structure into a rim for a steering wheel according to an exemplary embodiment.

[0075] FIGURE 25F is a schematic cross-section view of a composite structure of a rim of a steering wheel according to an exemplary embodiment.

[0076] FIGURES 26A and 26B are schematic block diagrams of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0077] FIGURE 27 is a schematic block diagram of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0078] FIGURE 28 is a schematic block diagram of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0079] FIGURE 29 is a schematic block diagram of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0080] FIGURE 30 is a schematic block diagram of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0081] FIGURE 31 is a schematic block diagram of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0082] FIGURE 32 is a schematic block diagram of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0083] FIGURES 33A and 33B are schematic block diagrams of a user interface system for operation of a steering wheel comprising a functional module and a control module according to an exemplary embodiment.

[0084] FIGURES 34A through 34E are schematic flow diagrams of a method for forming a composite structure into a rim for a steering wheel according to an exemplary embodiment.

DESCRIPTION

[0085] Referring to FIGURES 1A-1B, a vehicle V is shown with an interior I comprising components including trim panels such as instrument panel IP and a door panel DP and a console shown as floor console FC and a steering wheel SW.

[0086] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D and 6A-6B, the steering wheel SW may comprise a base section SB (with an emblem/logo TM) and a spoke structure SK with a rim SR; rim SR may comprise a composite structure CS assembled on a frame RM; rim SR/CS may comprise a set of segments SG (shown as shell segments SGa and SGb); segments SG may comprise a cover TX providing an exterior/cover layer (shown as functional layer and/or decorative layer FL/DL) and a positioning element GP on a base/carrier CB. See also FIGURES 3A-3L, 4A-4I and 5A-5L.

[0087] As indicated schematically in FIGURES 3A-3J and 6A-6B, steering wheel SW may be provided in any of a wide variety of configurations of base SB and/or spokes SK and/or rim SR with segments SG; as indicated schematically, rim SR may comprise any of a wide variety of configurations of segments SG; segments SG may be provided in any of a wide variety of configurations. As indicated schematically in FIGURES 3A, 3C, 3E, 3G and 3I, 6B, rim SR may comprise segments SG in an axially-arranged orientation (e.g. adjacent segments/sections); as indicated schematically in FIGURES 3B, 3D, 3F, 3H, 3J and 6A, rim SR may comprise segments with sections in a radial arrangement (e.g. segment shell sections SGa and SGb configured to be assembled onto the frame of the rim SR).

[0088] According to an exemplary embodiment as shown schematically in FIGURES 2A-2B, 4A-4I and 5A-5L, steering wheel SW may comprise a rim SR providing a functional segment comprising a sensor for hands-off detection SN/HOD and/or a heating section or element SH/HT. As indicated schematically in FIGURE 3D, steering wheel SW may comprise a switch ST for interaction with a vehicle system.

[0089] According to an exemplary embodiment as shown schematically in FIGURES 2C-2D, steering wheel SW may comprise a rim SR providing a functional segment comprising a functional module FM and/or a functional layer FL; functional segment may be configured to perform any of variety of functions as indicated schematically in FIGURES 4A-4I, 5A-5L, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B.

[0090] As indicated schematically in FIGURES 2C-2D, 4A-4I, 5A-5L, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, steering wheel SW may comprise a controller/control module CM shown as installed within base SB; rim SB of steering wheel may be configured to provide a user interface UI for interaction between an

occupant/operator of the vehicle with vehicle systems, network communications, etc. As indicated schematically in FIGURES 2C-2D, 4A-4I and 5A-5L, user interface UI may comprise at least one functional module FM configured to operate at the direction of the vehicle occupant and/or with a control program from a control module CM. See also FIGURES 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B.

[0091] As indicated schematically in FIGURES 2C-2D, 4A-4I and 5A-5L, rim SR may comprise a functional segment that comprises a lighting module/system SL, a speaker SP, a transducer SC, etc.; rim SR may comprise multiple functional segments and/or combined functional segments such as an audio system (e.g. speaker and microphone), transducer SC configured to provide haptic feedback (e.g. vibration), sensor SN to detect contact/hands off-on by the vehicle operator, a display/light panel SD, etc. See also FIGURES 3K-3L, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B.

[0092] As indicated schematically according to an exemplary embodiment in FIGURES 6A-6B and 7 and 8A-8B, the base SB of the steering wheel SW may comprise a base cover SBa and a rear housing SBb with a frame SBc and frame SBc to be assembled onto a frame structure shown as armature RM; the composite structure CS of rim SR of the steering wheel on the frame structure shown as armature RM may comprise segments SG that may comprise segment sections shown a shell sections SGa and SGb with a carrier CB that may comprise sections CBa and CBb. See also FIGURE 9A.

[0093] As indicated schematically according to an exemplary embodiment in FIGURES 9A-9C, 10A-10C, 11A-11D and 12A-12E, the composite structure CS for rim SR on frame RM may comprise segment SGa and segment SGb configured for engagement at an engagement portion NP shown as comprising engagement element NPa and engagement element NPb which engage to retain segment/sections SGa and SGb onto frame structure RM; segments SG may comprise a positioning/alignment section comprising element GPa and element GPb and a carrier/base layer CB with a cover comprising a cover layer TX. As indicated schematically in FIGURES 9B-9C, 10B-10C and 11D, engagement element NPa may be provided within the composite structure CS; as indicated schematically in FIGURES 12A-12B and 12D-12E, engagement element NPa may be provided on the frame structure RM. See also FIGURE 12C (axially-oriented engagement element NPb).

[0094] As indicated schematically according to an exemplary embodiment in FIGURES 13A-13D, 14A-14D and 15A-15D, the composite structure CS for rim SR on frame RM may comprise segment SGa and segment SGb configured for engagement at an engagement portion NP shown as comprising engagement element NPa and engagement element NPb

which engage to retain segment/sections SGa and SGb onto frame structure RM; segments SG may also comprise a functional layer FL shown as a spacer material and a carrier/base layer CB with a cover comprising a cover layer TX. As indicated schematically, engagement element NPa and engagement element NPb may be provided within the composite structure CS (e.g. as a projection and retainer/recess for a fitting connection, such as a snap-fit connection).

[0095] As indicated schematically according to an exemplary embodiment in FIGURES 16A-16F, the composite structure CS for rim SR on frame RM may comprise segment SGa and segment SGb configured for engagement at an engagement portion NP shown as comprising engagement element NPa and engagement element NPb which engage to retain segment/sections SGa and SGb onto frame structure RM; segments SG may comprise a positioning/alignment section comprising element GPa and element GPb (e.g. plurality of elements arranged for the segment/shell section) and a carrier/base layer CB with a cover comprising a cover layer TX. As indicated schematically, positioning element GPa and positioning element GPb may be provided within the composite structure CS to facilitate the placement/location of the segment/shell sections SGa and SGb during assembly onto frame structure RM; as indicated schematically, the positioning/alignment elements may provide structure for the segment and space/pathway for items such as connectors, wires, cables, lighting, sensors, etc. to be installed within the rim and/or between segments of the rim (e.g. such as for connectivity with functional segments, functional modules, functional layers, etc. to controller/control system, vehicle systems, etc.).

[0096] As indicated schematically in FIGURES 17A-17B, 18A-18B and 19A-19D, the steering wheel SW may comprise a controller/control module CM in the base SB with a rim SR comprising segments shown as functional segments SG (e.g. segments with functional layer/module) such as a hands-off sensor WR/HOD (see FIGURE 17A) or an integrated arrangement of hands-off sensor WR/HOD with heating element WR/HT (see FIGURES 17B and 19A-19D) or a transducer SC or sensor SN or lighting elements SN or heating element/wire SH (see FIGURE 18A) or lighting elements shown as light source/LED light LS/LED (see FIGURE 18B). As indicated schematically in FIGURES 20A-20E, composite structure CS for segments of the rim such as functional segments comprising a carrier CB and functional layer FL comprising the integrated hands-off sensor HOD and heating element SH/HT (e.g. mat with heating wire arrangement) may be connected by a connector CN comprising a connector elements CNa and CNb and CNc and CNd positioned for electrical connectivity within the segment/rim.

[0097] As indicated schematically according to an exemplary embodiment in FIGURES 21A-21D, 22A-22C and 23A-23C, the composite structure CS for rim SR on frame RM may comprise segment SGa and segment SGb configured for engagement at an engagement portion shown as comprising engagement element NPa and engagement element NPb which engage to retain segment/sections SGa and SGb onto frame structure RM; segments SG may comprise a functional/positioning module or layer FM/FL (shown as a foam/spacer material) and a carrier/base structure CB with a functional/lighting module LS/LP shown as an lighting arrangement comprising light guide LG (e.g. a light-transmissive element, lens, material, etc.) with LED arrangement (e.g. shown as comprising light elements LED) with a cover comprising a cover layer TX.

[0098] As indicated schematically in FIGURES 24A-24D and 25A-25E, an apparatus and method for forming the composite structure CSm comprising a barrier layer BL and functional layer FL shown as a spacer layer and a cover layer TX may be provided; the apparatus may comprise a mold tool with a forming tool MF and frame/clamp fixture MC and a base/bottom MB to form the shape of the composite structure CSm (see FIGURES 24A-24D); the apparatus may comprise a mold top MT with a slider MS to facilitate injection molding of resin R to form carrier CB for segment section SGb; to form the rim on the frame, segment section SGa is assembled onto segment section SGb. See also FIGURES 34A-34E.

[0099] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, the component shown as steering wheel SW with user interface UI provided through a functional module FM may be operated by a controller/control system CM in a vehicle comprising vehicle systems and/or connected to a network to perform any of a variety of functions for and with an occupant/operator of the vehicle. See also FIGURES 4A-4I and 5A-5L (configurations of steering wheel with composite structure/rim to provide user interface for input/output with vehicle occupant/operator).

[0100] As indicated schematically in FIGURES 2C-2D and 26A-26B, the steering wheel SW with user interface UI may be provided with a functional module FM and/or functional layer FL such as a sensor SN that may be coupled to the controller/control system CM and vehicle systems/network (e.g. to perform any of a wide variety of functions such as communications, alerts, monitoring, sensing, detecting, comfort, etc.).

[0101] As indicated schematically in FIGURES 2C-2D and 27, the steering wheel SW with user interface UI may be provided with a functional module FM such as a heating system SH that may be coupled to the controller/control system CM and vehicle systems/network to be

actuated/operated according to direction from the vehicle occupant to provide for comfort, etc.

[0102] As indicated schematically in FIGURES 2C-2D and 28, the steering wheel SW with user interface UI may be provided with a functional module FM such as a lighting system SL and speaker system SP that may be coupled to the controller/control system CM and vehicle systems/network to be actuated/operated according to direction from the vehicle occupant to provide for aesthetic/decorative and/or personalization (e.g. according to stored/saved settings and/or mobile device commands, etc.).

[0103] As indicated schematically in FIGURES 2C-2D, 29 and 30, the steering wheel SW with user interface UI may be provided with a functional module FM shown as functional layer FL such as a hands-off detection system HOD with sensors SN that may be coupled to the controller/control system CM and vehicle systems/network to be actuated/operated according to contact/touch with the vehicle operator; as indicated, if the sensors SN for system HOD detects that the vehicle operator is not in contact with the steering wheel in accordance with criteria established by the control program/system, an alert may be provided by a lighting system SL and/or a transducer SC (e.g. haptic and/or audio transducer) in an effort to call for attention from the vehicle operator.

[0104] As indicated schematically in FIGURES 2C-2D and 31, the steering wheel SW with user interface UI may be provided with a functional module FM such as a lighting system SL and sensors SN (e.g. within a functional layer) that may be coupled to the controller/control system CM and vehicle systems/network to be actuated/operated according to direction from a control program/controller to provide communications/alerts to the vehicle occupant/operator (e.g. to provide indicators, signals, etc. according to stored/saved settings and/or mobile device commands, etc.).

[0105] As indicated schematically in FIGURES 2C-2D and 32, the steering wheel SW with user interface UI may be provided with a functional module/layer FL such as a lighting system SL and transducer SC (e.g. device for haptic feedback/output) that may be coupled to the controller/control system CM and vehicle systems/network to be actuated/operated according to direction from a control program/controller to provide communications/alerts to the vehicle occupant/operator relating to attention management, advanced driver assistance system (ADAS), lane assist, etc. (e.g. to provide indicators, signals, etc. according to stored/saved settings and/or mobile device commands, etc.).

[0106] As indicated schematically in FIGURES 2C-2D, 4A and 33A-33B, the steering wheel SW with user interface UI may be provided with a functional module FM with functional

layer FL comprising a sensor/sensor array SN configured to as a health monitor for the vehicle operator configured that may be coupled to the controller/control system CM and vehicle systems/network to be actuated/operated according to direction from a control program/controller to monitor such parameters as pulse rate, blood oxygen, cardiac activity, electrodermal activity, etc.) and to provide communications/alerts to the vehicle occupant/operator (e.g. to provide indicators, signals, etc. according to stored/saved settings and/or mobile device commands, etc.). As indicated schematically, data/information and communications/alerts may be presented at a display panel SD for the user interface on the steering wheel (see FIGURE 33A) and/or at a component in the vehicle and/or at a data device/storage/computer or mobile device (see FIGURE 33B).

Exemplary Embodiments - A

[0107] As indicated schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7 and 8A-8B, a component for an interior of a vehicle may comprise a rim configured to be assembled on a steering wheel comprising a frame; the rim may comprise a composite structure; the composite structure may comprise a set of segments to be assembled on the frame; the composite structure may comprise a cover and a carrier; a segment of the set of segments may comprise at least one of a decorative segment and/or a functional segment. The composite structure may comprise a positioning layer. The segment may comprise a manufactured segment and/or replaceable segment and/or an exchangeable segment and/or spare part segment. The segment may be configured to provide a cavity between the frame and the segment; the cavity may be configured to accommodate cables, wires, LEDs or electronic components. The segment of the composite structure may comprise a manufactured element and/or an exchangeable element and/or a replaceable element and/or a selectable element and/or a spare part segment. The segment may comprise a segment shell section configured to be attached by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding; the segment shell section may be configured to be attached to an adjacent segment shell section by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding. The component may be formed by a method of manufacturing comprising the steps of: forming a base and a rim; providing a frame; providing a composite structure; wherein the composite structure is configured to provide a segmented cover; such that the steering wheel assembly comprises connecting the segmented covers and the frame; wherein the connection comprises at least one of clipping, latching, bonding, or welding

[0108] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7 and 8A-8B, a component for an interior of a vehicle may comprise a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover and an intermediate layer under the cover. The cover layer may comprise an exterior surface for the rim. The intermediate layer may comprise at least one of a soft material or a resilient material. The intermediate layer may comprise at least one of a foam material or a spacer material. The component may comprise a carrier on the frame. The carrier may comprise a carrier layer beneath the intermediate layer. The intermediate layer may comprise a carrier layer. The at least one segment may comprise at least one shell segment. The at least one segment may comprise an engagement portion. The at least one segment may comprise a set of segments. The set of segments may

comprise a set of selectable segments configured to be assembled onto the frame of the rim. The rim may comprise a multi-segment construction comprising the set of segments. The rim may comprise a multi-segment construction comprising the set of selectable segments. The at least one segment may comprise a first segment and a second segment; the first segment may be axially connected to the second segment. The at least one segment may comprise a set of segments; the set of segments may comprise a first segment and a second segment; the cover layer on the first segment may be different than the cover layer on the second segment. The at least one segment may comprise a set of segments; the set of segments may comprise a first segment and a second segment; the first segment may be different than the second segment. The at least one segment may comprise a set of segments; each segment of the set of segments may comprise a segment base. Each segment of the set of segments may comprise an engagement portion. When the set of segments is assembled onto the frame the engagement portion of a first segment may be connected at the engagement portion of a second segment. When the set of segments is assembled onto the frame the engagement portion of a first segment may be clipped to the engagement portion of a second segment. When the set of segments is assembled onto the frame the engagement portion of a first segment may be connected at the engagement portion of a second segment in axial alignment. The engagement portion may comprise a connector and/or a plurality of connectors. The connector may comprise a clip connector. The connector may comprise a snap-fit connector. The engagement portion may comprise at least one of a projection and a receptacle for the projection. The connector may comprise a snap-fit connector comprising a projection and a receptacle for the projection. The at least one segment may comprise a set of shell segments. The set of shell segments may comprise a first shell section and a second shell section. When the set of shell segments is assembled onto the frame the first shell section may be attached to the second shell section. When the set of shell segments is assembled onto the frame the first shell section may be attached to the second shell section in radial alignment. The at least one shell segment may comprise a first shell section and a second shell section. The at least one shell segment may comprise a first shell section and a second shell section; the first shell section may be radially connected to the second shell section. The first shell section may comprise a first engagement portion; the second shell section may comprise a second engagement portion configured to engage the first engagement portion of the first shell section. The cover layer may comprise a decorative layer. The composite structure may comprise a positioning element. The at least one segment may comprise a positioning element. The cover may be configured to provide a visual effect for the rim. The cover may

comprise a cover layer comprising at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material, an opaque material, a light-transmissive material. The cover layer may comprise a no-stitch appearance. The composite structure may be configured to provide a visual effect for the rim. The visual effect may comprise a multi-segment appearance. The visual effect may comprise a multi-section appearance. The visual effect may comprise a multi-tone appearance. The visual effect may comprise a no-stitch appearance. The visual effect may comprise a modular appearance. The at least one segment may comprise a first segment and a second segment; the cover of the first segment may be different from the cover of the second segment. The component may comprise a spoke structure connecting the rim to the base. The component may comprise a functional layer; the functional layer may comprise at least one of (a) a sensor for hands-off detection or (b) heating mat. The base may comprise an airbag module. The frame may comprise an armature. The base may comprise a cover; the cover may provide a logo. The composite structure may be configured for mass/weight reduction.

[0109] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7 and 8A-8B, a component for an interior of a vehicle may comprise a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover and an intermediate layer under the cover. The composite structure may be configured to provide a visual effect for the rim. The at least one segment may comprise a set of segments. The visual effect may comprise a multi-segment appearance provided by the set of shell segments. The composite structure may be configured to provide a tactile effect. The set of segments may comprise a set of shell segments. The visual effect may comprise a multi-segment appearance. The visual effect may comprise a multi-section appearance. The visual effect may comprise a multi-tone appearance. The visual effect may comprise a no-stitch appearance. The cover may comprise a cover layer. The cover layer may be configured to provide the visual effect for the rim. The cover layer may comprise at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material, an opaque material, a light-transmissive material. The cover layer may comprise a no-stitch appearance. The intermediate layer may comprise at least one of a foam material or a spacer material. The intermediate layer may comprise a carrier layer on the frame. The at least one segment may comprise an engagement portion. The at least one

segment may comprise a set of shell segments. The set of shell segments may comprise a set of selectable shell segments configured to be assembled onto the frame of the rim. The rim may comprise a multi-segment construction comprising the set of shell segments. The set of segments may comprise a first segment and a second segment; the cover on the first segment may be different than the cover on the second segment. The set of segments may comprise a first segment and a second segment; the first segment may be different than the second segment. The set of segments may be assembled onto the frame in axial alignment. The set of segments may be assembled onto the frame in axial alignment at an engagement portion. The engagement portion may comprise a connector for each segment of the set of segments. The connector may comprise a snap-fit connector comprising a projection and a receptacle for the projection. The at least one segment may comprise a first shell section and a second shell section. When the set of segments is assembled onto the frame the first shell section may be attached to the second shell section in radial alignment. The first shell section may comprise a first engagement portion; the second shell section may comprise a second engagement portion configured to engage the first engagement portion of the first shell section.

[0110] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7, 8A-8B, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, a component for an interior of a vehicle may comprise a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover layer and an intermediate layer under the cover layer. The composite structure may comprise a functional layer. The functional layer may comprise at least one of (a) sensor or (b) a transducer or (c) a light. The sensor may comprise at least one of (a) capacitive sensor or (b) an infrared sensor or (c) an ultrasonic sensor (d) conductive sensor or (e) light. The at least one segment may be configured for integration of the functional layer. The at least one segment may be configured for interconnection of the functional layer. The composite structure may comprise a connector for the functional layer. The base may comprise a control module for the functional layer. The composite structure may comprise a positioning element. The at least one segment may comprise a positioning element. The positioning element may be configured to facilitate connectivity for the functional layer. The positioning element may be configured to facilitate positioning of the cover layer relative to the frame. The base may comprise an airbag module. The frame may comprise an armature. The base may comprise a horn module.

[0111] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7, 8A-8B, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, a component for an interior of a vehicle may comprise a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one segment comprising a cover and an intermediate layer under the cover. The composite structure may comprise a functional layer. The functional layer may comprise at least one of (a) a sensor and/or (b) a transducer and/or (c) a hands-off sensor and/or (d) a heating element. The transducer may comprise at least one of (a) an audio speaker and/or (b) a microphone and/or (c) a haptic device. The functional layer may comprise a user interface. The cover may comprise a cover layer. The at least one segment may comprise at least one shell segment.

[0112] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7, 8A-8B, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, a component for an interior of a vehicle configured to provide a user interface for a vehicle occupant in a vehicle comprising vehicle systems may comprise a steering wheel comprising a base and a rim. The rim may comprise a composite structure and a frame connected to the base. The composite structure of the rim may comprise at least one shell segment comprising a cover and an intermediate layer under the cover. The rim may comprise a functional module. The functional module may comprise at least one of (a) a sensor and/or (b) transducer and/or (c) a hands-off sensor and/or (d) a heating element and/or (e) a light and/or (f) a display. The functional module may comprise the display; the display may comprise a display panel. The light may comprise a light panel. The light may comprise an LED element. The light may comprise a set of LED elements. The transducer may comprise at least one of (a) an audio speaker and/or (b) a microphone and/or (c) a haptic device. The sensor may comprise a hand-off detector. The sensor may be configured to detect health-related information. Health-related information may comprise a signal representative of at least one of heart rate, blood oxygen saturation, sweat, temperature. The sensor may comprise an ECG (electrocardiograph) electrode to measure heart condition such as heart rate, heart rate variability. The sensor may comprise a PPG (photoplethysmography) optical sensor to measure blood oxygen saturation. The sensor may comprise an EDA sensor to measure skin potential, skin DC conductance, and skin AC admittance. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover. The sensor may be configured to represent a switch. The switch may be configured to operate a vehicle system. The user interface may be connected to at least one

vehicle system. The user interface may be connected to a network. The user interface may be connected to a network using telecommunication protocols. The network may comprise the internet. The user interface may be configured to be connected to a device. The device may comprise a mobile device. The mobile device may comprise a telecommunication device connected to a network. The telecommunication device may comprise a smart phone. The functional module may comprise a functional layer for the composite structure. The functional layer may comprise at least one of (a) a sensor and/or (b) a transducer and/or (c) a hands-off sensor and/or (d) a heating element. The functional layer may be configured under the cover. The functional layer may comprise a light source and the cover may comprise a light-transmissive cover layer. The functional module may comprise a light source configured to transmit light through the cover. The functional module may comprise a functional layer. The functional layer may comprise a light guide configured to transmit light. The functional layer may comprise a light guide configured to transmit light through the cover. The functional layer may comprise a light guide configured to transmit light from a light source. The functional module may comprise a display configured to provide illumination at least partially visible at the cover. Operation of the user interface for the vehicle occupant may comprise at least one of (a) an output signal (b) an input signal. The output signal may comprise at least one of (a) light or (b) information display or (c) sound or (d) vibration or (e) haptic output. The input signal may comprise at least one of (a) touch or (b) sound or (c) a signal detected by a sensor. The at least one segment may comprise a set of segments on the frame; the set of segments may comprise a functional segment comprising a functional module. The at least one segment may comprise a set of shell sections; the set of shell sections may comprise a front section and a back section. The at least one segment may comprise a decorative segment. The cover may comprise a decorative layer. The at least one segment may comprise a functional segment. The functional segment may comprise a functional layer. The user interface may comprise an input device and an output device. The user interface may comprise connectivity with vehicle systems and/or a network. The component may comprise a controller for the user interface. The component may comprise a control system for the user interface. The user interface may comprise at least one of signaling, alerting, sensing, detecting, messaging, reporting. The user interface may comprise at least one of transmission of light, display of information, audio input, audio output, haptic feedback, health-sensing, heating, multi-functionality. The composite structure may comprise at least one of a light source, an LED, a LED arrangement, a display, a display panel. The user interface may be configured for at least one of connectivity to a vehicle

system, connectivity to a network, connectivity to a mobile device, connectivity to a component, connectivity to a communication network, connectivity to the internet.

[0113] According to an exemplary embodiment as shown schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7, 8A-8B, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, a component for an interior of a vehicle may comprise a steering wheel comprising a base and a rim. The rim may comprise a composite structure. The composite structure may comprise a frame and a set of segments on the frame. The composite structure may comprise a cover and a positioning layer. Each segment of the set of segments may comprise at least one of a decorative segment and a functional segment. The functional segment may comprise a sensor. The functional segment may comprise a functional layer. The functional segment may comprise a functional module. The functional segment may be configured to provide a user interface for a vehicle occupant with vehicle systems and/or a telecommunication network. The cover may comprise an exterior surface. The functional segment may comprise the sensor. The functional segment may comprise a light display. The functional segment may comprise a functional layer. The composite structure may comprise a positioning layer. The cover may comprise a layer configured to facilitate the transmission of light. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover. The light display may be configured to provide illumination at least partially visible through the exterior surface of the cover. Operation of the user interface for a vehicle occupant may comprise at least one of output from illumination from the display and (b) input detected by the sensor. The composite structure may comprise (a) the cover; (b) the functional layer; (c) the sensor; (d) the positioning layer; (e) the display; (f) a substrate. The positioning layer may comprise at least one of (a) a foam material and/or (b) a spacer fabric. The cover may comprise at least one of (a) textile; (b) fabric; (c) fiber mesh; (d) leather; (e) grained surface; (f) synthetic fibers; (g) natural fibers; (h) artificial leather; (i) polyester; (j) fabric sheet; (k) upholstered material; (l) a fleece material; (m) a woven material; (n) a non-woven material; (o) a sheet material; (p) a perforated material; (q) a composite of multiple fiber materials; (r) a translucent material; (s) a resilient material; (t) a leather material configured to facilitate the transmission of light; (u) a material that is partially transparent and partially opaque; (v) a layer configured to facilitate transmission of visible light; (w) a surface material perforated to improve the visibility of light from the display. The cover may comprise a light- transmissive cover comprising at least one of (a) film; (b) resin; (c) polycarbonate; (d) polyurethane; (e) polyvinyl material; (f) TPO; (g) a polymeric material; (h) a polymeric film; (i) a composite of

multiple plastic materials; (j) a composite of multiple materials; (k) a composite of fiber material; (l) natural material; (m) metal; (n) a perforated material; (o) a translucent layer. The functional layer may be configured for at least one of (a) positioning; (b) spacing; (c) haptic feedback; (d) tactile feedback such as vibration; (e) audible feedback such as sound; (f) optical enhancement; (g) light shielding; (h) interaction with a vehicle system; (i) cushioning; (j) tactile shear/feel performance; (k) heating; (l) cooling; (m) diffusion of illumination from the display; (n) alerting; (o) messaging; (p) light guiding; (q) flexibility. The positioning layer may be configured to retain positioning within the composite structure for operation of the sensor from input from the vehicle occupant; the positioning layer may comprise at least one of (a) a spacer; (b) a flexible spacer; (c) a spacer fabric; (d) a foam material; (e) a plastic material; (f) fabric; (g) polyurethane; (h) a woven material; (i) a spacer material; (j) a fabric material; (k) a fiber material. The user interface may be configured so that input from the vehicle occupant at the exterior surface of the cover is detected by the sensor. The user interface may be configured so that output from the display is presented at least partially through the exterior surface of the cover. The composite structure may comprise a substrate. The substrate may comprise a carrier. The component may comprise a control system configured to connect the user interface to at least one vehicle system; the control system may be configured to facilitate operation by the vehicle occupant of at least one vehicle system. The component may comprise a control system for the user interface configured for at least one of (1) visible feedback, (2) audible feedback, (3) tactile feedback, (4) haptic feedback to the vehicle occupant. The user interface may be configured for interaction with a vehicle occupant by at least one of (a) touch at the exterior surface of the cover detected by the sensor or (b) gesture adjacent to the exterior surface of the cover detected by the sensor. The sensor may comprise at least one of (a) an array; (b) a grid; (c) a foil; (d) a panel; (e) a touch panel; (f) a flexible panel; (g) a detector; (h) a proximity detector; (i) a capacitive touch panel; (j) a pressure sensitive panel. The user interface may comprise a light display; the light display may comprise at least one of (a) an array; (b) a panel; (c) a flexible panel. The composite structure may comprise a composite surface; the cover may comprise an at least partially translucent cover; illumination from the display at the exterior surface of the composite structure may comprise visible light transmitted through the functional layer and through the at least partially translucent cover. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover. The functional segment may comprise a functional layer configured for at least one of (a) positioning; (b) spacing; (c) haptic feedback; (d) tactile feedback such as vibration; (e) audible feedback such

as sound; (f) optical enhancement; (g) light shielding; (h) interaction with a vehicle system; (i) cushioning; (j) tactile shear/feel performance; (k) heating; (l) cooling; (m) diffusion of illumination from the display; (n) alerting; (o) messaging; (p) light guiding; (q) flexibility. The sensor may be configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover from at least one of (a) touch; (b) pressure; (c) proximity; (d) position. The positioning layer may comprise at least one of (a) a spacer; (b) a flexible spacer; (c) a spacer fabric; (d) a fabric material; (e) a foam material; (f) a plastic material; (g) a woven material; (h) a fiber material; (i) fabric; (j) polyurethane; (k) a spacer material. The cover may comprise at least one of (a) textile; (b) fabric; (c) fiber mesh; (d) leather; (e) grained surface; (f) synthetic fibers; (g) natural fibers; (h) artificial leather; (i) polyester; (j) fabric sheet; (k) upholstered material; (l) a fleece material; (m) a woven material; (n) a non-woven material; (o) a sheet material; (p) a perforated material; (q) a composite of multiple fiber materials; (r) a translucent material; (s) a resilient material; (t) a leather material configured to facilitate the transmission of light; (u) a material that is partially transparent and partially opaque; (v) a layer configured to facilitate transmission of visible light; (w) a surface material perforated to improve the visibility of light from the display; (x) film; (y) resin; (z) a composite of multiple materials; (aa) a composite of fiber material; (bb) natural material; (cc) metal; (dd) a perforated material; (ee) a translucent layer.

Exemplary Embodiments - B

[0114] As indicated schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7 and 8A-8B, the composite structure of the rim of the steering wheel may comprise segments such as shell segments configured to facilitate variable/various, customizable, light weight construction for decoration and that can be produced efficiently and/or connected and replaced and selected for arrangement; connection between segments may comprise mechanical connections such as clips, ribs, protrusions (and counterparts); connection of segments and the form of the composite structure can be configured to facilitate positioning and alignment as well as to enhance/control spacing/distance, ensure robust connection (e.g. reduce squeak, rattle, etc.) and to provide space for available to be used for electronic components (e.g, wires, LED, transducers, sensors, plug in connectivity, etc.) and/or other materials and items within the rim.

[0115] As indicated schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7 and 8A-8B, the composite structure of the rim of the steering wheel may comprise segments such as shell segments provides a design configuration that facilitates interchangeable variations of segments and/or decorative/cover materials with visual effect, tactile effect, durability, functional capability; internal construction configuration facilitates integration of different individual or multiple functions as well as a lower mass/lighter weight form that is intended to be more efficient to produce (e.g. no stitching, no-stitch appearance, reduced size/mass, simpler mechanical connections, fewer total parts, etc.); the configuration of the composite structure and/or segments are intended to facilitate replacement and/or updating over the vehicle life time (e.g. including available interchange/exchange such as using new parts, spare parts for update/replacement, etc.).

[0116] As indicated schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7, 8A-8B, 17A-17B, 18A-18B, 26A-26B, 27, 28, 29, 30, 31, 32 and 33A-33B, the composite structure of the rim of the steering wheel may comprise segments such as shell segments configured as segmented sections with fitting parts that integrate functional modules providing features (e.g. sensing, heating, hands off detection, lighting, health monitoring/sensing (heart rate by ECG, skin, conductance by EDA and oxygen saturation in the blood by oximeter or by PPG); integration of a functional module/layer in the composite structure of the rim facilitates efficient assembly and construction to allow the overall intended decorative effect and tactile effect/durability (e.g. material selection for appearance, visual effect, tactile effect, durability, customization, sustainability, light weight, etc.). Construction of the composite structure is intended to facilitate integration of layers and

elements including functional, positioning/alignment, decorative, etc. intent as well as selective positioning of functional elements (e.g. lighting, heating, sensing/detecting, button/switches, input/output for user interface) and or decorative effects for enhanced performance and manufacturability; fitment of elements of the composite structure and/or connection of segments/sections can be enhanced to facilitate use of space within the rim for optimized performance (e.g. space creation, air gap, light weight, package space for electronic functions.

[0117] According to an exemplary embodiment, a vehicle interior component and a method for manufacturing said vehicle interior component is shown schematically in the FIGURES; the component may comprise a trim component comprising a cover and a substrate/carrier in a composite structure assembled on a frame for the rim of a steering wheel. The cover may comprise an exterior cover layer, an intermediate cover layer, a functional layer and a base. The substrate may comprise a depression, a projection and/or a fastening portion. The substrate may comprise a metal and a soft material. The cover/base may comprise a depression, a projection and/or a fastening portion. The depression and/or projection are configured to align substrate and cover. The cover may comprise cover segments. The cover segments may be configured to present the cover. The functional layer may comprise a heating mat, a sensor, a light-transmissive layer. The method of forming/assembling the component may comprise (a) at least one of a foaming process, an injection molding process or a press lamination process; (b) positioning of the cover or of the cover segments on the substrate; (c) fixing of the cover or of the cover segments to the substrate; (d) surrounding of the substrate with cover segments; (e) joining of the cover segments with each other around the substrate.

[0118] The vehicle interior component may be configured to present a user interface at a steering wheel. The method and component are configured to provide an effective method of steering wheel trim, a customizable steering wheel cover, and an effective method of replacing the steering wheel cover.

[0119] According to an exemplary embodiment, the rim and composite structure may comprise selected materials for cost/performance; the frame structure/armature may comprise a metal, metal alloy (e.g. magnesium, aluminum, steel, etc.); the shell segments and other plastic elements such as the carrier, etc. may comprise a plastic, molded plastic (e.g. polypropylene, nylon plastic, polyamide nylon, polystyrene, acetal plastic, polyoxymethylene, polycarbonate, acrylonitrile butadiene styrene, polyethylene terephthalate, or other plastic compounds); the heating mat and/or sensor layer may comprise

a commercially-available structure or an integrated/formed structure with heating wires (e.g. within a matrix/substrate, foam, elastomer, filled foam, graphene-filled foam, etc.); connections and connectors for electric/electronic system may be commercially-available structures or produced from suitable materials (e.g. as for heating mat/wires, sensor mat, etc.).

[0120] According to an exemplary embodiment as indicated schematically in FIGURES 2A-2D, 3A-3L, 4A-4I, 5A-5L, 6A-6B, 7 and 8A-8B, a component for an interior of a vehicle may comprise a rim configured to be assembled on a steering wheel comprising a frame; the rim may comprise a composite structure; the composite structure may comprise a set of segments to be assembled on the frame; the composite structure may comprise a cover and a carrier; a segment of the set of segments may comprise at least one of a decorative segment and/or a functional segment. The composite structure may comprise a positioning layer. The segment may comprise a manufactured segment and/or replaceable segment and/or an exchangeable segment and/or spare part segment. The segment may be configured to provide a cavity between the frame and the segment; the cavity may be configured to accommodate cables, wires, LEDs or electronic components. The segment of the composite structure may comprise a manufactured element and/or an exchangeable element and/or a replaceable element and/or a selectable element and/or a spare part segment. The segment may comprise a segment shell section configured to be attached by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding; the segment shell section may be configured to be attached to an adjacent segment shell section by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding. The component may be formed by a method of manufacturing comprising the steps of: forming a base and a rim; providing a frame; providing a composite structure; wherein the composite structure is configured to provide a segmented cover; such that the steering wheel assembly comprises connecting the segmented covers and the frame; wherein the connection comprises at least one of clipping, latching, bonding, or welding.

REFERENCE SYMBOL LIST	
ELEMENT, PART OR COMPONENT	**REFERENCE SYMBOL**
Vehicle	V
Interior	I
Door Panel	DP
Floor Console	FC
Instrument Panel	IP
Steering Wheel	SW
User Interface	UI
Composite Structure	CS, CSm
Armature/Frame	RM
Base	SB, SBa, SBb, SBc, SBd
Spoke	SK
Rim	SR
Switch	ST
Controller/Control Module	CM
Functional Module	FM
Connector	CN, CNa, CNb, CNc, CNd
Wire	WR
Shell Segment/Section	SG, SGa, SGb
Logo/Emblem	TM
Shell Segment Base	CB
Positioning Means	GP, GPa, GPb
Light Guide	LG
Engagement Member (Fastening Member)	NP, NPa, NPb
Light Panel/Display	LP
Light Source	LS
Transducer (Haptic/Microphone/Speaker)	SC
Display	SD
Heater	SH
Light	SL
Sensor	SN
Audio Module/Speaker/Microphone	SP
Functional Layer	FL
Hands-Off Detection/Sensor	HOD
Heating Mat	HT
Decorative Layer	DL
Cover	TX
Barrier Layer/Structure	BL
Resin	R
Tool/Mold	M
Tool Bottom Section	MB
Clamping Frame	MC
Forming Tool	MF
Slider	MS
Tool Top Section	MT

* * *

[0121] It is important to note that the present inventions (e.g. inventive concepts, etc.) have been described in the specification and/or illustrated in the FIGURES of the present patent document according to exemplary embodiments; the embodiments of the present inventions are presented by way of example only and are not intended as a limitation on the scope of the present inventions. The construction and/or arrangement of the elements of the inventive concepts embodied in the present inventions as described in the specification and/or illustrated in the FIGURES is illustrative only. Although exemplary embodiments of the present inventions have been described in detail in the present patent document, a person of ordinary skill in the art will readily appreciate that equivalents, modifications, variations, etc. of the subject matter of the exemplary embodiments and alternative embodiments are possible and contemplated as being within the scope of the present inventions; all such subject matter (e.g. modifications, variations, embodiments, combinations, equivalents, etc.) is intended to be included within the scope of the present inventions. It should also be noted that various/other modifications, variations, substitutions, equivalents, changes, omissions, etc. may be made in the configuration and/or arrangement of the exemplary embodiments (e.g. in concept, design, structure, apparatus, form, assembly, construction, means, function, system, process/method, steps, sequence of process/method steps, operation, operating conditions, performance, materials, composition, combination, etc.) without departing from the scope of the present inventions; all such subject matter (e.g. modifications, variations, embodiments, combinations, equivalents, etc.) is intended to be included within the scope of the present inventions. The scope of the present inventions is not intended to be limited to the subject matter (e.g. details, structure, functions, materials, acts, steps, sequence, system, result, etc.) described in the specification and/or illustrated in the FIGURES of the present patent document. It is contemplated that the claims of the present patent document will be construed properly to cover the complete scope of the subject matter of the present inventions (e.g. including any and all such modifications, variations, embodiments, combinations, equivalents, etc.); it is to be understood that the terminology used in the present patent document is for the purpose of providing a description of the subject matter of the exemplary embodiments rather than as a limitation on the scope of the present inventions.

[0122] It is also important to note that according to exemplary embodiments the present inventions may comprise conventional technology (e.g. as implemented and/or integrated in exemplary embodiments, modifications, variations, combinations, equivalents, etc.) or may

comprise any other applicable technology (present and/or future) with suitability and/or capability to perform the functions and processes/operations described in the specification and/or illustrated in the FIGURES. All such technology (e.g. as implemented in embodiments, modifications, variations, combinations, equivalents, etc.) is considered to be within the scope of the present inventions of the present patent document.

CLAIMS

The invention claimed is:

1. A component for an interior of a vehicle comprising:

a steering wheel comprising a base and a rim;

wherein the rim comprises a composite structure and a frame connected to the base;

wherein the composite structure of the rim comprises at least one segment comprising a cover and an intermediate layer under the cover;

wherein the cover layer comprises an exterior surface for the rim.

2. The component of Claim 1 wherein the intermediate layer comprises at least one of a soft material or a resilient material.

3. The component of Claim 1 wherein the intermediate layer comprises at least one of a foam material or a spacer material.

4. The component of Claim 1 further comprising a carrier on the frame.

5. The component of Claim 4 wherein the carrier comprises a carrier layer beneath the intermediate layer.

6. The component of Claim 1 wherein the intermediate layer comprises a carrier layer.

7. The component of Claim 1 wherein the at least one segment comprises at least one shell segment.

8. The component of Claim 1 wherein the at least one segment comprises an engagement portion.

9. The component of Claim 1 wherein the at least one segment comprises a set of segments.

10. The component of Claim 9 wherein the set of segments comprises a set of selectable segments configured to be assembled onto the frame of the rim.

11. The component of Claim 1 wherein the rim comprises a multi-segment construction comprising the set of segments.

12. The component of Claim 1 wherein the rim comprises a multi-segment construction comprising the set of selectable segments.

13. The component of Claim 1 wherein the at least one segment comprises a first segment and a second segment; wherein the first segment is axially connected to the second segment.

14. The component of Claim 1 wherein the at least one segment comprises a set of segments; wherein the set of segments comprises a first segment and a second segment; wherein the cover layer on the first segment is different than the cover layer on the second segment.

15. The component of Claim 1 wherein the at least one segment comprises a set of segments; wherein the set of segments comprises a first segment and a second segment; wherein the first segment is different than the second segment.

16. The component of Claim 1 wherein the at least one segment comprises a set of segments; wherein each segment of the set of segments comprises a segment base.

17. The component of Claim 16 wherein each segment of the set of segments comprises an engagement portion.

18. The component of Claim 16 wherein when the set of segments is assembled onto the frame the engagement portion of a first segment can be connected at the engagement portion of a second segment.

19. The component of Claim 16 wherein when the set of segments is assembled onto the frame the engagement portion of a first segment can be clipped to the engagement portion of a second segment.

20. The component of Claim 16 wherein when the set of segments is assembled onto the frame the engagement portion of a first segment can be connected at the engagement portion of a second segment in axial alignment.

21. The component of Claim 1 wherein the engagement portion comprises a connector and/or a plurality of connectors.

22. The component of Claim 1 wherein the connector comprises a clip connector.

23. The component of Claim 1 wherein the connector comprises a snap-fit connector.

24. The component of Claim 1 wherein the engagement portion comprises at least one of a projection and a receptacle for the projection.

25. The component of Claim 1 wherein the connector comprises a snap-fit connector comprising a projection and a receptacle for the projection.

26. The component of Claim 1 wherein the at least one segment comprises a set of shell segments.

27. The component of Claim 1 wherein the set of shell segments comprises a first shell section and a second shell section.

28. The component of Claim 1 wherein when the set of shell segments is assembled onto the frame the first shell section is attached to the second shell section.

29. The component of Claim 1 wherein when the set of shell segments is assembled onto the frame the first shell section is attached to the second shell section in radial alignment.

30. The component of Claim 1 wherein the at least one shell segment comprises a first shell section and a second shell section.

31. The component of Claim 1 wherein the at least one shell segment comprises a first shell section and a second shell section; wherein the first shell section is radially connected to the second shell section.

32. The component of Claim 1 wherein the first shell section comprises a first engagement portion; wherein the second shell section comprises a second engagement portion configured to engage the first engagement portion of the first shell section.

33. The component of Claim 1 wherein the cover layer comprises a decorative layer.

34. The component of Claim 1 wherein the composite structure comprises a positioning element.

35. The component of Claim 1 wherein the at least one segment comprises a positioning element.

36. The component of Claim 1 wherein the cover is configured to provide a visual effect for the rim.

37. The component of Claim 1 wherein the cover comprises a cover layer comprising at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material, an opaque material, a light-transmissive material.

38. The component of Claim 1 wherein the cover layer comprises a no-stitch appearance.

39. The component of Claim 1 wherein the composite structure is configured to provide a visual effect for the rim.

40. The component of Claim 1 wherein the visual effect comprises a multi-segment appearance.

41. The component of Claim 1 wherein the visual effect comprises a multi-section appearance.

42. The component of Claim 1 wherein the visual effect comprises a multi-tone appearance.

43. The component of Claim 1 wherein the visual effect comprises a no-stitch appearance.

44. The component of Claim 1 wherein the visual effect comprises a modular appearance.

45. The component of Claim 1 wherein the at least one segment comprises a first segment and a second segment; wherein the cover of the first segment is different from the cover of the second segment.

46. The component of Claim 1 further comprising a spoke structure connecting the rim to the base.

47. The component of Claim 1 further comprising a functional layer; wherein the functional layer comprises at least one of (a) a sensor for hands-off detection or (b) heating mat.

48. The component of Claim 1 wherein the base comprises an airbag module.

49. The component of Claim 1 wherein the frame comprises an armature.

50. The component of Claim 1 wherein the base comprises a cover; wherein the cover provides a logo.

51. The component of Claim 1 wherein the composite structure is configured for mass/weight reduction.

52. A component for an interior of a vehicle comprising:

a steering wheel comprising a base and a rim;

wherein the rim comprises a composite structure and a frame connected to the base;

wherein the composite structure of the rim comprises at least one segment comprising a cover and an intermediate layer under the cover;

wherein the composite structure is configured to provide a visual effect for the rim;

wherein the at least one segment comprises a set of segments;

wherein the visual effect comprises a multi-segment appearance provided by the set of shell segments.

53. The component of Claim 52 wherein the composite structure is configured to provide a tactile effect.

54. The component of Claim 52 wherein the set of segments comprises a set of shell segments.

55. The component of Claim 52 wherein the visual effect comprises a multi-segment appearance.

56. The component of Claim 52 wherein the visual effect comprises a multi-section appearance.

57. The component of Claim 52 wherein the visual effect comprises a multi-tone appearance.

58. The component of Claim 52 wherein the visual effect comprises a no-stitch appearance.

59. The component of Claim 52 wherein the cover comprises a cover layer.

60. The component of Claim 59 wherein the cover layer is configured to provide the visual effect for the rim.

61. The component of Claim 59 wherein the cover layer comprises at least one of a fabric material, a textile material, a fiber material, a leather, a synthetic leather material, a foil, a skin, a wrap, a veneer, a recycled material, an opaque material, a light-transmissive material.

62. The component of Claim 59 wherein the cover layer comprises a no-stitch appearance.

63. The component of Claim 52 wherein the intermediate layer comprises at least one of a foam material or a spacer material.

64. The component of Claim 52 wherein the intermediate layer comprises a carrier layer on the frame.

65. The component of Claim 52 wherein the at least one segment comprises an engagement portion.

66. The component of Claim 52 wherein the at least one segment comprises a set of shell segments.

67. The component of Claim 66 wherein the set of shell segments comprises a set of selectable shell segments configured to be assembled onto the frame of the rim.

68. The component of Claim 66 wherein the rim comprises a multi-segment construction comprising the set of shell segments.

69. The component of Claim 66 wherein the set of shell segments comprises a first segment and a second segment; wherein the cover on the first segment is different than the cover on the second segment.

70. The component of Claim 66 wherein the set of shell segments comprises a first segment and a second segment; wherein the first segment is different than the second segment.

71. The component of Claim 66 wherein the set of segments is assembled onto the frame in axial alignment.

72. The component of Claim 66 wherein the set of segments is assembled onto the frame in axial alignment at an engagement portion.

73. The component of Claim 72 wherein the engagement portion comprises a connector for each segment of the set of segments.

74. The component of Claim 73 wherein the connector comprises a snap-fit connector comprising a projection and a receptacle for the projection.

75. The component of Claim 52 wherein the at least one segment comprises a first shell section and a second shell section.

76. The component of Claim 75 wherein when the set of segments is assembled onto the frame the first shell section is attached to the second shell section in radial alignment.

77. The component of Claim 75 wherein the first shell section comprises a first engagement portion; wherein the second shell section comprises a second engagement portion configured to engage the first engagement portion of the first shell section.

78. A component for an interior of a vehicle comprising:

a steering wheel comprising a base and a rim;

wherein the rim comprises a composite structure and a frame connected to the base;

wherein the composite structure of the rim comprises at least one segment comprising a cover layer and an intermediate layer under the cover layer;

wherein the composite structure comprises a functional layer.

79. The component of Claim 78 wherein the functional layer comprises at least one of (a) sensor or (b) a transducer or (c) a light.

80. The component of Claim 79 wherein the sensor comprises at least one of (a) capacitive sensor or (b) an infrared sensor or (c) an ultrasonic sensor (d) conductive sensor or (e) light.

81. The component of Claim 78 wherein the at least one segment is configured for integration of the functional layer.

82. The component of Claim 78 wherein the at least one segment is configured for interconnection of the functional layer.

83. The component of Claim 78 wherein the composite structure comprises a connector for the functional layer.

84. The component of Claim 78 wherein the base comprises a control module for the functional layer.

85. The component of Claim 78 wherein the composite structure comprises a positioning element.

86. The component of Claim 78 wherein the at least one segment comprises a positioning element.

87. The component of Claim 86 wherein the positioning element is configured to facilitate connectivity for the functional layer.

88. The component of Claim 86 wherein the positioning element is configured to facilitate positioning of the cover layer relative to the frame.

89. The component of Claim 78 wherein the base comprises an airbag module.

90. The component of Claim 78 wherein the frame comprises an armature.

91. The component of Claim 78 wherein the base comprises a horn module.

92. A component for an interior of a vehicle comprising:

a steering wheel comprising a base and a rim;

wherein the rim comprises a composite structure and a frame connected to the base;

wherein the composite structure of the rim comprises at least one segment comprising a cover and an intermediate layer under the cover;

wherein the composite structure comprises a functional layer;

wherein the functional layer comprises at least one of (a) a sensor and/or (b) a transducer and/or (c) a hands-off sensor and/or (d) a heating element.

93. The component of Claim 92 wherein the transducer comprises at least one of (a) an audio speaker and/or (b) a microphone and/or (c) a haptic device.

94. The component of Claim 92 wherein the functional layer comprises a user interface.

95. The component of Claim 92 wherein the cover comprises a cover layer.

96. The component of Claim 92 wherein the at least one segment comprises at least one shell segment.

97. A component for an interior of a vehicle configured to provide a user interface for a vehicle occupant in a vehicle comprising vehicle systems comprising:

a steering wheel comprising a base and a rim;

wherein the rim comprises a composite structure and a frame connected to the base;

wherein the composite structure of the rim comprises at least one shell segment comprising a cover and an intermediate layer under the cover;

wherein the rim comprises a functional module;

wherein the functional module comprises at least one of (a) a sensor and/or (b) transducer and/or (c) a hands-off sensor and/or (d) a heating element and/or (e) a light and/or (f) a display.

98. The component of Claim 97 wherein the functional module comprises the display; wherein the display comprises a display panel.

99. The component of Claim 97 wherein the light comprises a light panel.

100. The component of Claim 97 wherein the light comprises an LED element.

101. The component of Claim 97 wherein the light comprises a set of LED elements.

102. The component of Claim 97 wherein the transducer comprises at least one of (a) an audio speaker and/or (b) a microphone and/or (c) a haptic device.

103. The component of Claim 97 wherein the sensor comprises a hand-off detector.

104. The component of Claim 97 wherein the sensor is configured to detect health-related information.

105. The component of Claim 104 wherein health-related information comprises a signal representative of at least one of heart rate, blood oxygen saturation, sweat, temperature.

106. The component of Claim 97 wherein the sensor comprises an ECG (electrocardiograph) electrode to measure heart condition such as heart rate, heart rate variability.

107. The component of Claim 97 wherein the sensor comprises a PPG (photoplethysmography) optical sensor to measure blood oxygen saturation.

108. The component of Claim 97 wherein the sensor comprises an EDA sensor to measure skin potential, skin DC conductance, and skin AC admittance.

109. The component of Claim 97 wherein the sensor is configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover.

110. The component of Claim 97 wherein the sensor is configured to represent a switch.

111. The component of Claim 97 wherein the switch is configured to operate a vehicle system.

112. The component of Claim 97 wherein the user interface is connected to at least one vehicle system.

113. The component of Claim 97 wherein the user interface is connected to a network.

114. The component of Claim 97 wherein the user interface is connected to a network using telecommunication protocols.

115. The component of Claim 114 wherein the network comprises the internet.

116. The component of Claim 97 wherein the user interface is configured to be connected to a device.

117. The component of Claim 116 wherein the device comprises a mobile device.

118. The component of Claim 117 wherein the mobile device comprises a telecommunication device connected to a network.

119. The component of Claim 118 wherein the telecommunication device comprises a smart phone.

120. The component of Claim 97 wherein the functional module comprises a functional layer for the composite structure.

121. The component of Claim 97 wherein the functional layer comprises at least one of (a) a sensor and/or (b) a transducer and/or (c) a hands-off sensor and/or (d) a heating element.

122. The component of Claim 97 wherein the functional layer is configured under the cover.

123. The component of Claim 97 wherein the functional layer comprises a light source and the cover comprises a light-transmissive cover layer.

124. The component of Claim 97 wherein the functional module comprises a light source configured to transmit light through the cover.

125. The component of Claim 97 wherein the functional module comprises a functional layer.

126. The component of Claim 125 wherein the functional layer comprises a light guide configured to transmit light.

127. The component of Claim 125 wherein the functional layer comprises a light guide configured to transmit light through the cover.

128. The component of Claim 125 wherein the functional layer comprises a light guide configured to transmit light from a light source.

129. The component of Claim 97 wherein the functional module comprises a display configured to provide illumination at least partially visible at the cover.

130. The component of Claim 97 wherein operation of the user interface for the vehicle occupant comprises at least one of (a) an output signal (b) an input signal.

131. The component of Claim 130 wherein the output signal comprises at least one of (a) light or (b) information display or (c) sound or (d) vibration or (e) haptic output.

132. The component of Claim 130 wherein the input signal comprises at least one of (a) touch or (b) sound or (c) a signal detected by a sensor.

133. The component of Claim 97 wherein the at least one segment comprises a set of segments on the frame; wherein the set of segments comprises a functional segment comprising a functional module.

134. The component of Claim 97 wherein the at least one segment comprises a set of shell sections; wherein the set of shell sections comprises a front section and a back section.

135. The component of Claim 97 wherein the at least one segment comprises a decorative segment.

136. The component of Claim 97 wherein the cover comprises a decorative layer.

137. The component of Claim 97 wherein the at least one segment comprises a functional segment.

138. The component of Claim 137 wherein the functional segment comprises a functional layer.

139. The component of Claim 97 wherein the user interface comprises an input device and an output device; wherein the user interface comprises connectivity with vehicle systems and/or a network.

140. The component of Claim 97 further comprising a controller for the user interface.

141. The component of Claim 97 further comprising a control system for the user interface.

142. The component of Claim 97 wherein the user interface comprises at least one of signaling, alerting, sensing, detecting, messaging, reporting.

143. The component of Claim 97 wherein the user interface comprises at least one of transmission of light, display of information, audio input, audio output, haptic feedback, health-sensing, heating, multi-functionality.

144. The component of Claim 97 wherein the composite structure comprises at least one of a light source, an LED, a LED arrangement, a display, a display panel.

145. The component of Claim 97 wherein the user interface is configured for at least one of connectivity to a vehicle system, connectivity to a network, connectivity to a mobile device, connectivity to a component, connectivity to a communication network, connectivity to the internet.

146. A component for an interior of a vehicle comprising:

a steering wheel comprising a base and a rim;

wherein the rim comprises a composite structure;

wherein the composite structure comprises a frame and a set of segments on the frame;

wherein the composite structure comprises a cover and a positioning layer;

wherein each segment of the set of segments comprises at least one of a decorative segment and a functional segment.

147. The component of Claim 146 wherein the functional segment comprises a sensor.

148. The component of Claim 146 wherein the functional segment comprises a functional layer.

149. The component of Claim 146 wherein the functional segment comprises a functional module.

150. The component of Claim 146 wherein the functional segment is configured to provide a user interface for a vehicle occupant with vehicle systems and/or a telecommunication network.

151. The component of Claim 146 wherein the cover comprises an exterior surface.

152. The component of Claim 146 wherein the functional segment comprises a light display.

153. The component of Claim 146 wherein the cover comprises a layer configured to facilitate the transmission of light.

154. The component of Claim 146 wherein the functional segment comprises a sensor configured to detect input from the vehicle occupant at or adjacent to an exterior surface of the cover.

155. The component of Claim 146 wherein the light display is configured to provide illumination at least partially visible through an exterior surface of the cover.

156. The component of Claim 146 wherein operation of the user interface for a vehicle occupant comprises at least one of (a) output from illumination from the display and (b) input detected by the sensor.

157. The component of Claim 146 wherein the composite structure comprises: (a) the cover; (b) the functional layer; (c) the sensor; (d) the positioning layer; (e) the display; (f) a substrate.

158. The component of Claim 146 wherein the positioning layer comprises at least one of (a) a foam material and/or (b) a spacer fabric.

159. The component of Claim 146 wherein the cover comprises at least one of (a) textile; (b) fabric; (c) fiber mesh; (d) leather; (e) grained surface; (f) synthetic fibers; (g) natural fibers; (h) artificial leather; (i) polyester; (j) fabric sheet; (k) upholstered material; (l) a fleece material; (m) a woven material; (n) a non-woven material; (o) a sheet material; (p) a perforated material; (q) a composite of multiple fiber materials; (r) a translucent material; (s) a resilient material; (t) a leather material configured to facilitate the transmission of light; (u) a material that is partially transparent and partially opaque; (v) a layer configured to facilitate transmission of visible light; (w) a surface material perforated to improve the visibility of light from the display.

160. The component of Claim 146 wherein the cover comprises a light-transmissive cover comprising at least one of (a) film; (b) resin; (c) polycarbonate; (d) polyurethane; (e) polyvinyl material; (f) TPO; (g) a polymeric material; (h) a polymeric film; (i) a composite of multiple plastic materials; (j) a composite of multiple materials; (k) a composite of fiber material; (l) natural material; (m) metal; (n) a perforated material; (o) a translucent layer.

161. The component of Claim 146 wherein the functional layer is configured for at least one of (a) positioning; (b) spacing; (c) haptic feedback; (d) tactile feedback such as vibration; (e) audible feedback such as sound; (f) optical enhancement; (g) light shielding; (h) interaction with a vehicle system; (i) cushioning; (j) tactile shear/feel performance; (k) heating; (l) cooling; (m) diffusion of illumination from the display; (n) alerting; (o) messaging; (p) light guiding; (q) flexibility.

162. The component of Claim 146 wherein the positioning layer is configured to retain positioning within the composite structure for operation of a sensor from input from the vehicle occupant; wherein the positioning layer comprises at least one of (a) a spacer; (b) a flexible spacer; (c) a spacer fabric; (d) a foam material; (e) a plastic material; (f) fabric; (g) polyurethane; (h) a woven material; (i) a spacer material; (j) a fabric material; (k) a fiber material.

163. The component of Claim 146 wherein the user interface is configured so that input from the vehicle occupant at an exterior surface of the cover is detected by a sensor.

164. The component of Claim 146 wherein the user interface is configured so that output from the display is presented at least partially through an exterior surface of the cover.

165. The component of Claim 146 wherein the composite structure comprises a substrate.

166. The component of Claim 166 wherein the substrate comprises a carrier.

167. The component of Claim 146 further comprising a control system configured to connect the user interface to at least one vehicle system; wherein the control system is configured to facilitate operation by the vehicle occupant of at least one vehicle system.

168. The component of Claim 146 further comprising a control system for the user interface configured for at least one of (1) visible feedback, (2) audible feedback, (3) tactile feedback, (4) haptic feedback to the vehicle occupant.

169. The component of Claim 146 wherein the user interface is configured for interaction with a vehicle occupant by at least one of (a) touch at the exterior surface of the cover detected by a sensor or (b) gesture adjacent to the exterior surface of the cover detected by a sensor.

170. The component of Claim 146 wherein the functional segment comprises a sensor; wherein the sensor comprises at least one of (a) an array; (b) a grid; (c) a foil; (d) a panel; (e) a touch panel; (f) a flexible panel; (g) a detector; (h) a proximity detector; (i) a capacitive touch panel; (j) a pressure sensitive panel.

171. The component of Claim 146 wherein the user interface comprises a light display; wherein the light display comprises at least one of (a) an array; (b) a panel; (c) a flexible panel.

172. The component of Claim 146 wherein the composite structure comprises a composite surface; wherein the cover comprises an at least partially translucent cover; wherein illumination from the display at the exterior surface of the composite structure comprises visible light transmitted through the functional layer and through the at least partially translucent cover.

173. The component of Claim 146 wherein the functional segment comprises a sensor; wherein the sensor is configured to detect input from the vehicle occupant at or adjacent to an exterior surface of the cover.

174. The component of Claim 146 wherein the functional segment comprises a functional layer configured for at least one of (a) positioning; (b) spacing; (c) haptic feedback; (d) tactile feedback such as vibration; (e) audible feedback such as sound; (f) optical enhancement; (g) light shielding; (h) interaction with a vehicle system; (i) cushioning; (j) tactile shear/feel performance; (k) heating; (l) cooling; (m) diffusion of illumination from the display; (n) alerting; (o) messaging; (p) light guiding; (q) flexibility.

175. The component of Claim 146 wherein the functional segment comprises a sensor; wherein the sensor is configured to detect input from the vehicle occupant at or adjacent to the exterior surface of the cover from at least one of (a) touch; (b) pressure; (c) proximity; (d) position.

176. The component of Claim 146 wherein the positioning layer comprises at least one of (a) a spacer; (b) a flexible spacer; (c) a spacer fabric; (d) a fabric material; (e) a foam material; (f) a plastic material; (g) a woven material; (h) a fiber material; (i) fabric; (j) polyurethane; (k) a spacer material.

177. The component of Claim 146 wherein the cover comprises at least one of (a) textile; (b) fabric; (c) fiber mesh; (d) leather; (e) grained surface; (f) synthetic fibers; (g) natural fibers; (h) artificial leather; (i) polyester; (j) fabric sheet; (k) upholstered material; (l) a fleece material; (m) a woven material; (n) a non-woven material; (o) a sheet material; (p) a perforated material; (q) a composite of multiple fiber materials; (r) a translucent material; (s) a resilient material; (t) a leather material configured to facilitate the transmission of light; (u) a material that is partially transparent and partially opaque; (v) a layer configured to facilitate transmission of visible light; (w) a surface material perforated to improve the visibility of light from the display; (x) film; (y) resin; (z) a composite of multiple materials; (aa) a composite of fiber material; (bb) natural material; (cc) metal; (dd) a perforated material; (ee) a translucent layer.

178. A component for an interior of a vehicle comprising:

a rim configured to be assembled on a steering wheel comprising a frame;

wherein the rim comprises a composite structure;

wherein the composite structure may comprise a set of segments to be assembled on the frame;

wherein the composite structure comprises a cover and a carrier;

wherein a segment of the set of segments comprises at least one of a decorative segment and/or a functional segment.

179. The component of Claim 178 wherein the composite structure comprises a positioning layer.

180. The component of Claim 178 wherein the segment comprises a manufactured segment and/or a replaceable segment and/or an exchangeable segment and/or a selectable element and/or a spare part segment.

181. The component of Claim 178 wherein a segment is configured to provide a cavity between the frame and the segment.

182. The component of Claim 181 wherein the cavity is configured to accommodate cables, wires, LEDs or electronic components.

183. The component of Claim 178 wherein the segment of the composite structure comprises at least one of exchangeable elements and/or replaceable elements and/or selectable elements.

184. The component of Claim 178 wherein the segment comprises a segment shell section configured to be attached by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding.

185. The component of Claim 184 wherein the segment shell section is configured to be attached to an adjacent segment shell section by (a) by mechanical fastening and/or (b) by glue and/or (c) by ultrasonic welding.

186. The component of Claim 178 formed by a method of manufacturing comprising the steps of: forming a base and a rim; providing a frame; providing a composite structure; wherein the composite structure is configured to provide a segmented cover; such that the steering wheel assembly comprises connecting the segmented covers and the frame; wherein the connection comprises at least one of clipping, latching, bonding, or welding.

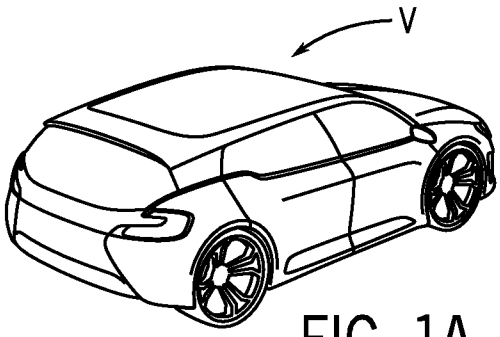


FIG. 1A

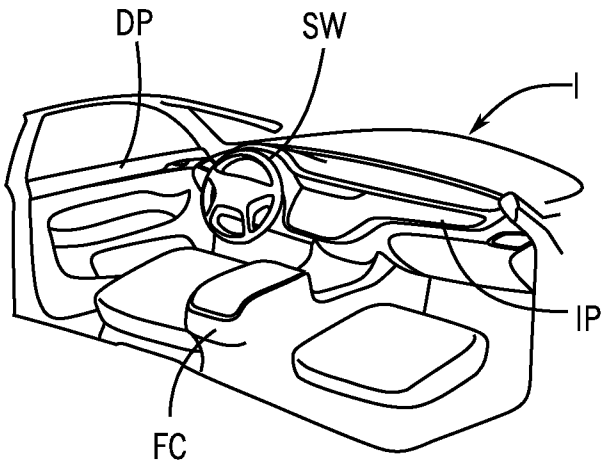


FIG. 1B

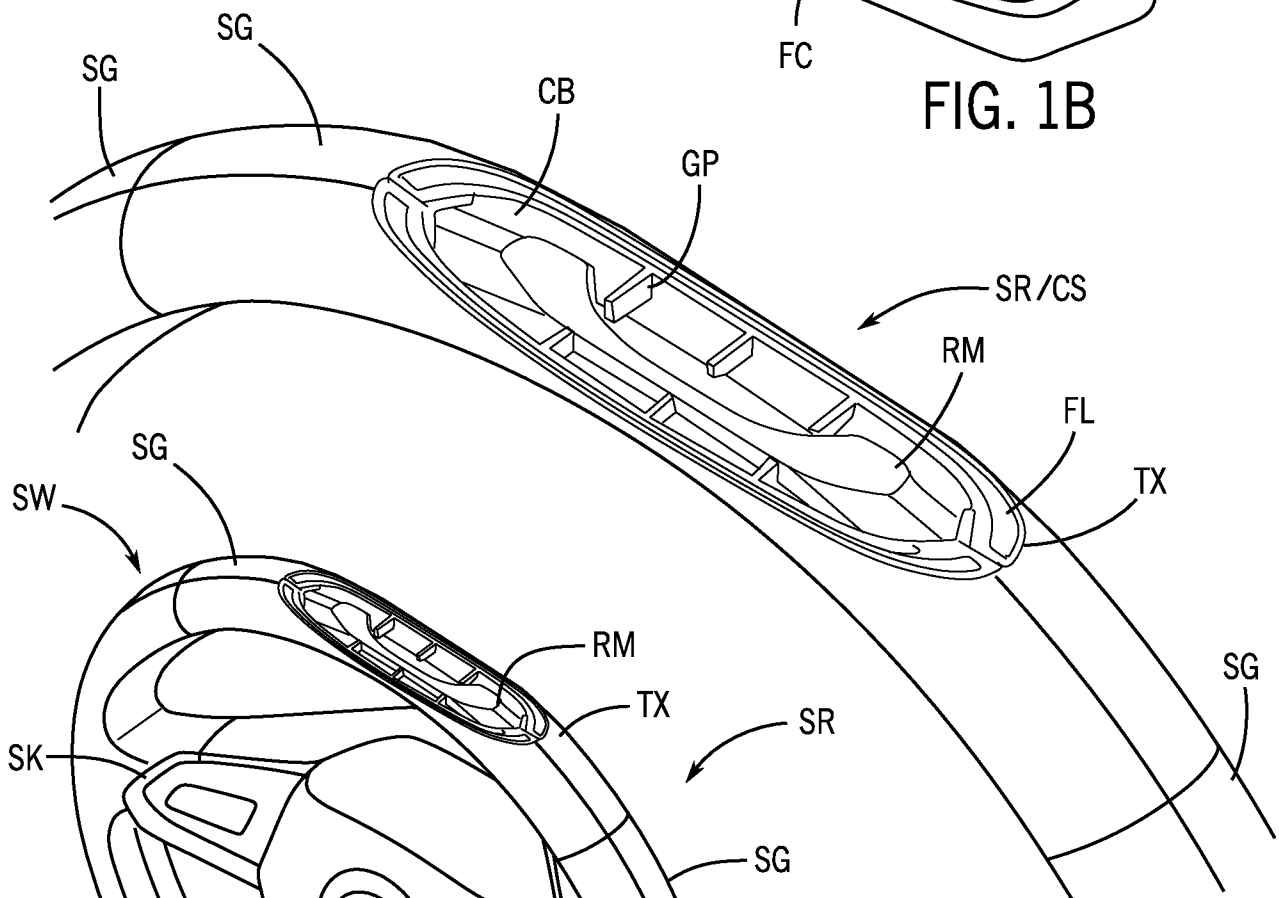


FIG. 2B

FIG. 2A

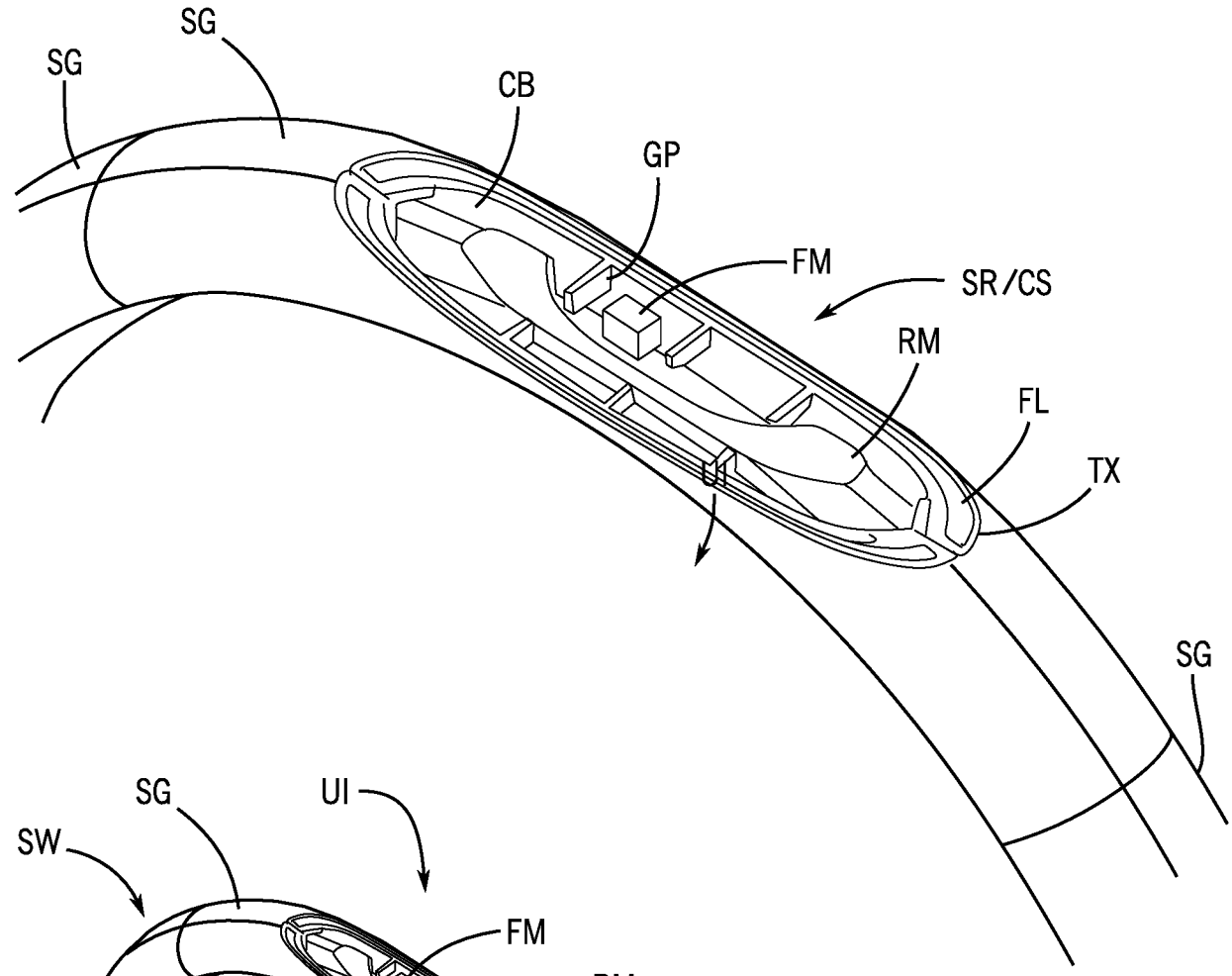

SG
SG
CB
GP
FM
SR/CS
RM
FL
TX
UI
SG

FIG. 2D

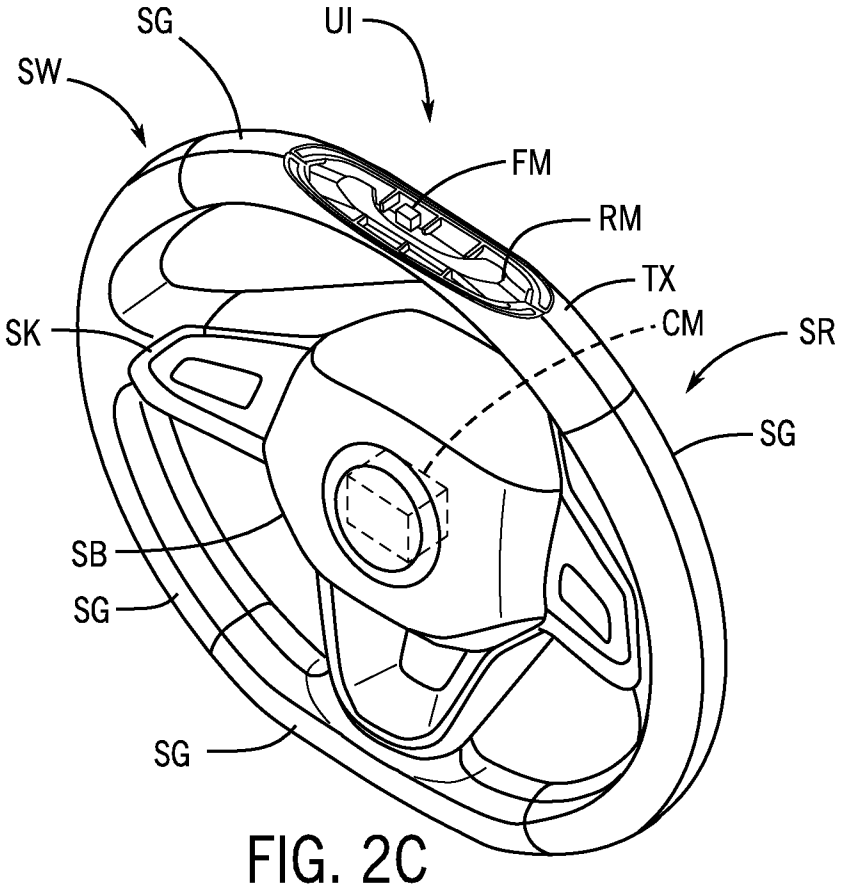

SG
UI
SW
FM
RM
TX
SK
CM
SR
SG
SB
SG
SG

FIG. 2C

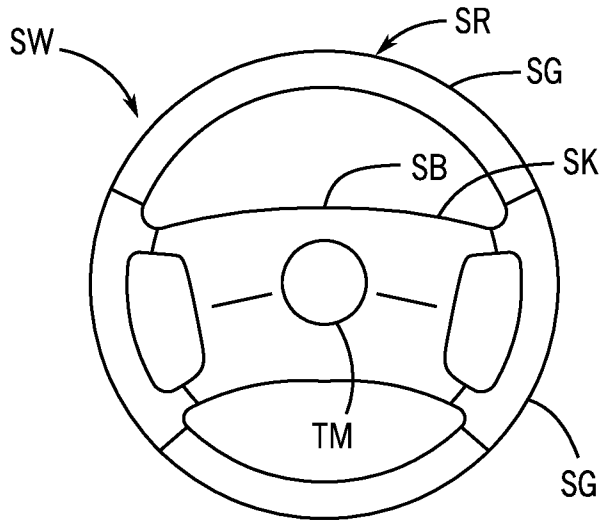


FIG. 3A

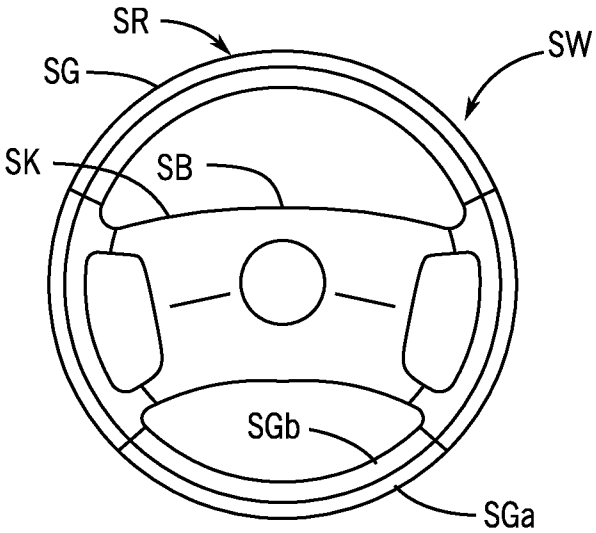


FIG. 3B

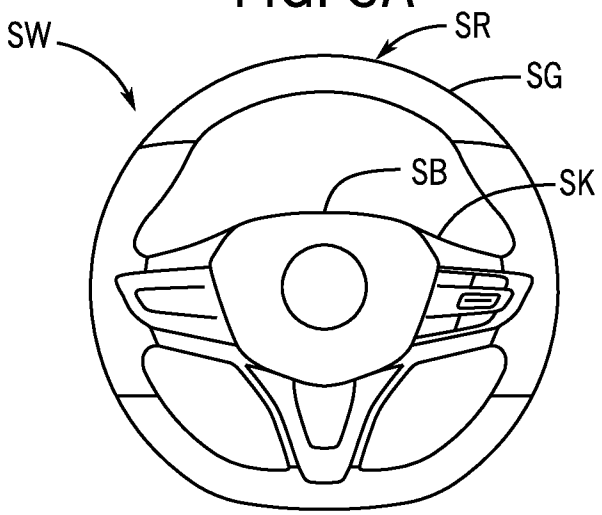


FIG. 3C

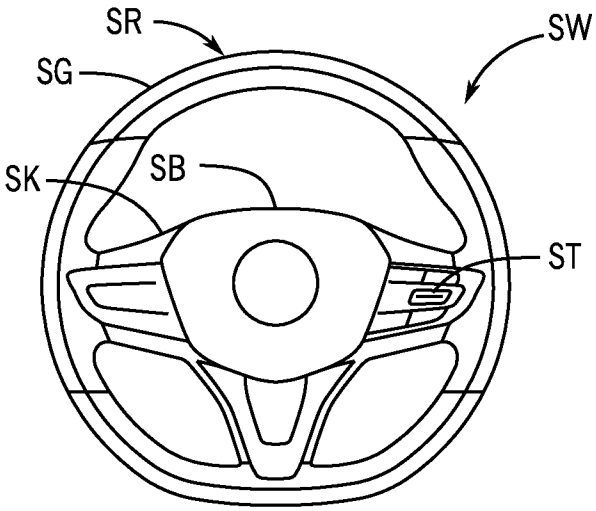


FIG. 3D

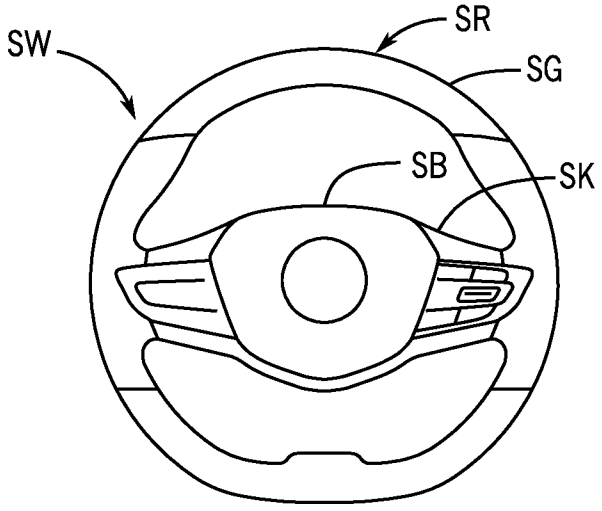


FIG. 3E

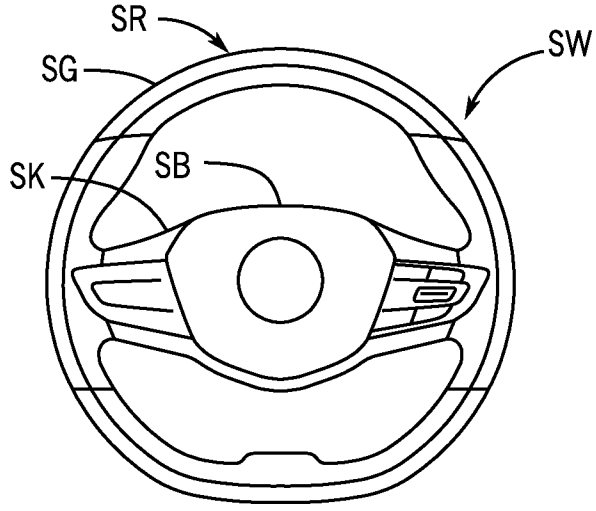


FIG. 3F

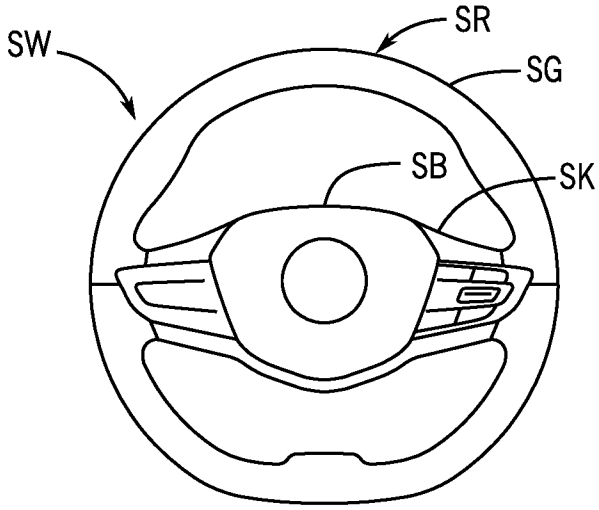


FIG. 3G

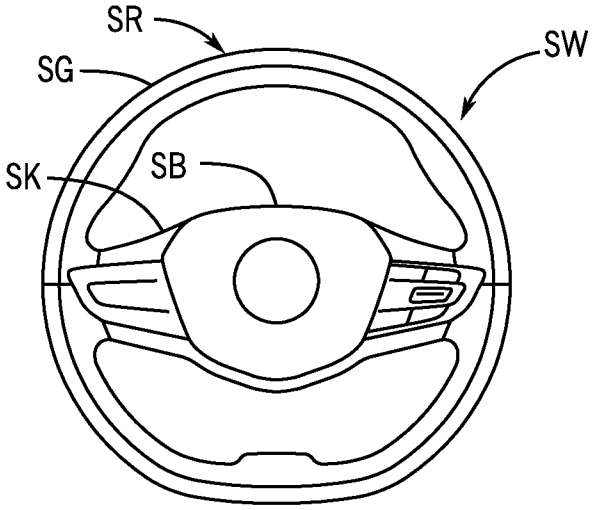


FIG. 3H

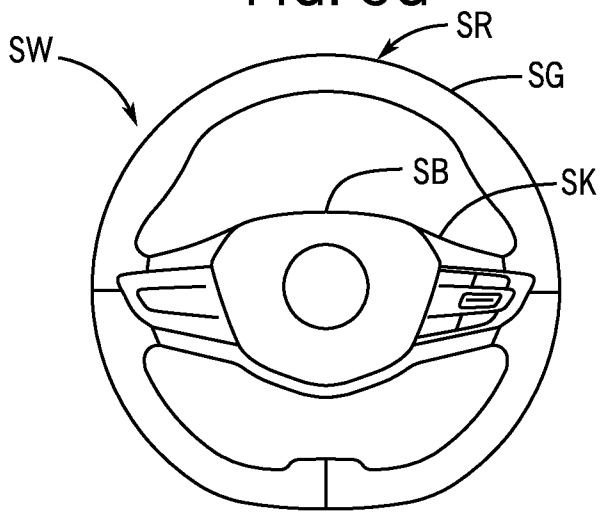


FIG. 3I

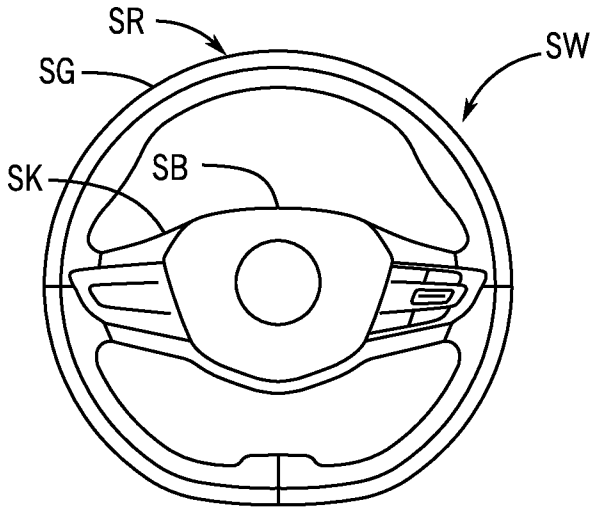


FIG. 3J

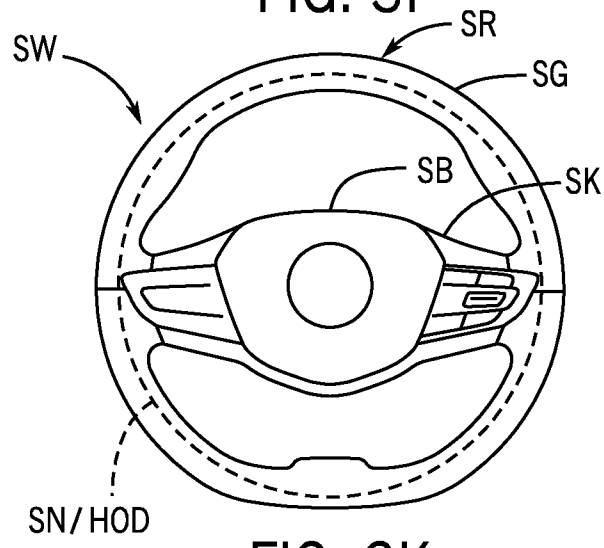


FIG. 3K

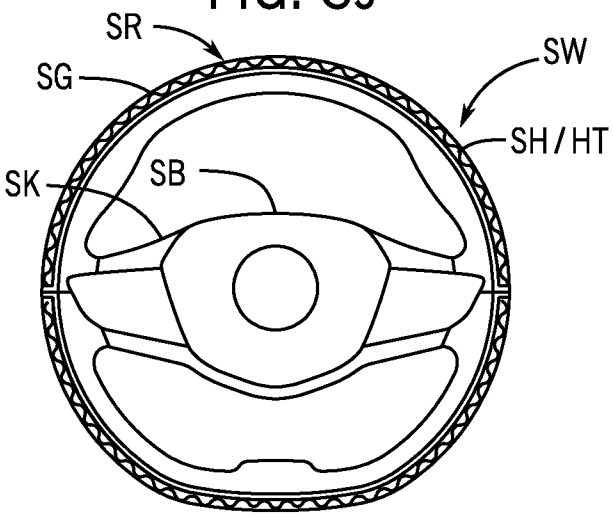


FIG. 3L

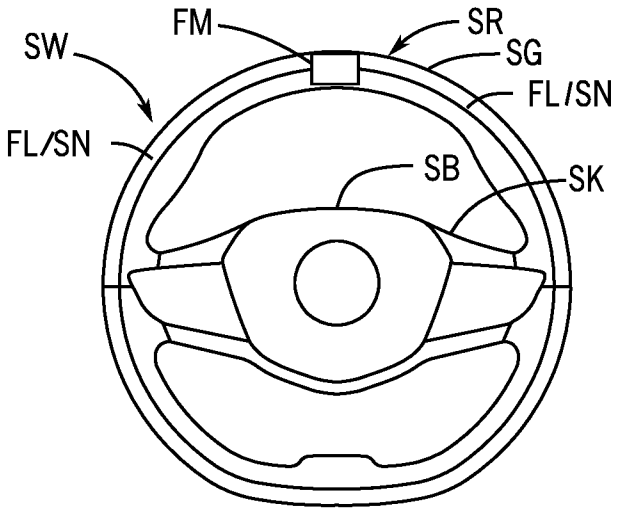


FIG. 4A

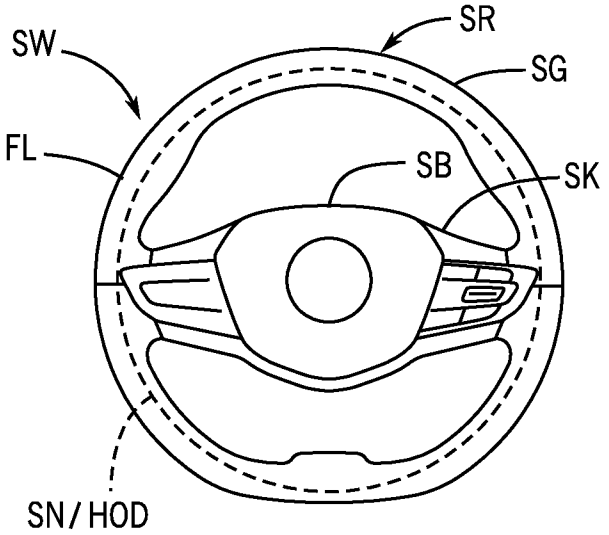


FIG. 4B

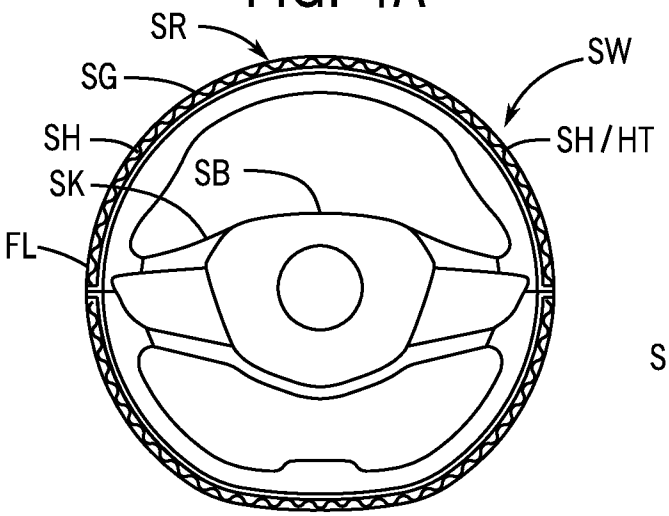


FIG. 4C

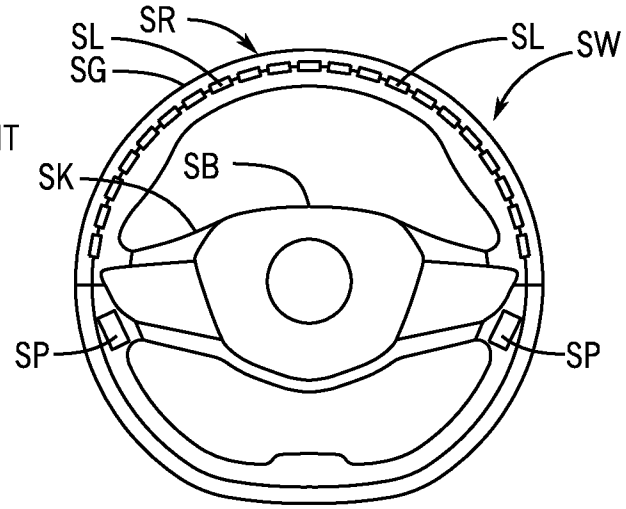


FIG. 4D

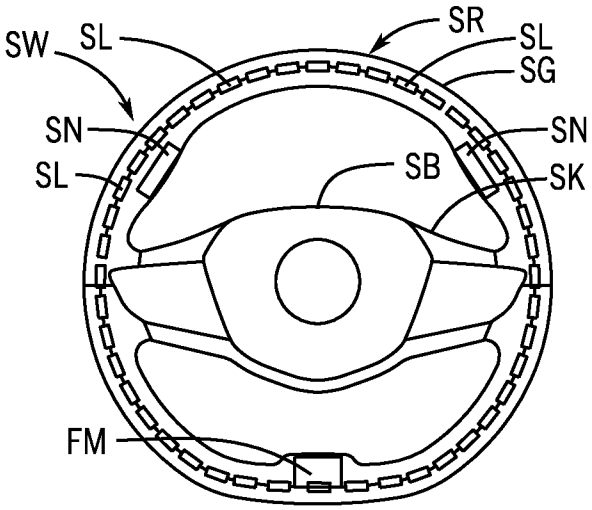


FIG. 4E

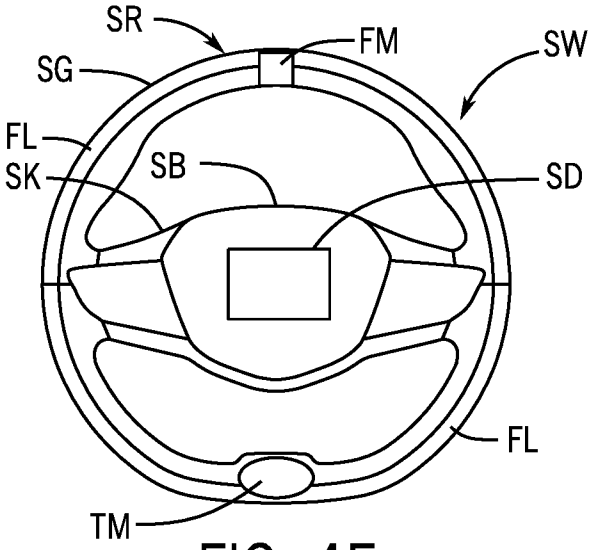


FIG. 4F

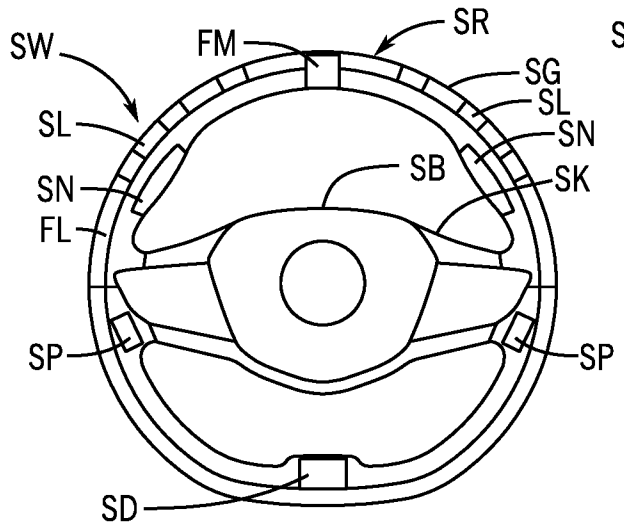


FIG. 4G

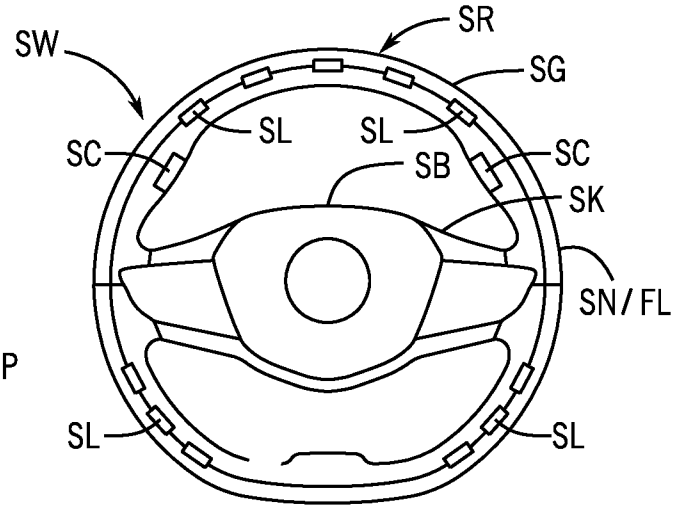


FIG. 4H

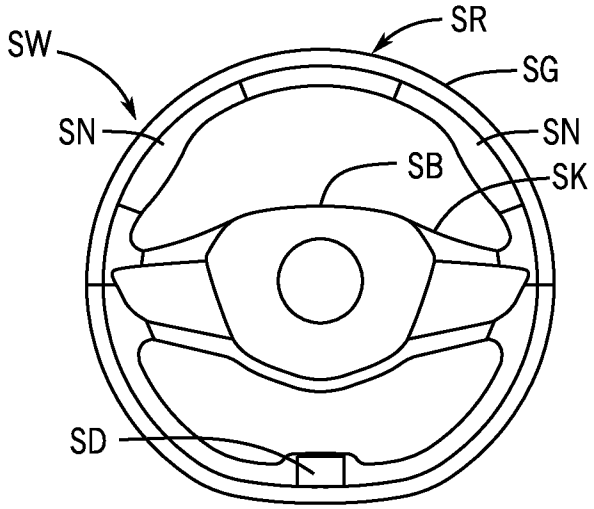


FIG. 4I

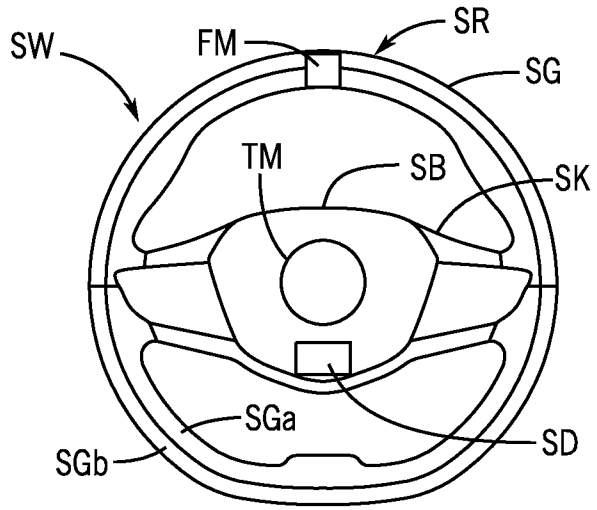


FIG. 5A

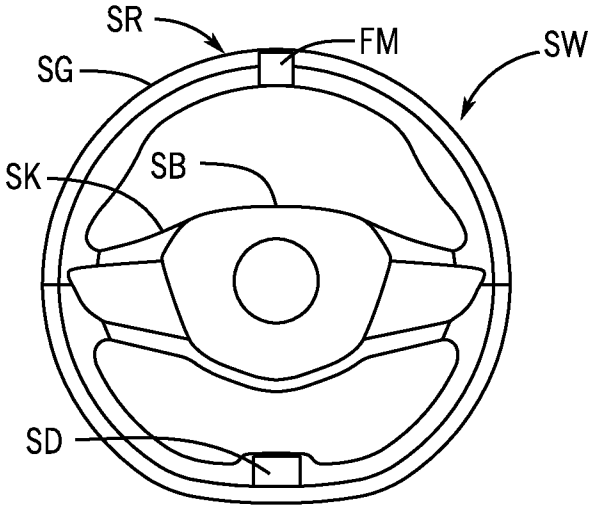


FIG. 5B

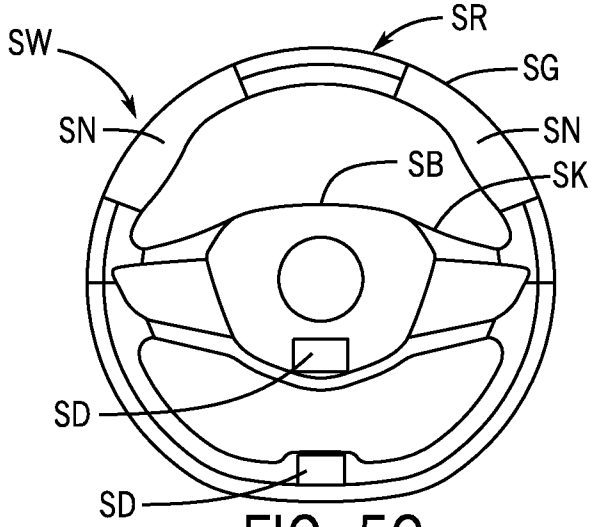


FIG. 5C

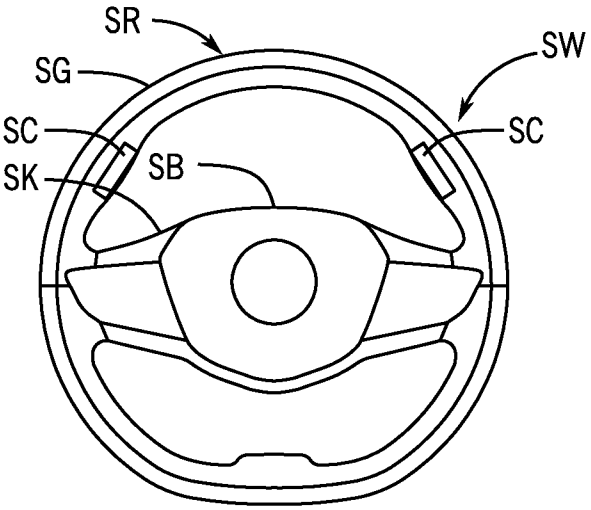


FIG. 5D

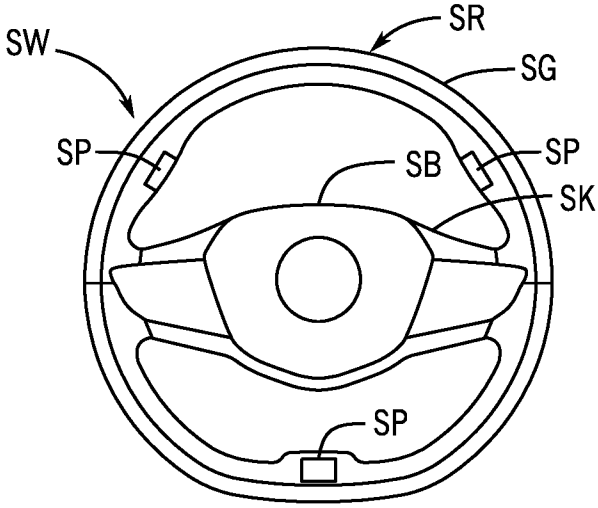


FIG. 5E

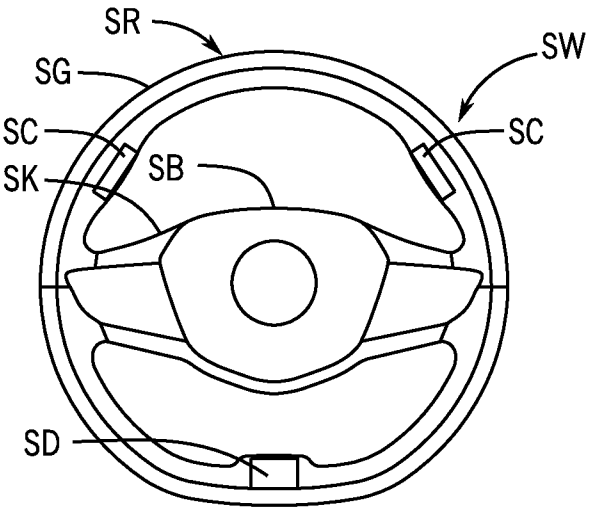


FIG. 5F

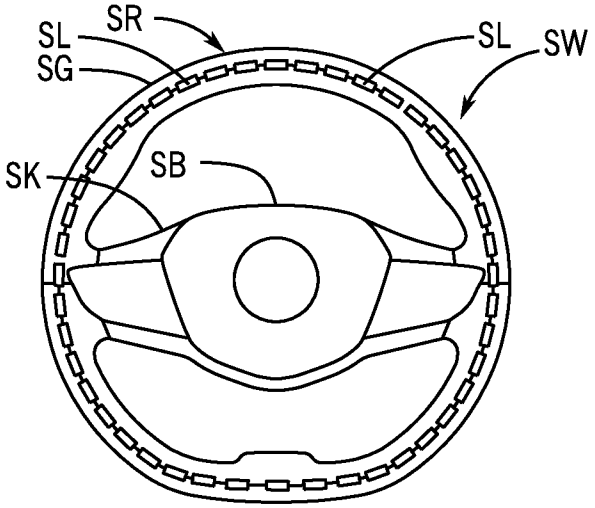


FIG. 5G

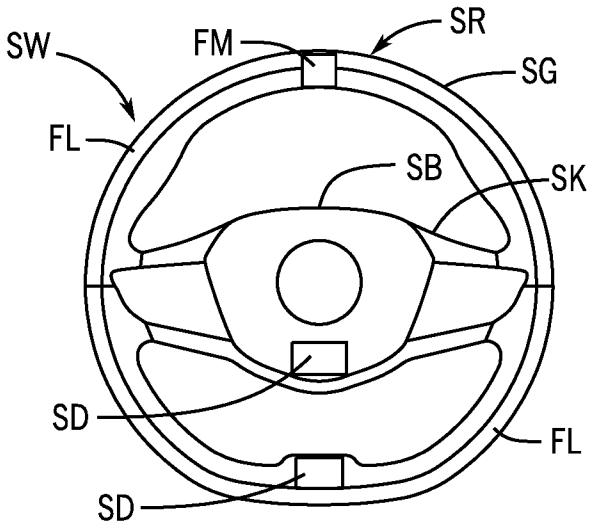


FIG. 5H

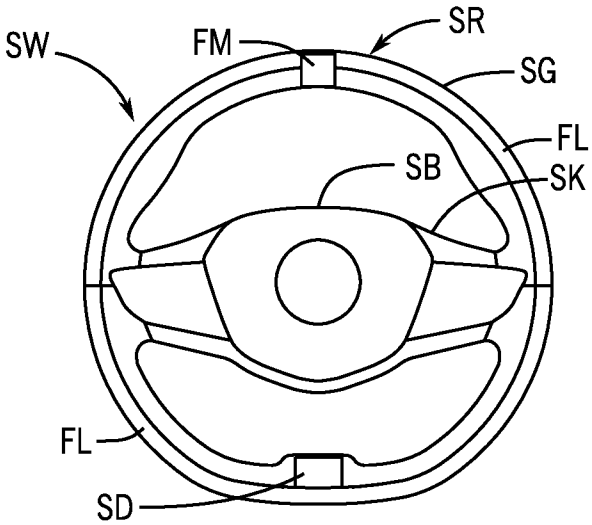


FIG. 5I

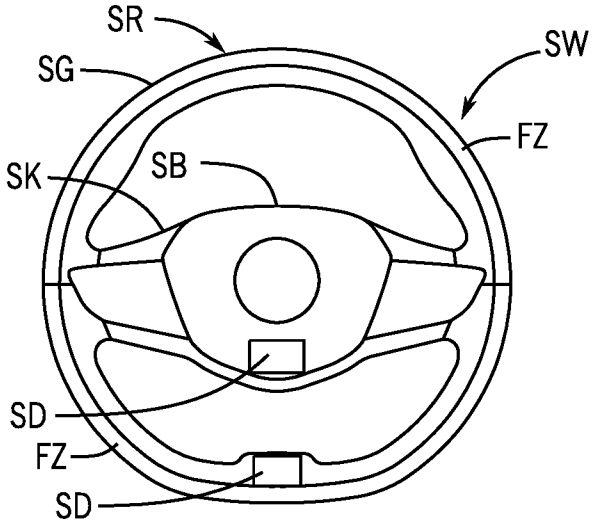


FIG. 5J

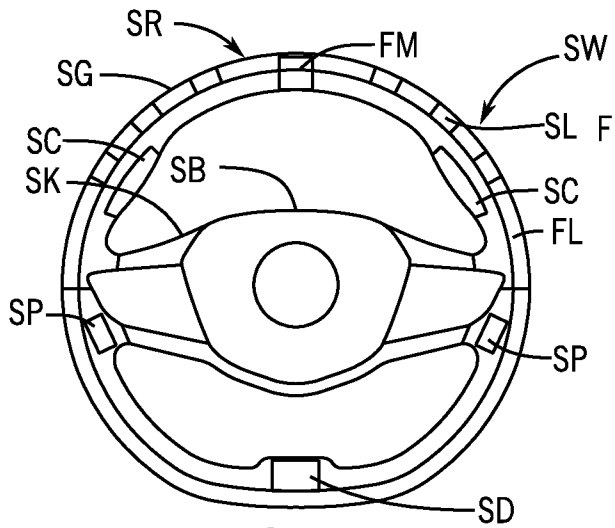


FIG. 5K

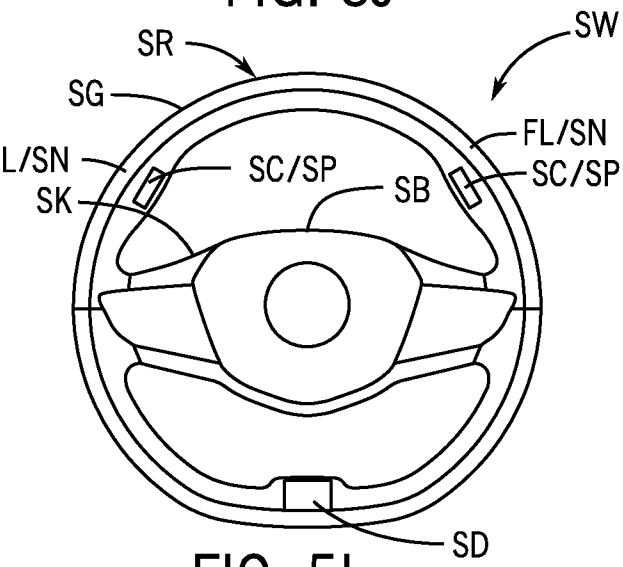


FIG. 5L

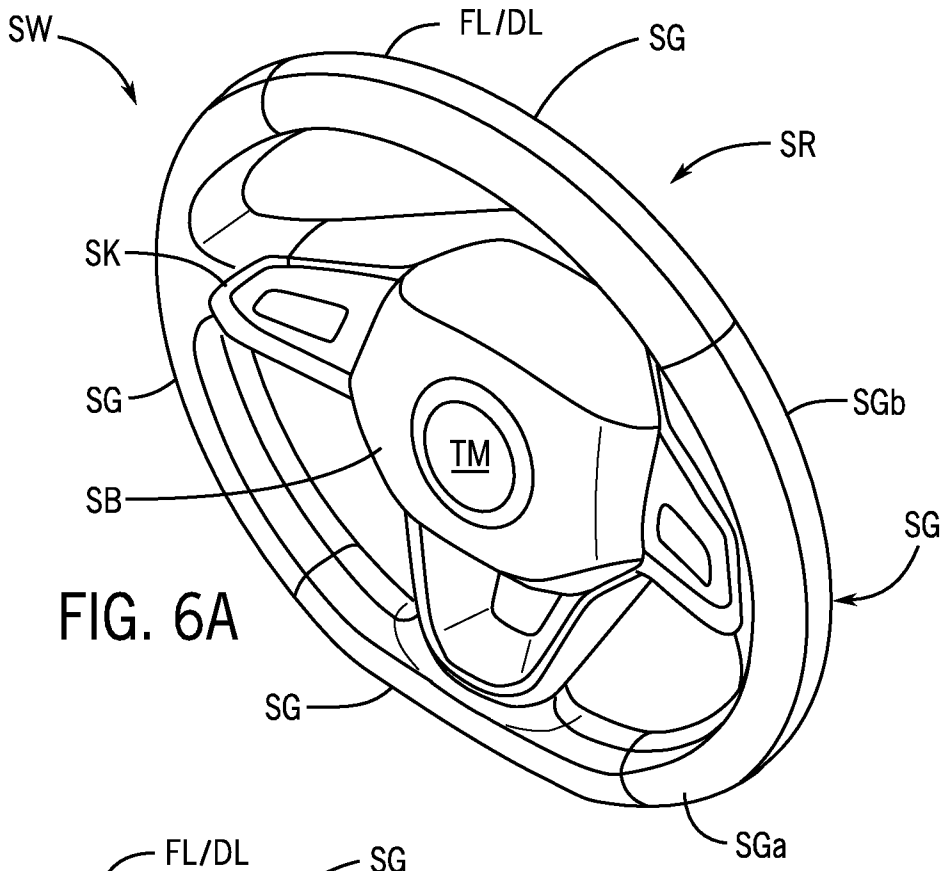

SW
FL/DL
SG
SR
SK
SG
SB
TM
SGb
SG
SG
SGa

FIG. 6A

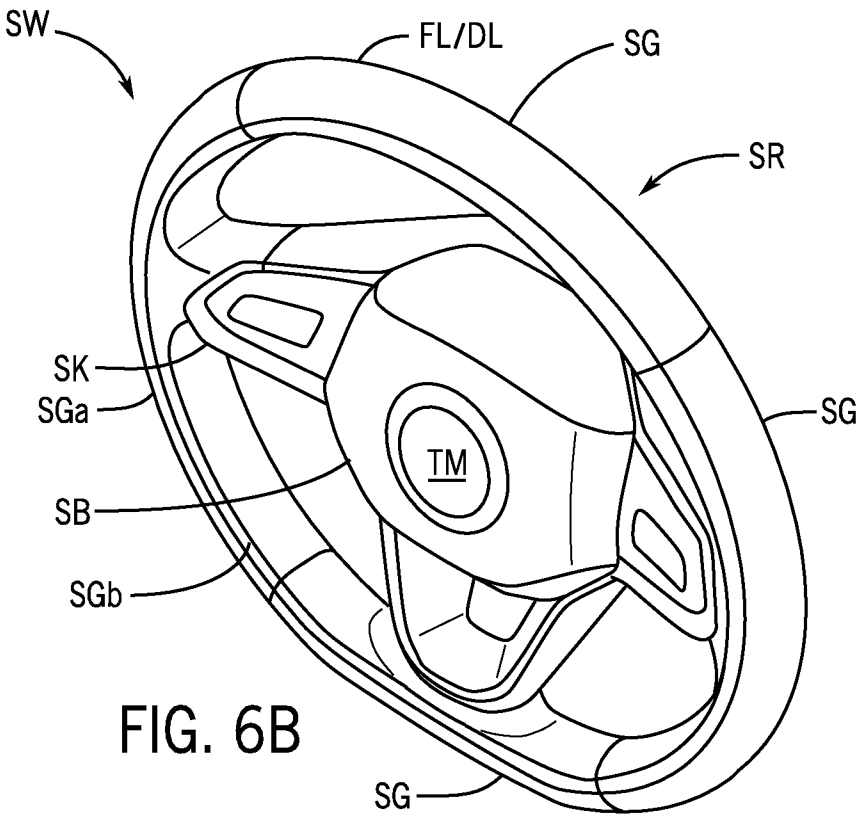

SW
FL/DL
SG
SR
SK
SGa
SB
SGb
TM
SG
SG

FIG. 6B

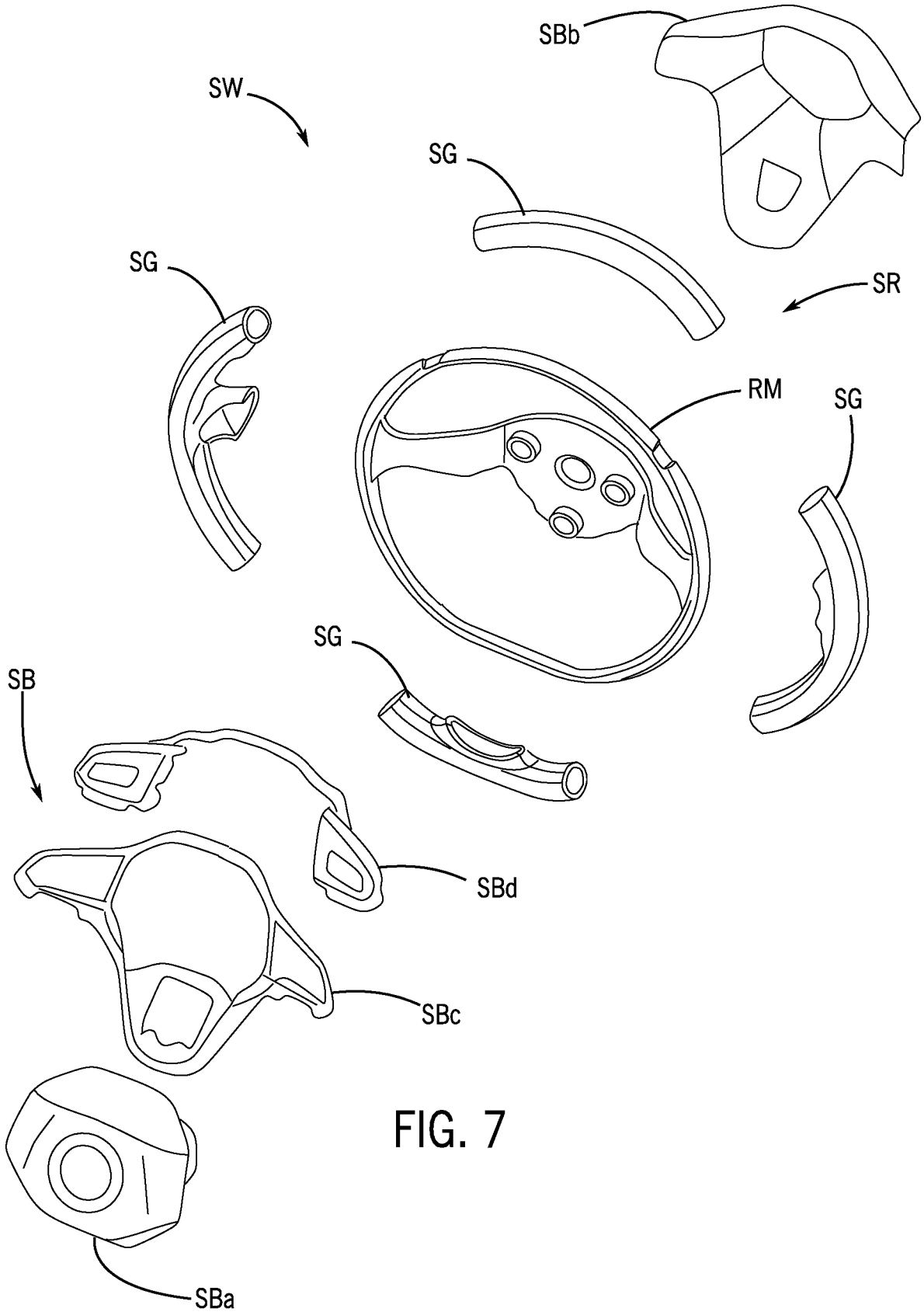


FIG. 7

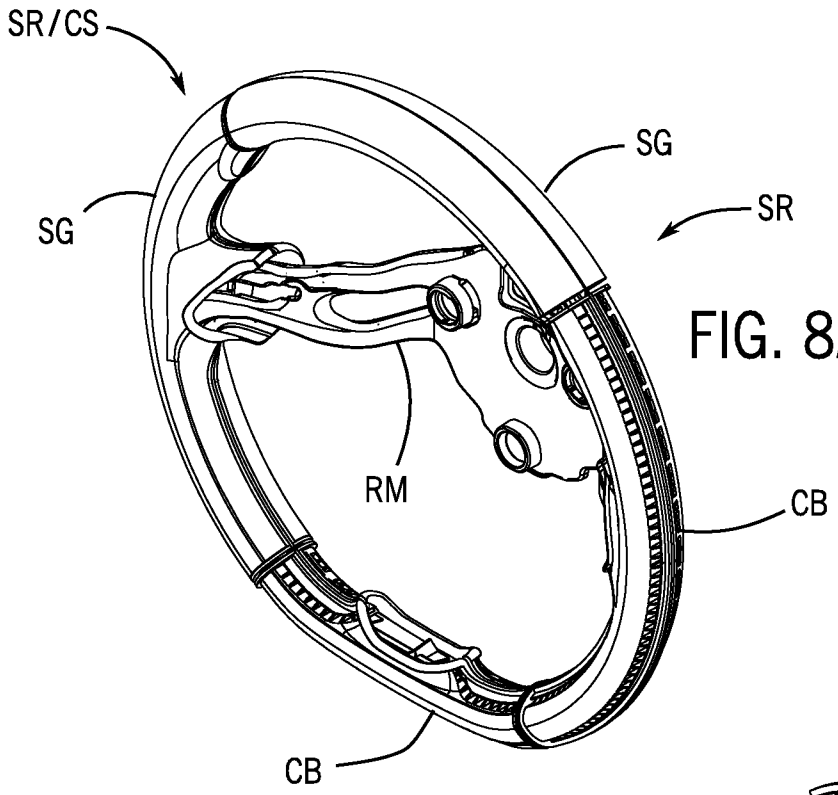


FIG. 8A

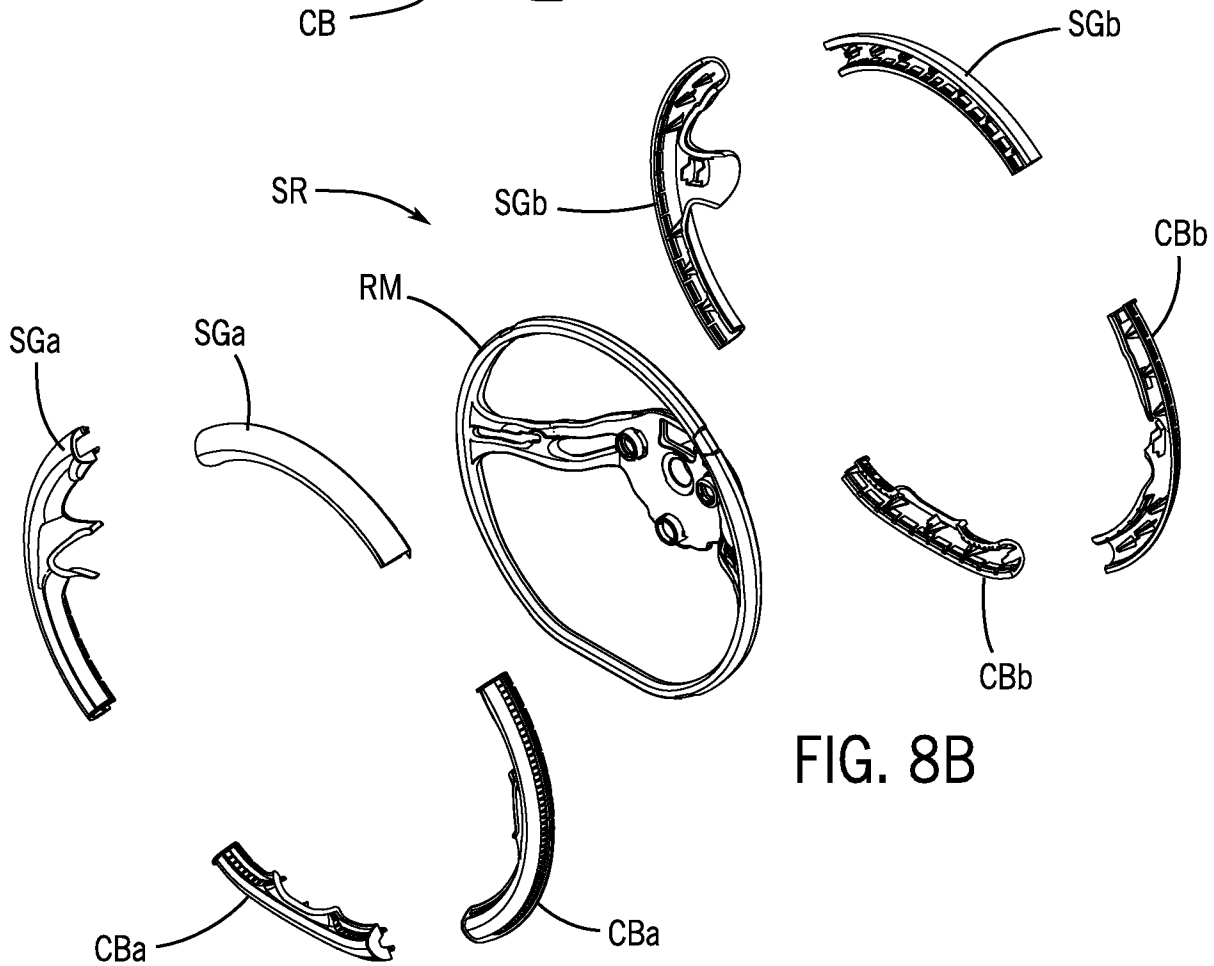


FIG. 8B

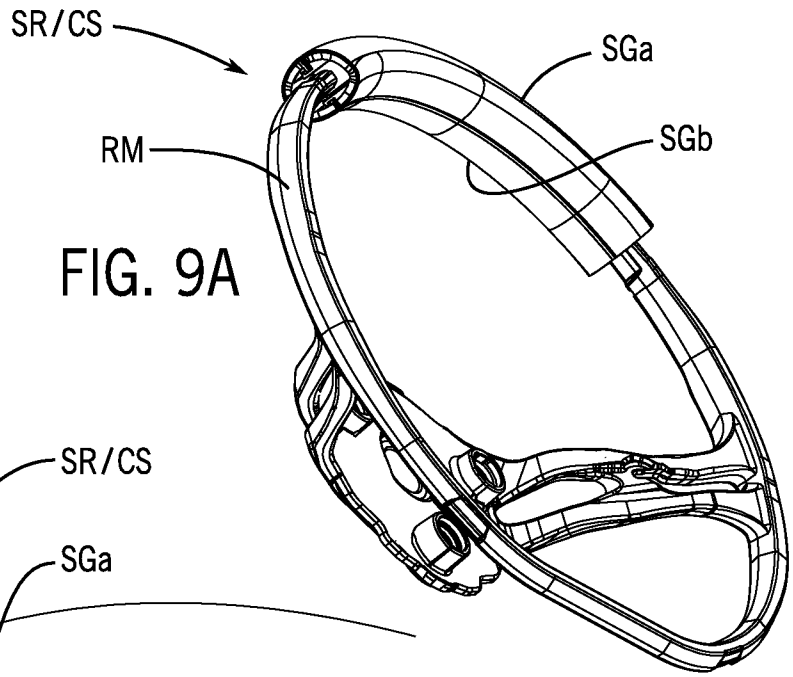


FIG. 9A

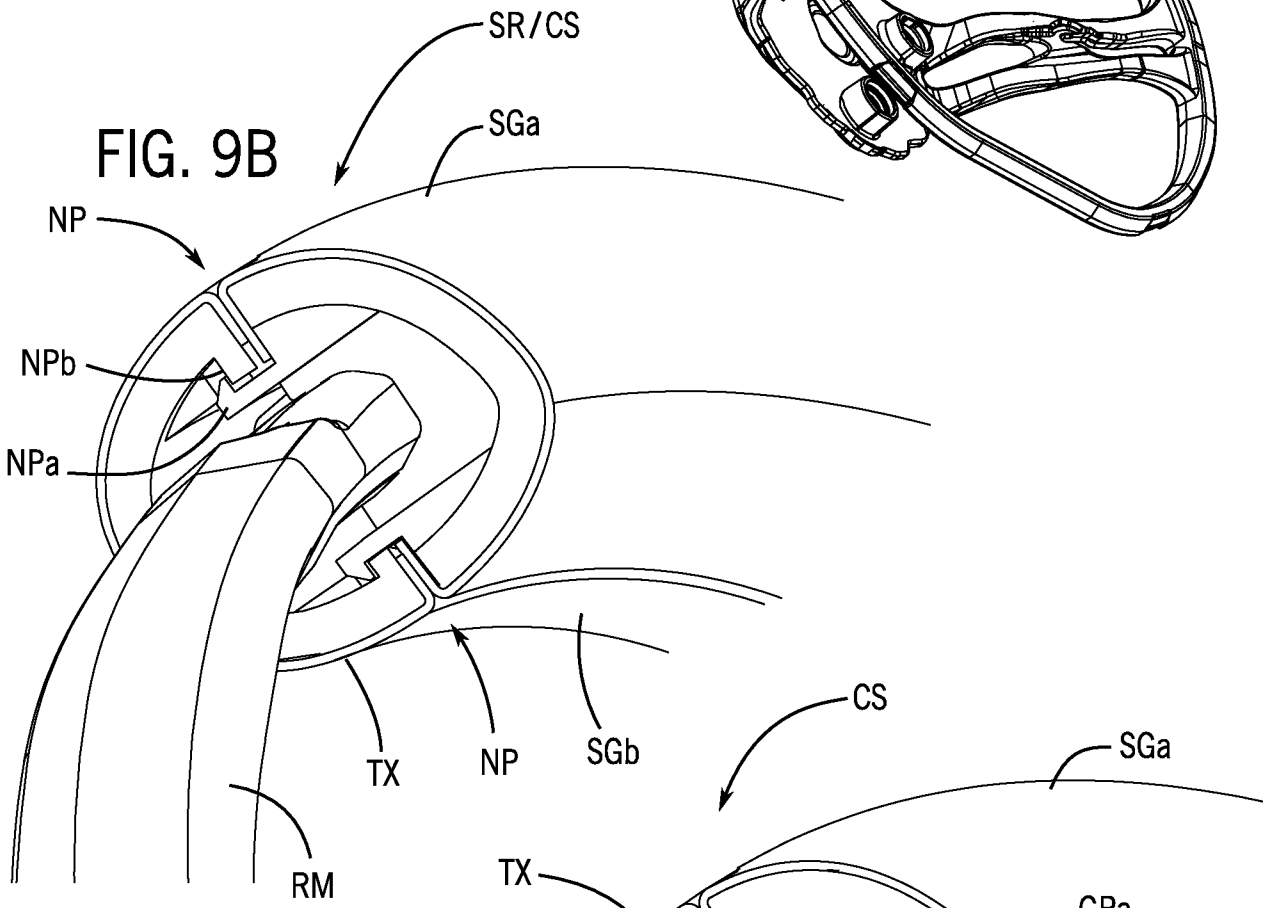


FIG. 9B

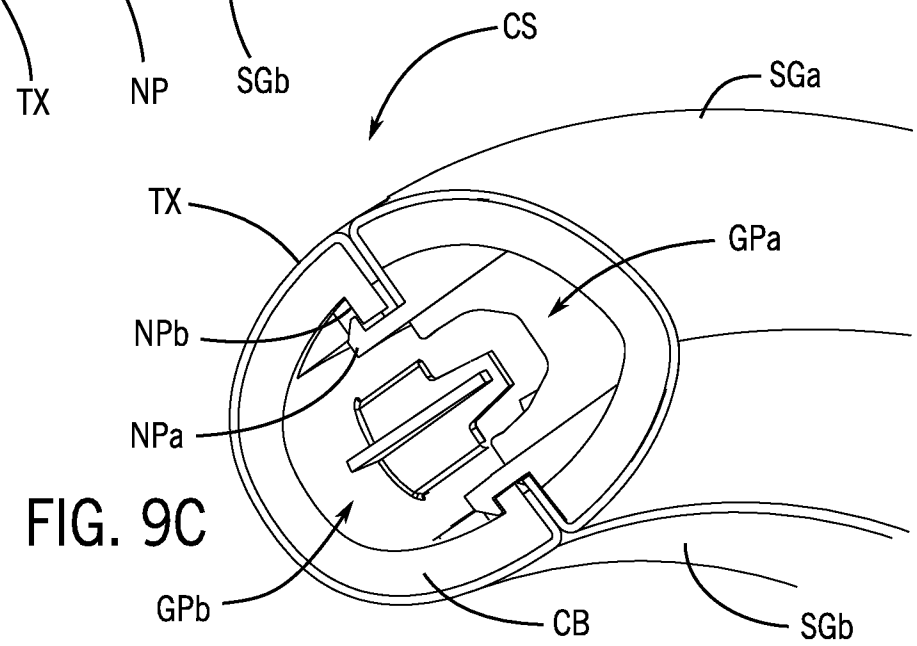


FIG. 9C

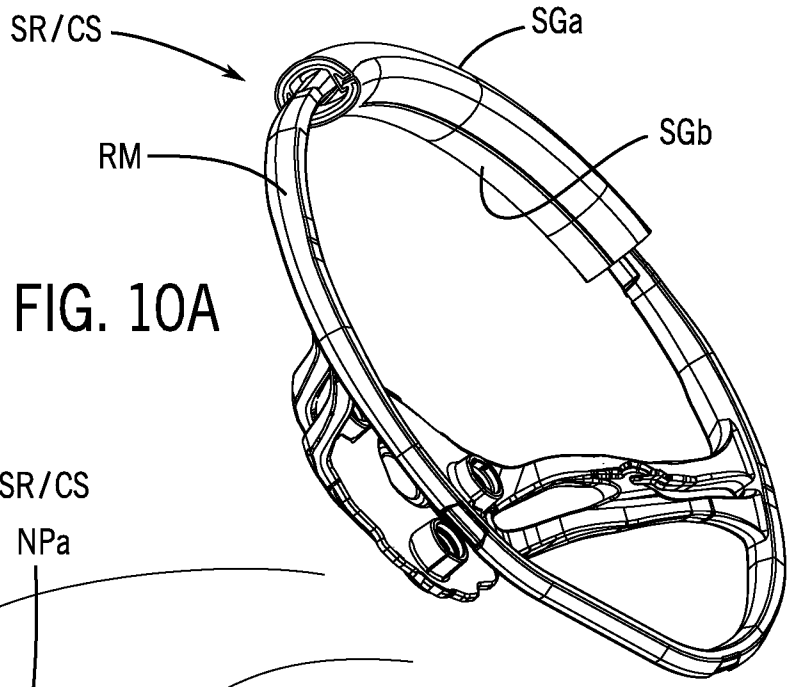


FIG. 10A

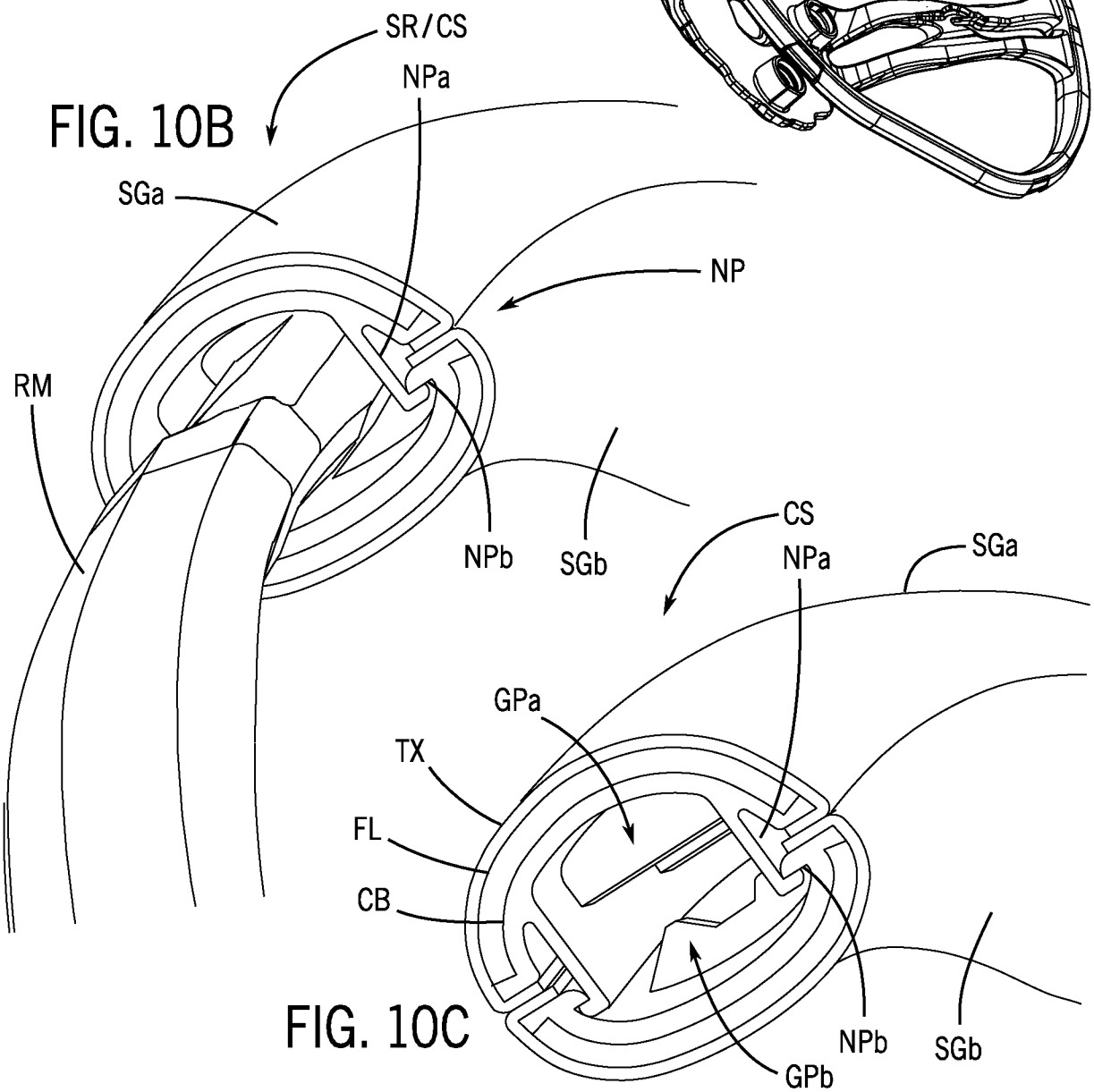


FIG. 10B

FIG. 10C

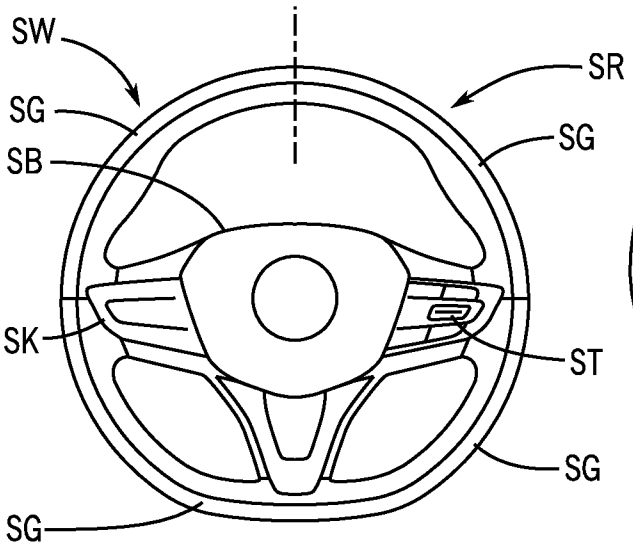


FIG. 11A

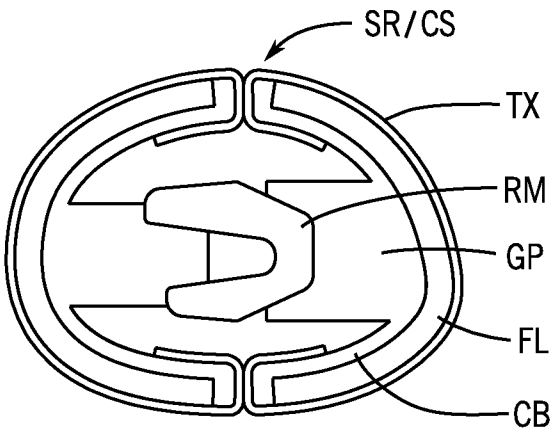


FIG. 11B

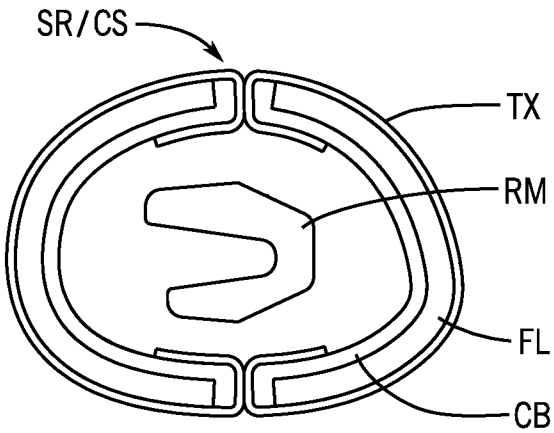


FIG. 11C

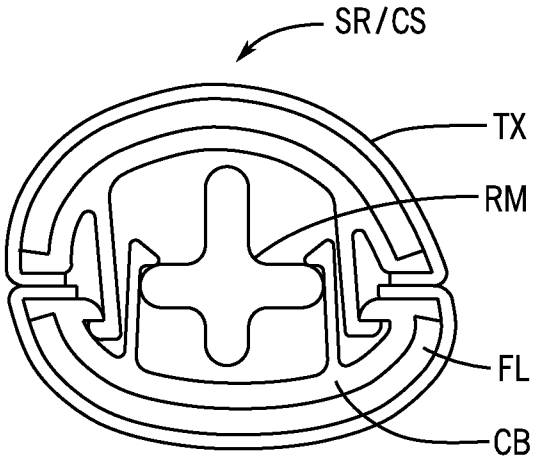


FIG. 11D

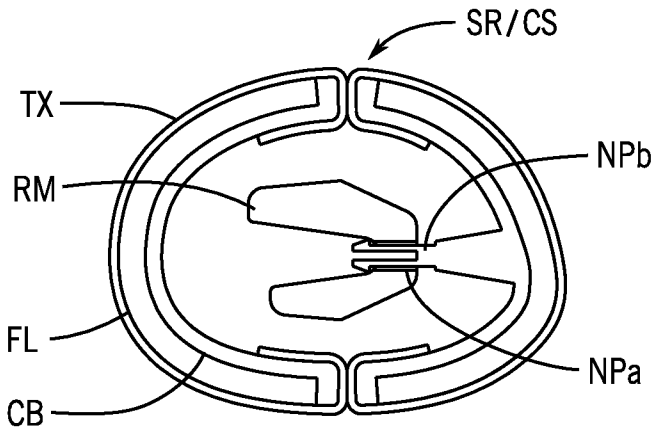


FIG. 12A

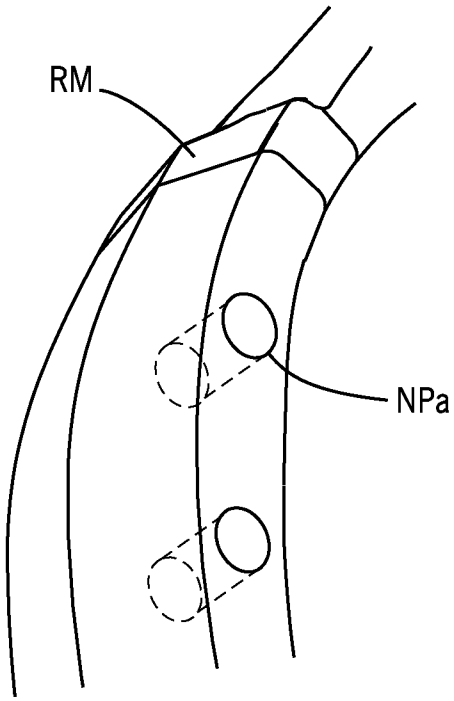


FIG. 12B

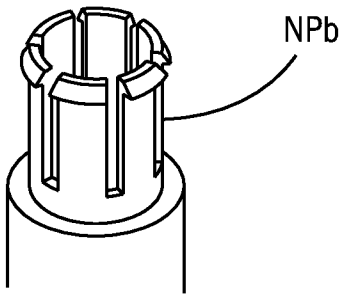


FIG. 12C

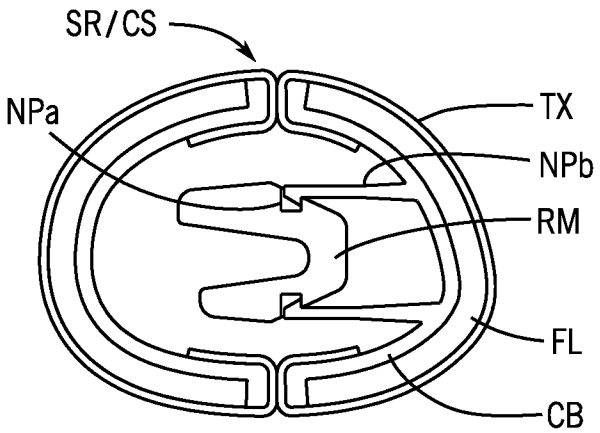


FIG. 12D

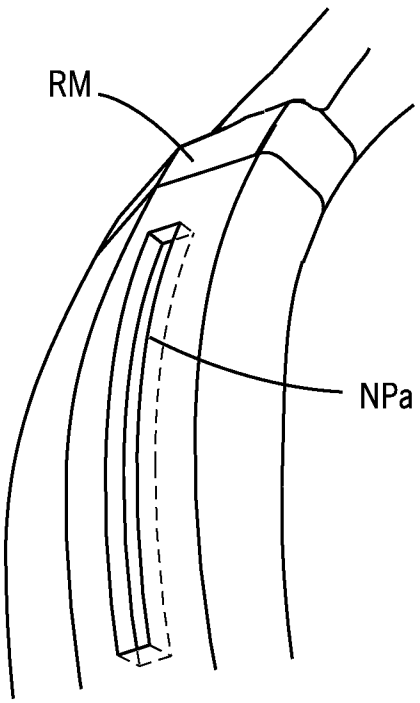


FIG. 12E

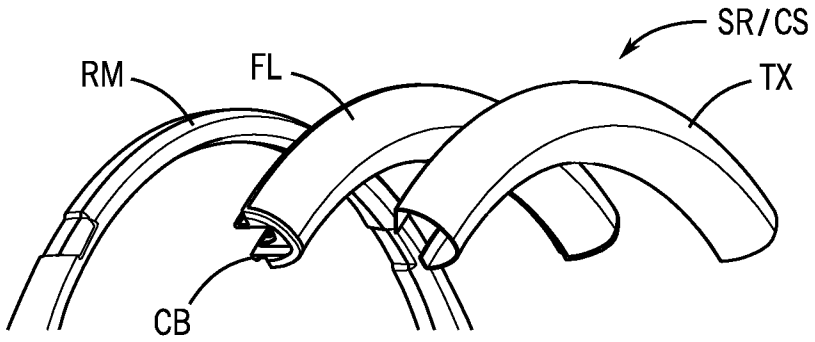


FIG. 13A

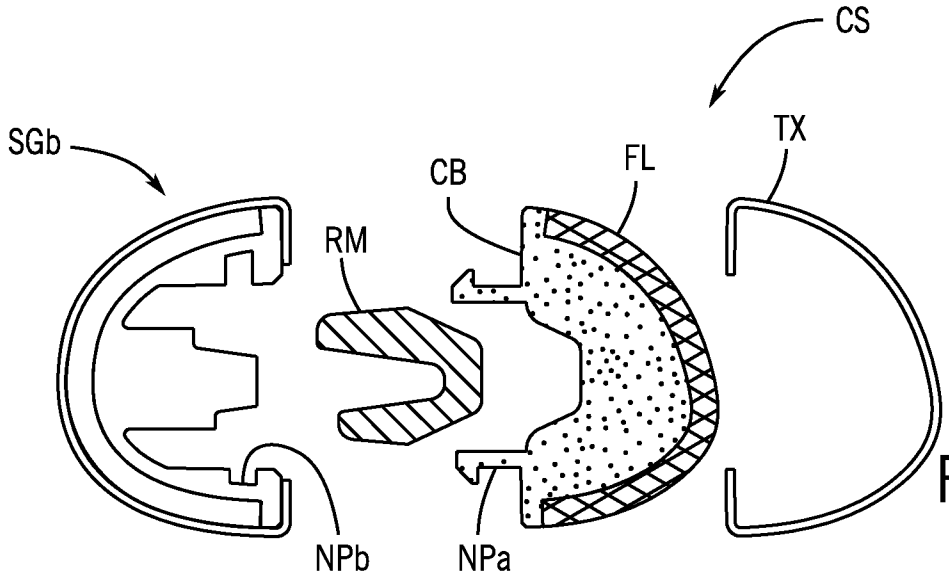


FIG. 13B

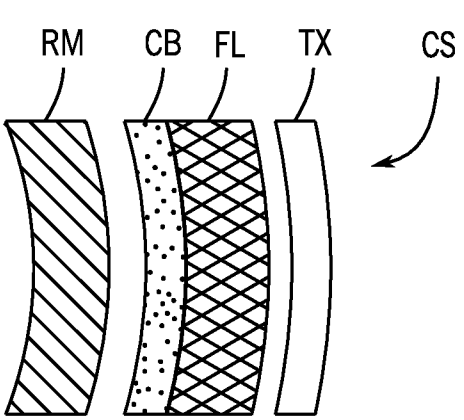


FIG. 13C

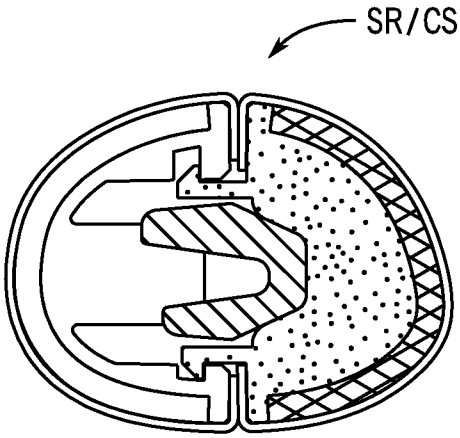


FIG. 13D

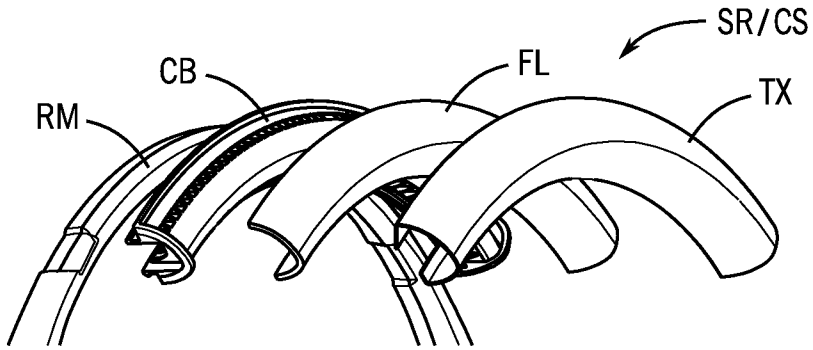


FIG. 14A

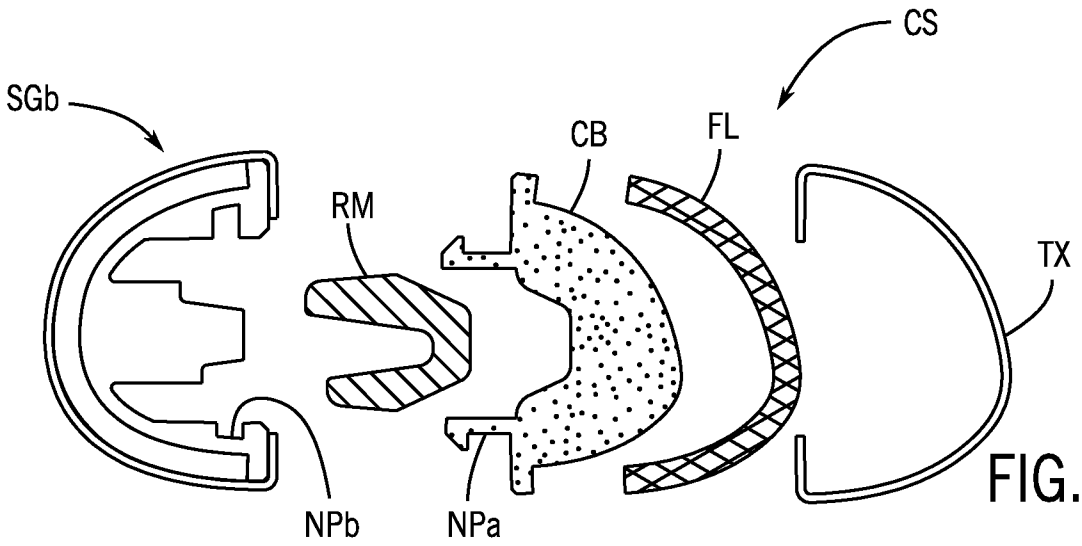


FIG. 14B

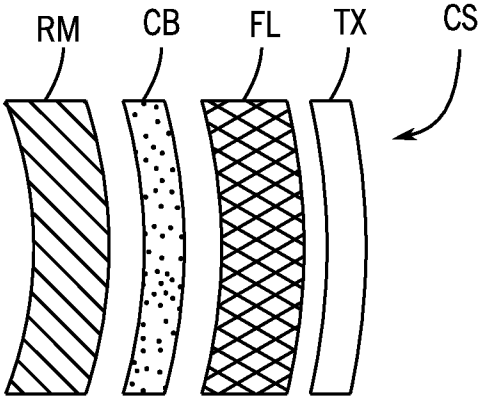


FIG. 14C

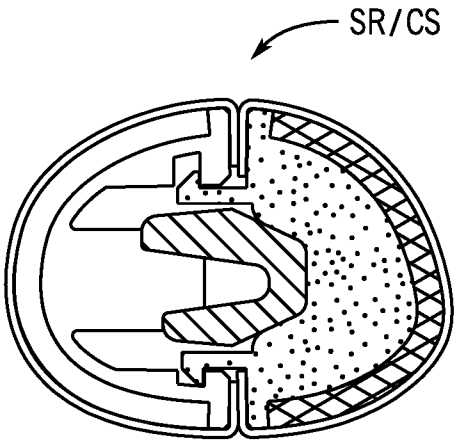


FIG. 14D

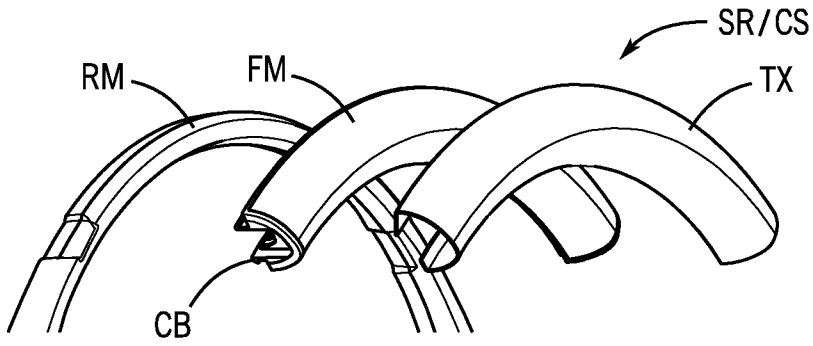


FIG. 15A

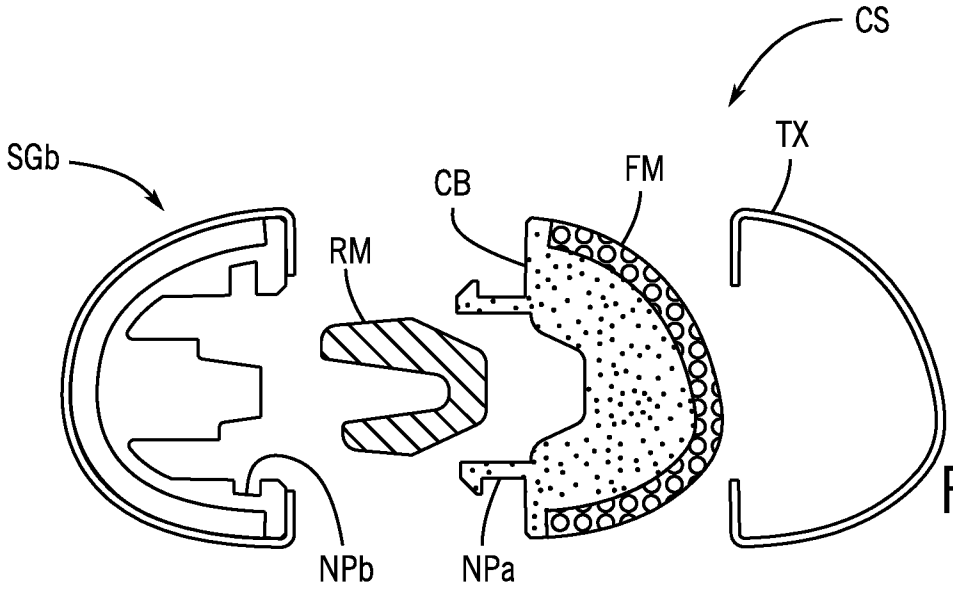


FIG. 15B

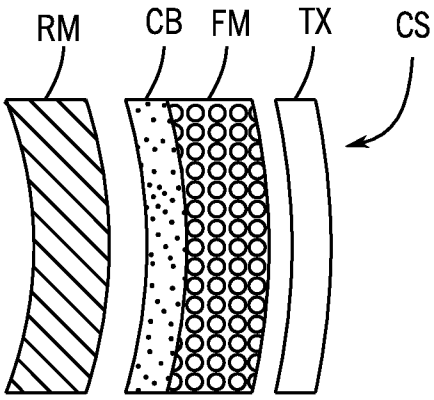


FIG. 15C

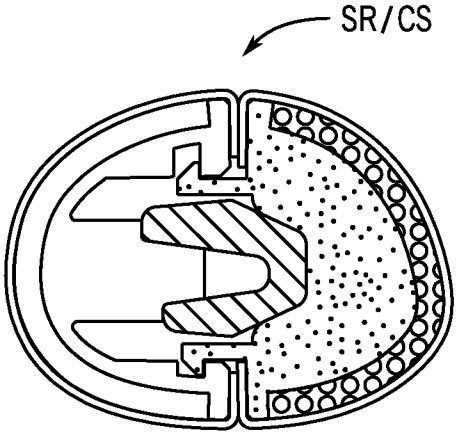


FIG. 15D

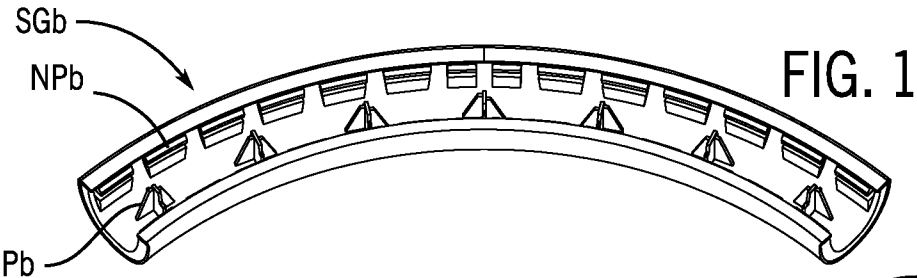


FIG. 16A

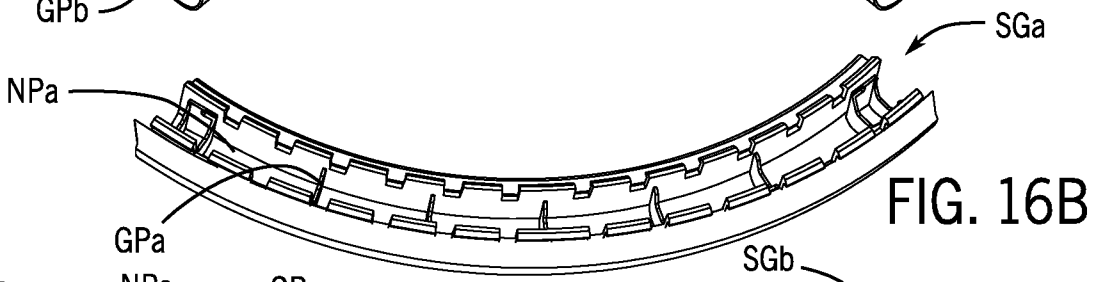


FIG. 16B

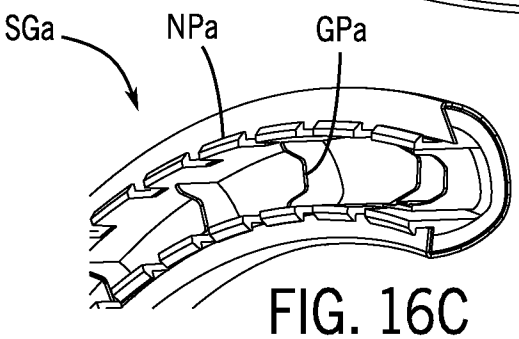


FIG. 16C

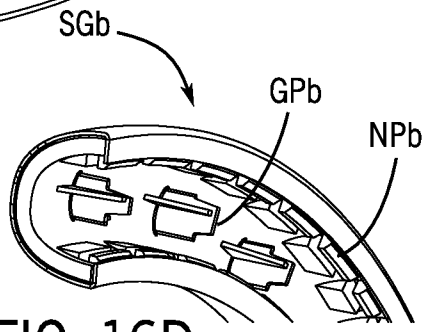


FIG. 16D

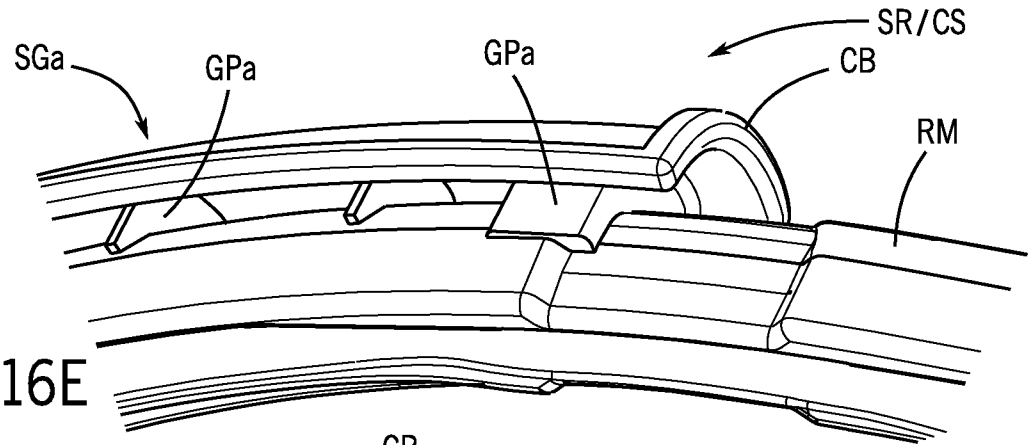


FIG. 16E

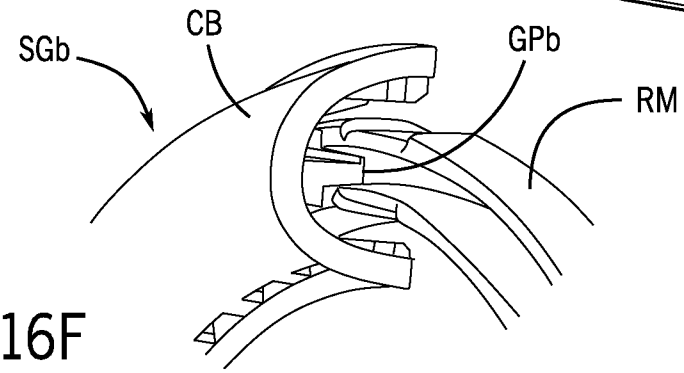


FIG. 16F

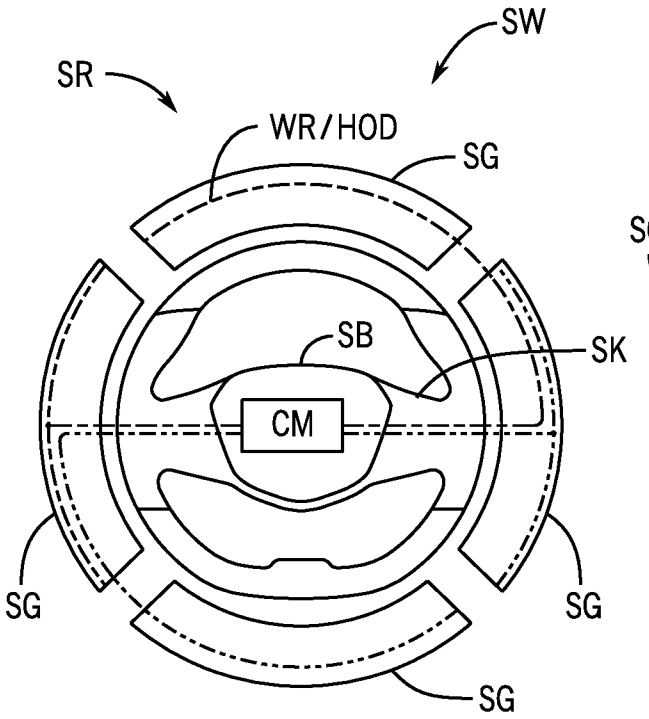


FIG. 17A

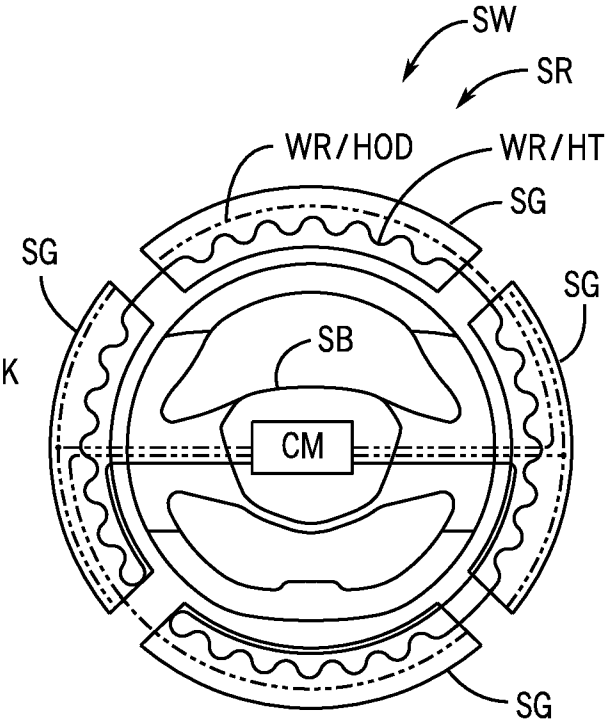


FIG. 17B

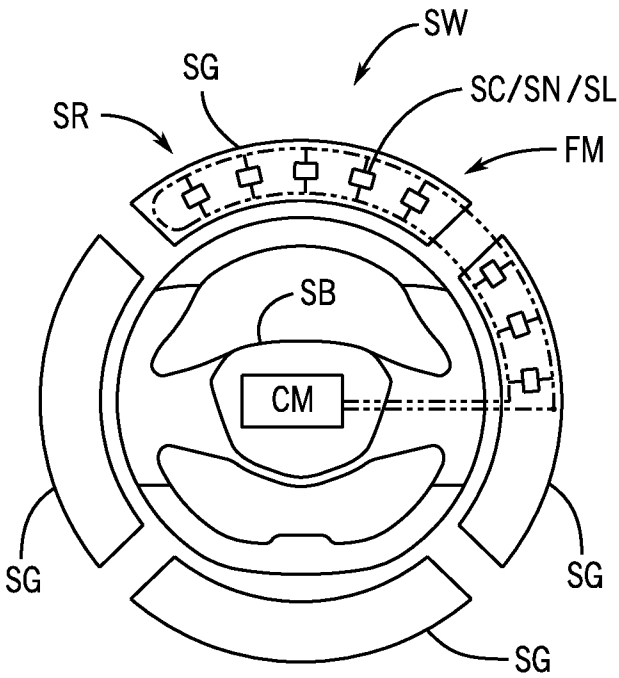


FIG. 18A

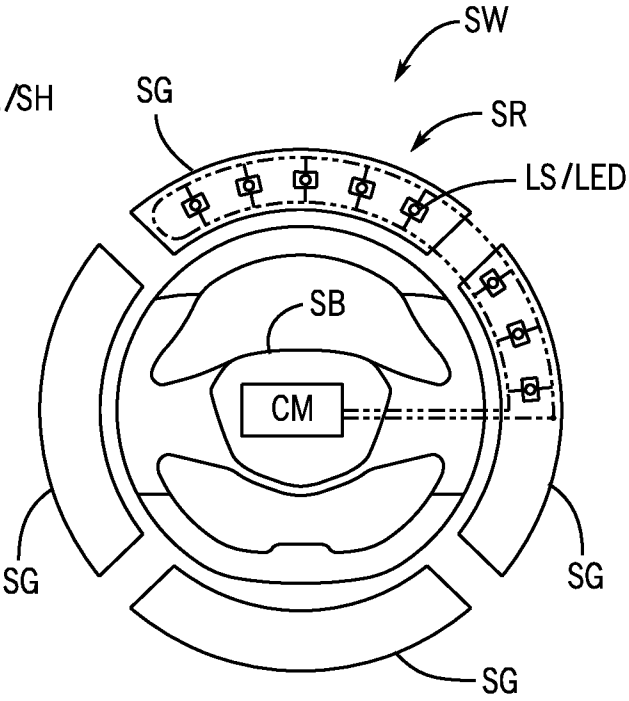


FIG. 18B

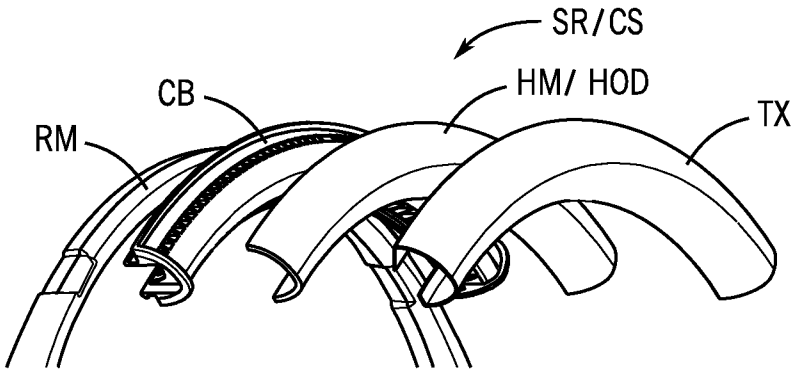


FIG. 19A

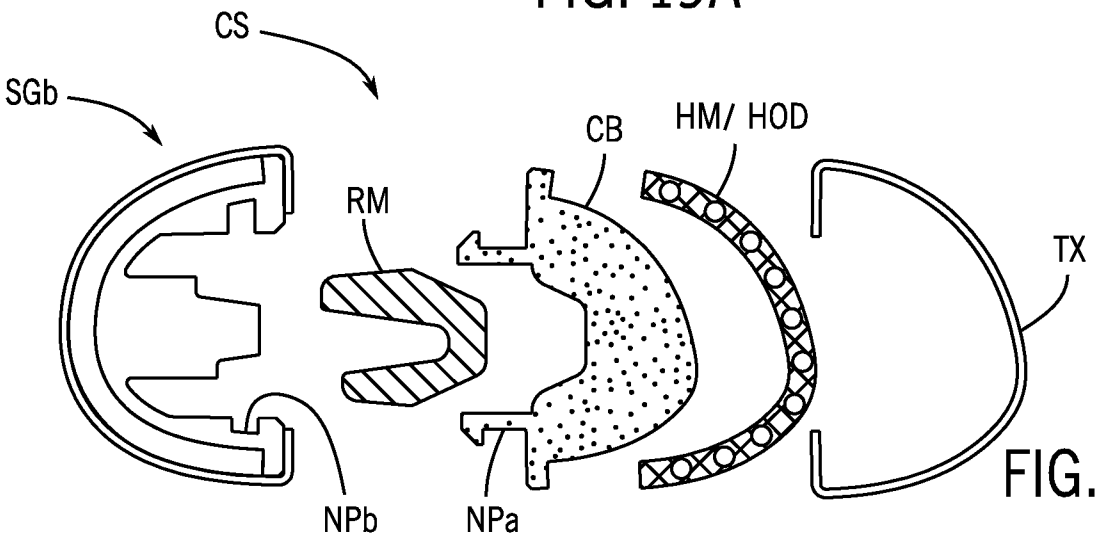


FIG. 19B

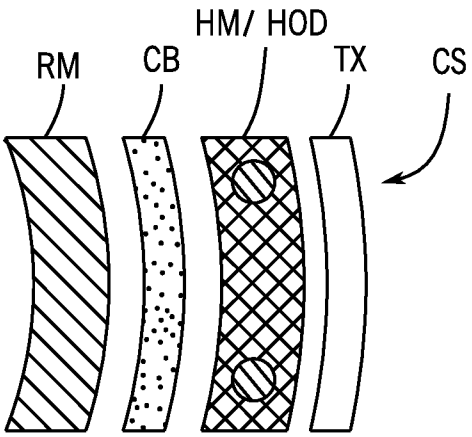


FIG. 19C

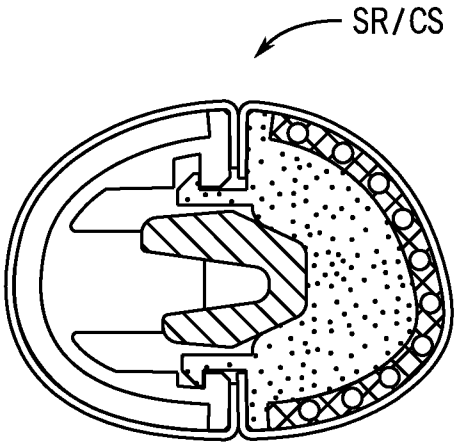


FIG. 19D

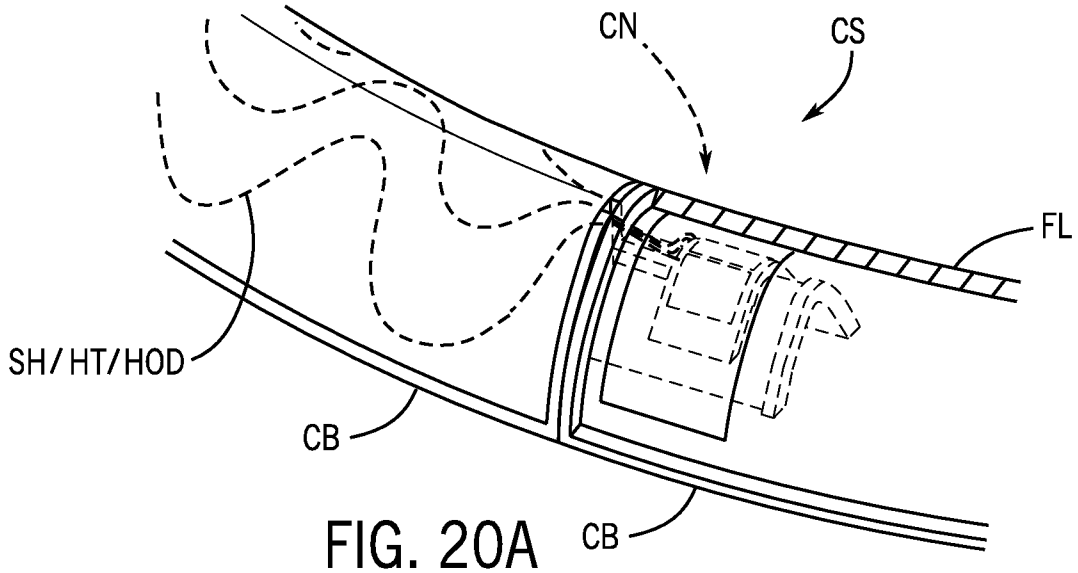


FIG. 20A

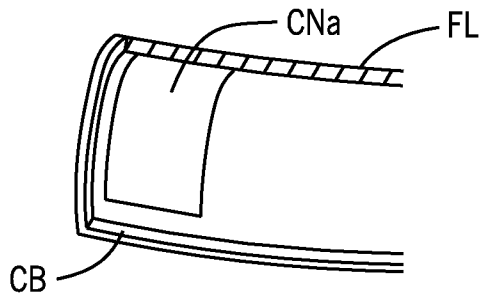


FIG. 20B

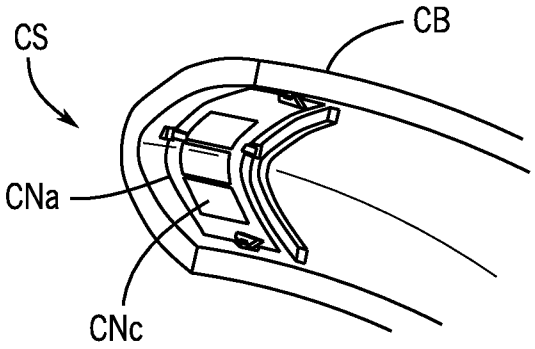


FIG. 20C

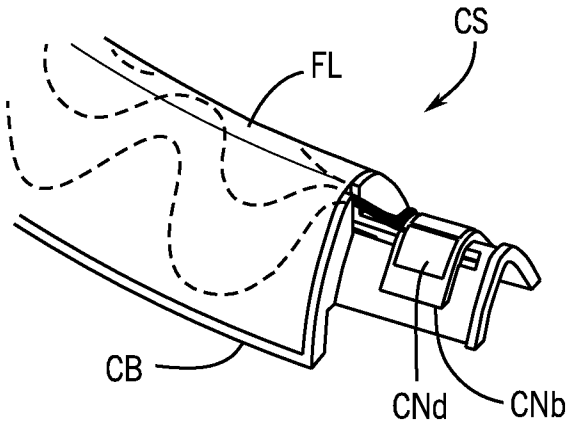


FIG. 20D

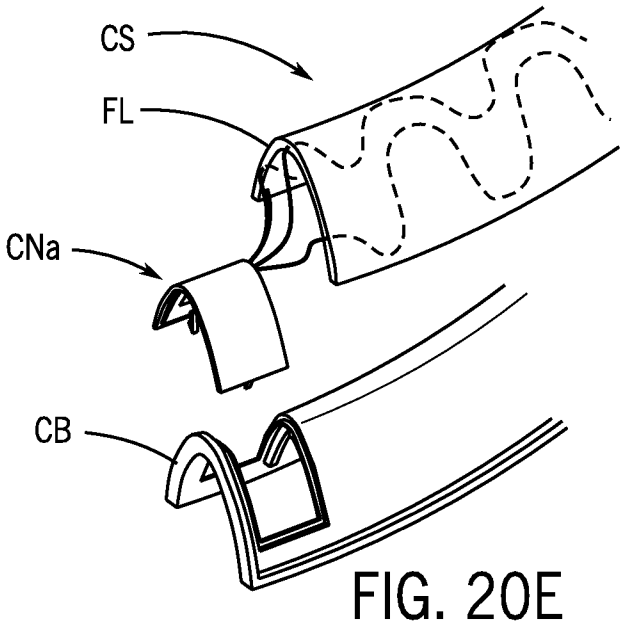


FIG. 20E

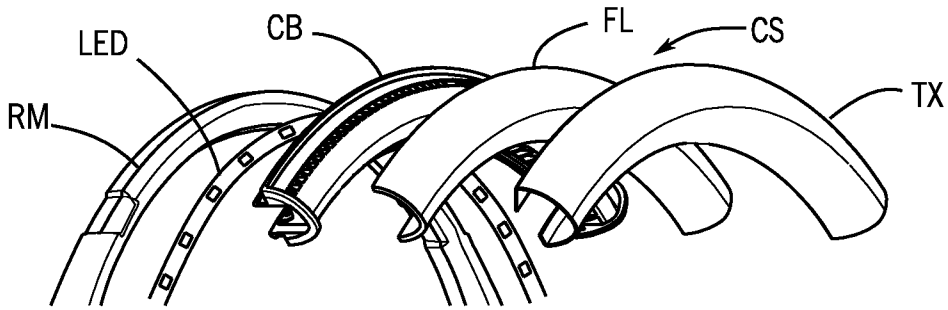


FIG. 21A

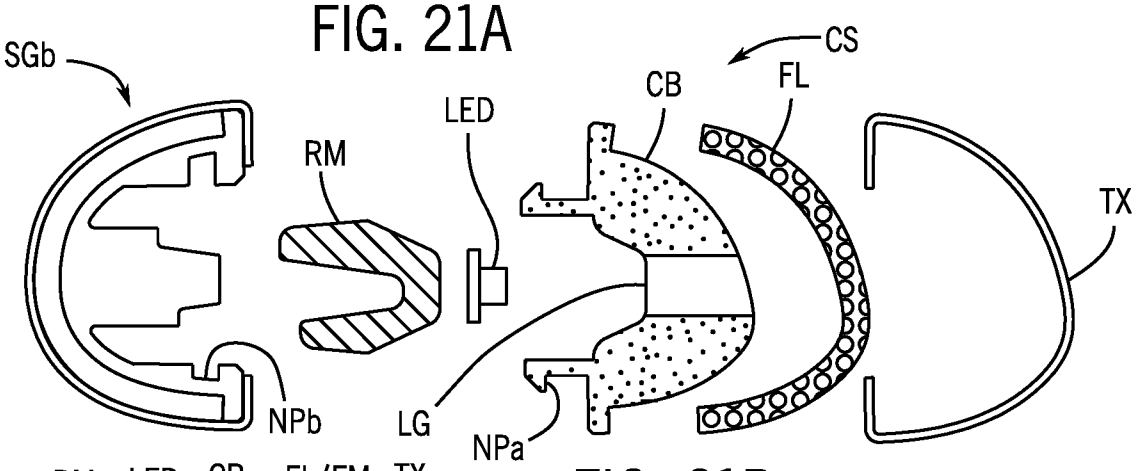


FIG. 21B

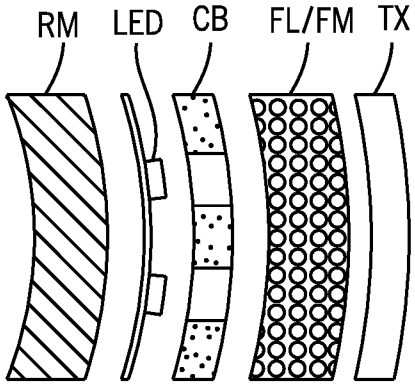


FIG. 21C

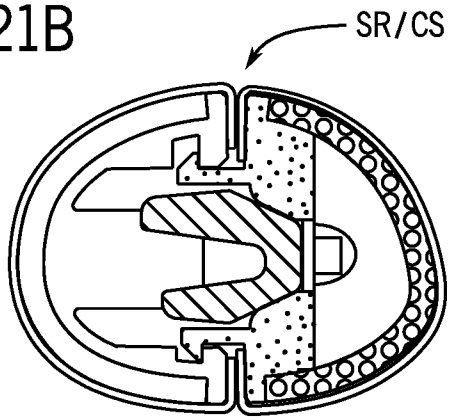


FIG. 21E

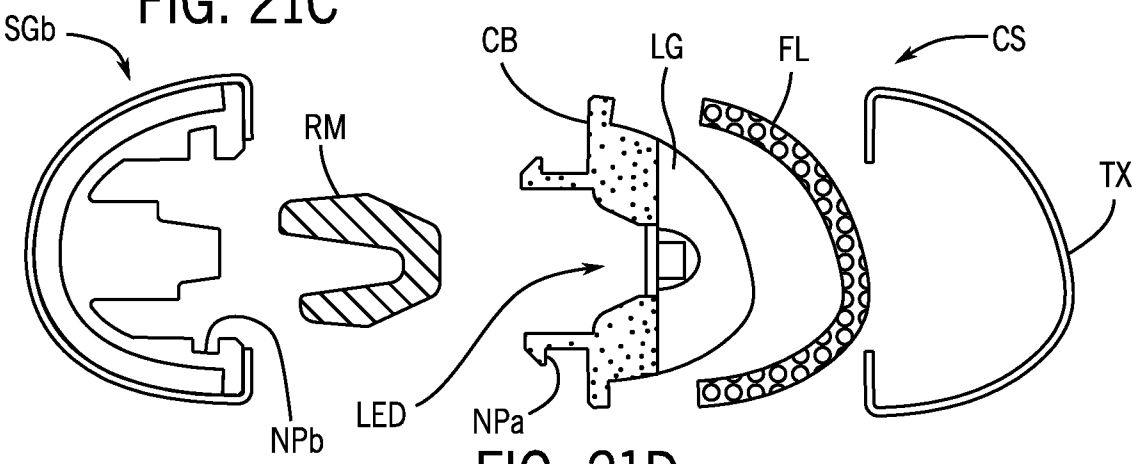


FIG. 21D

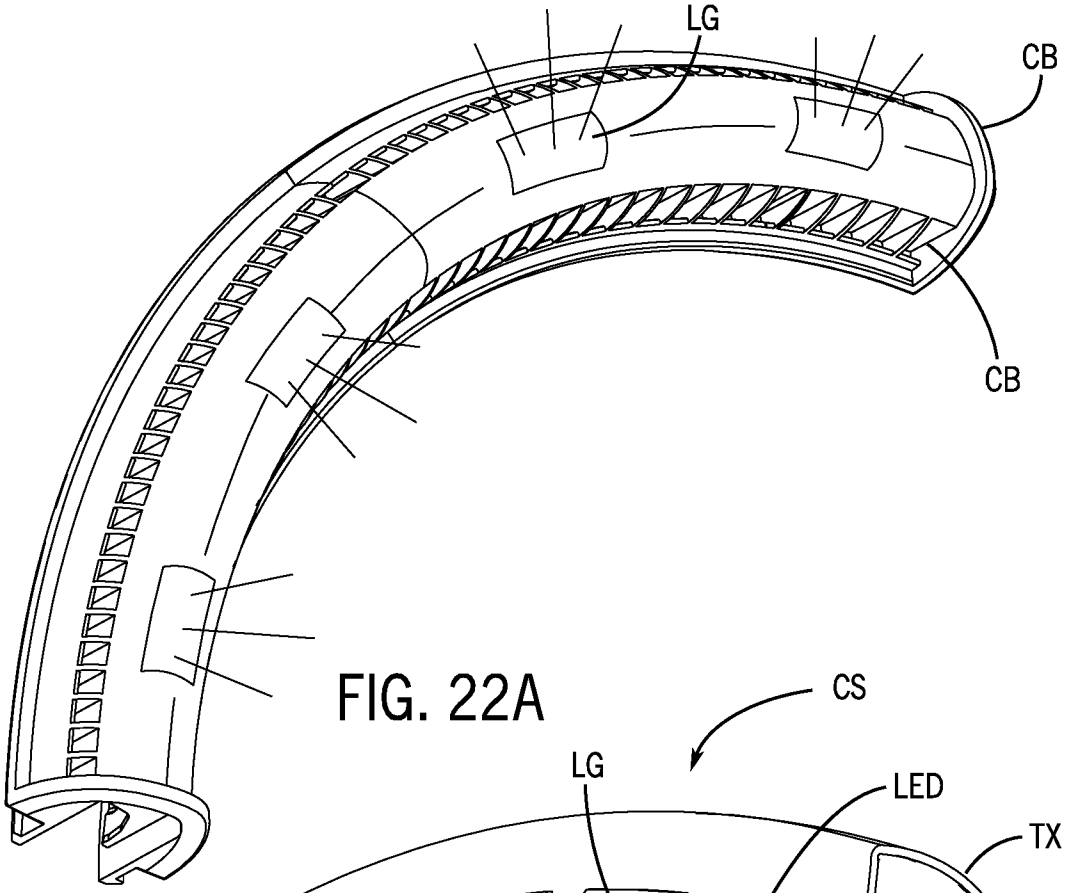


FIG. 22A

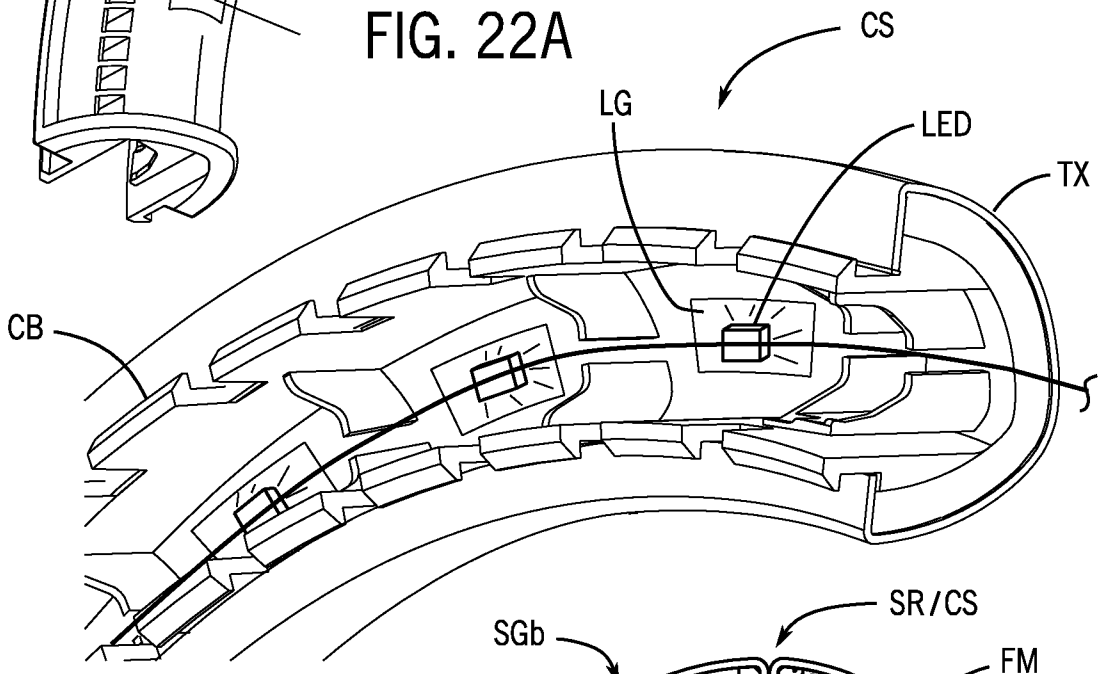


FIG. 22B

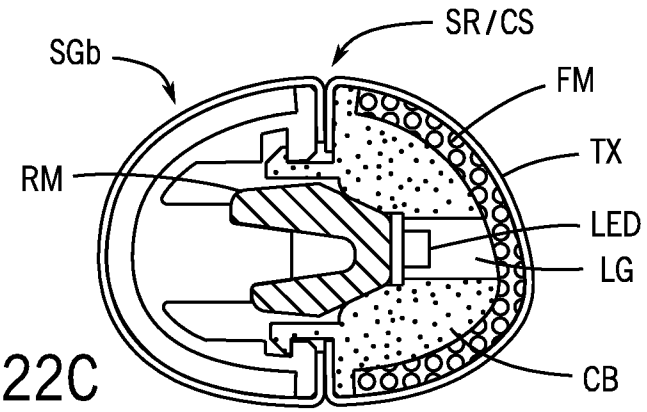


FIG. 22C

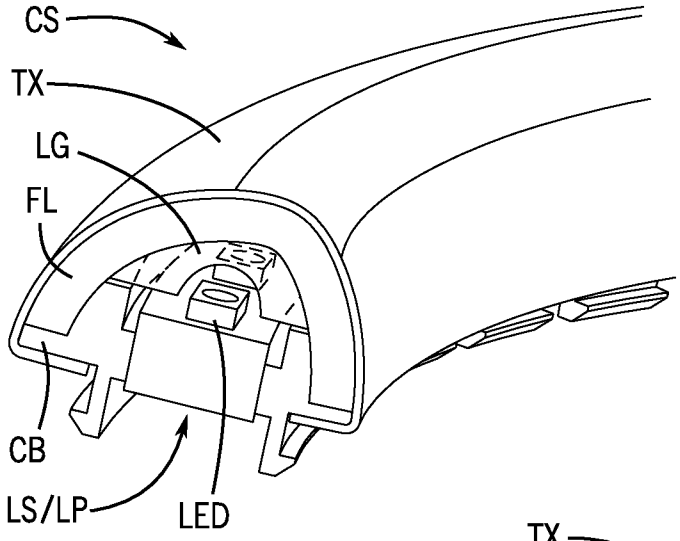


FIG. 23A

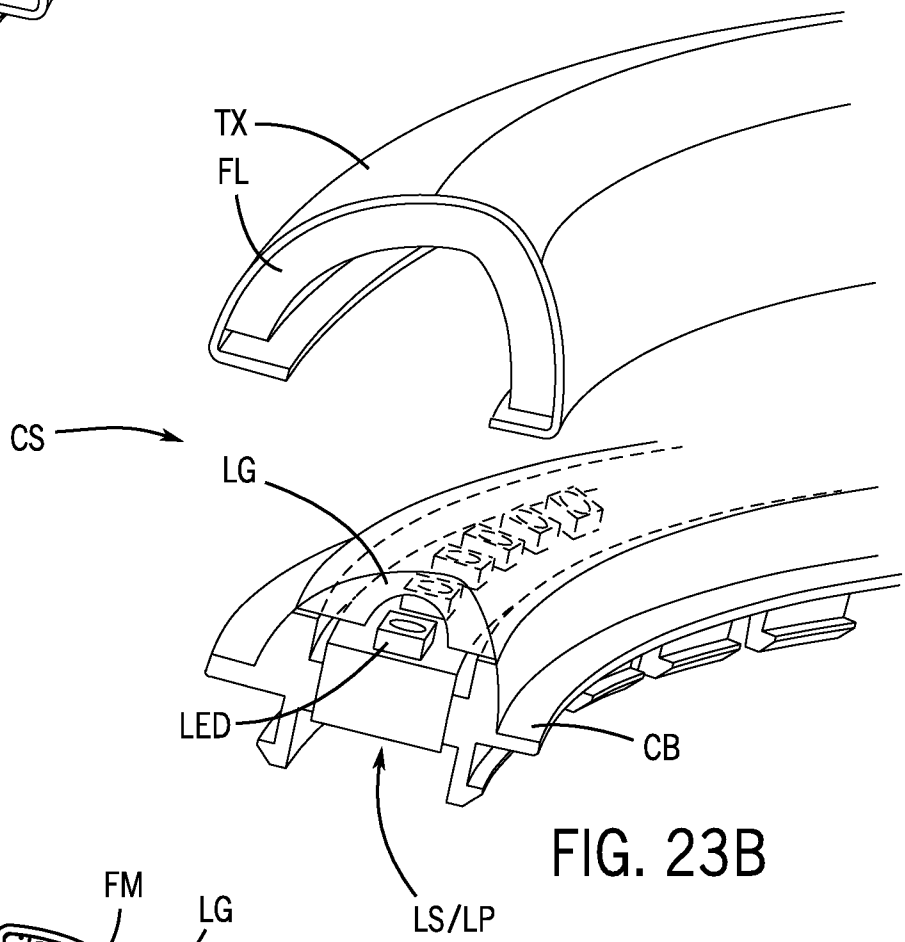


FIG. 23B

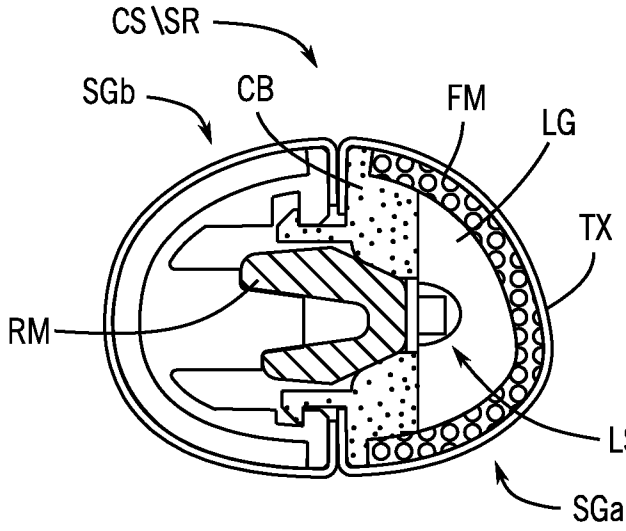


FIG. 23C

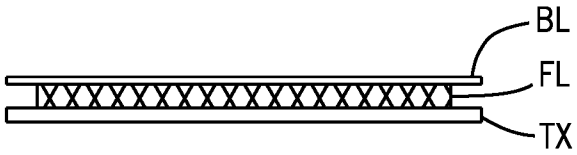


FIG. 24A

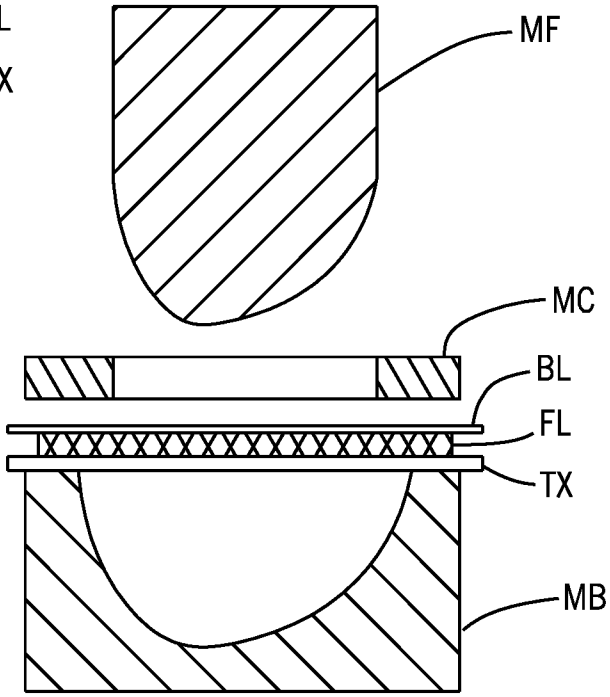


FIG. 24B

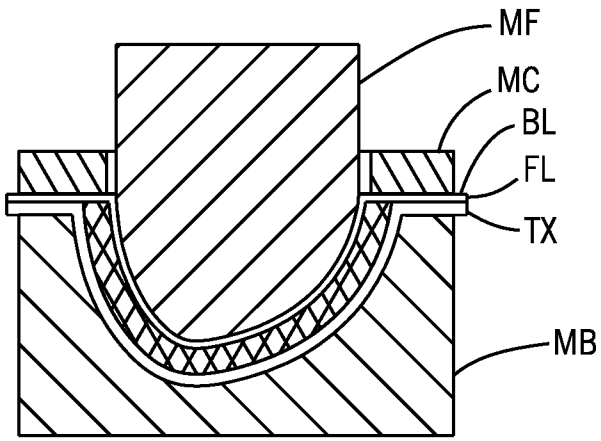


FIG. 24C

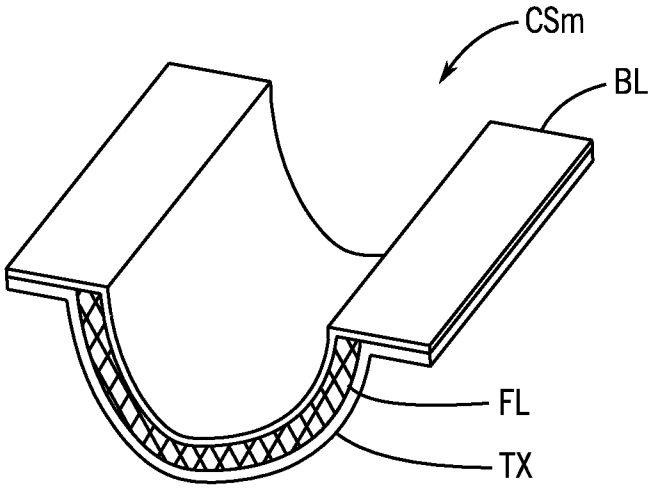


FIG. 24D

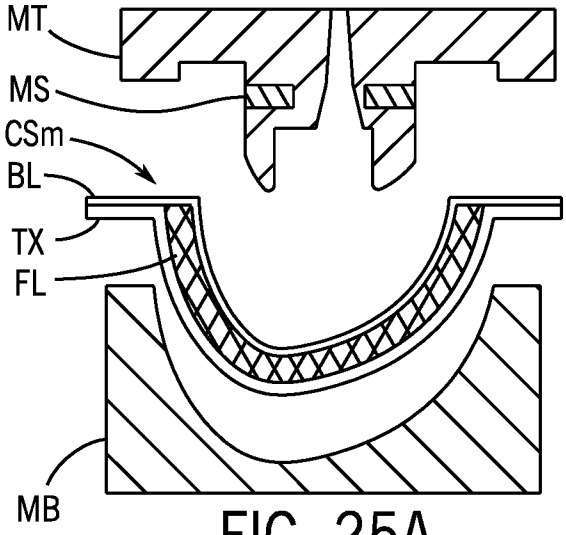


FIG. 25A

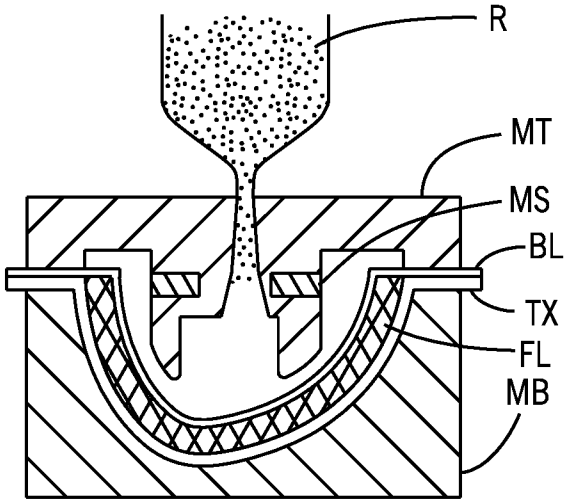


FIG. 25B

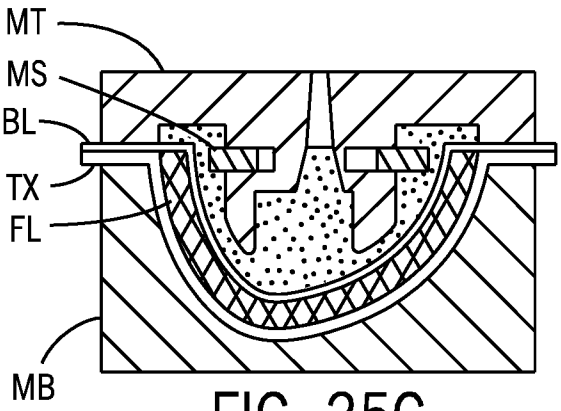


FIG. 25C

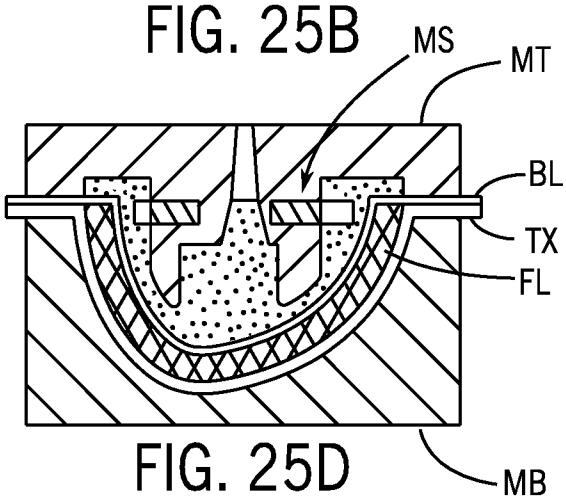


FIG. 25D

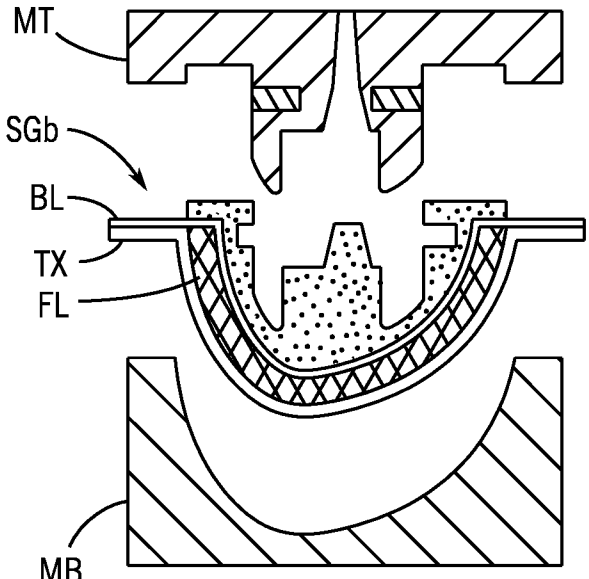


FIG. 25E

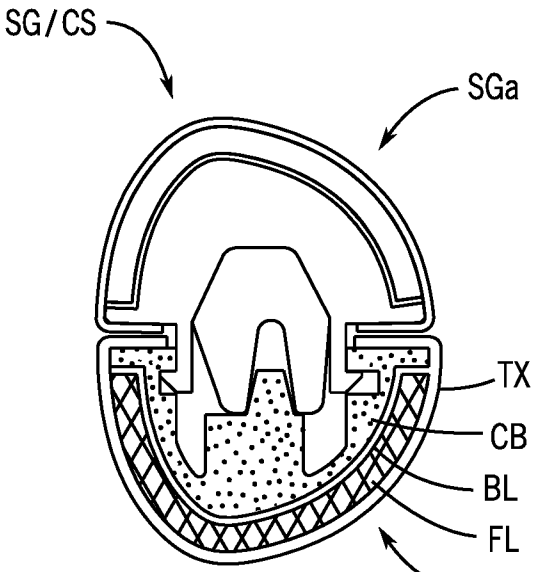


FIG. 25F

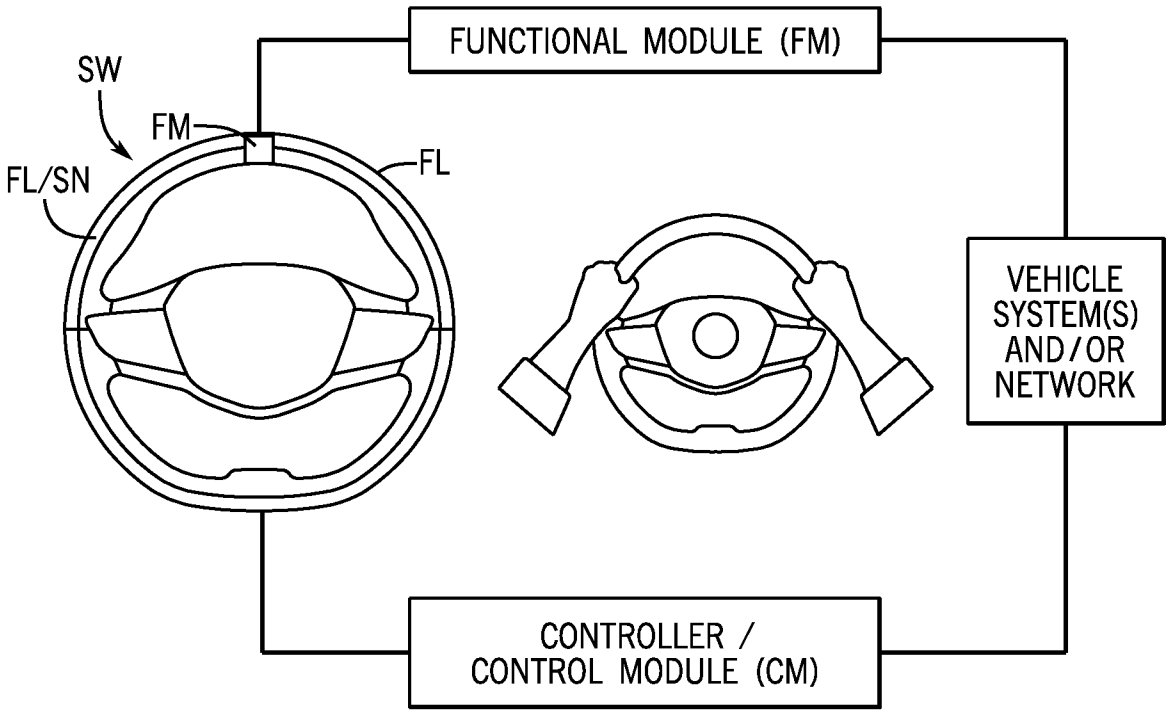


FIG. 26A

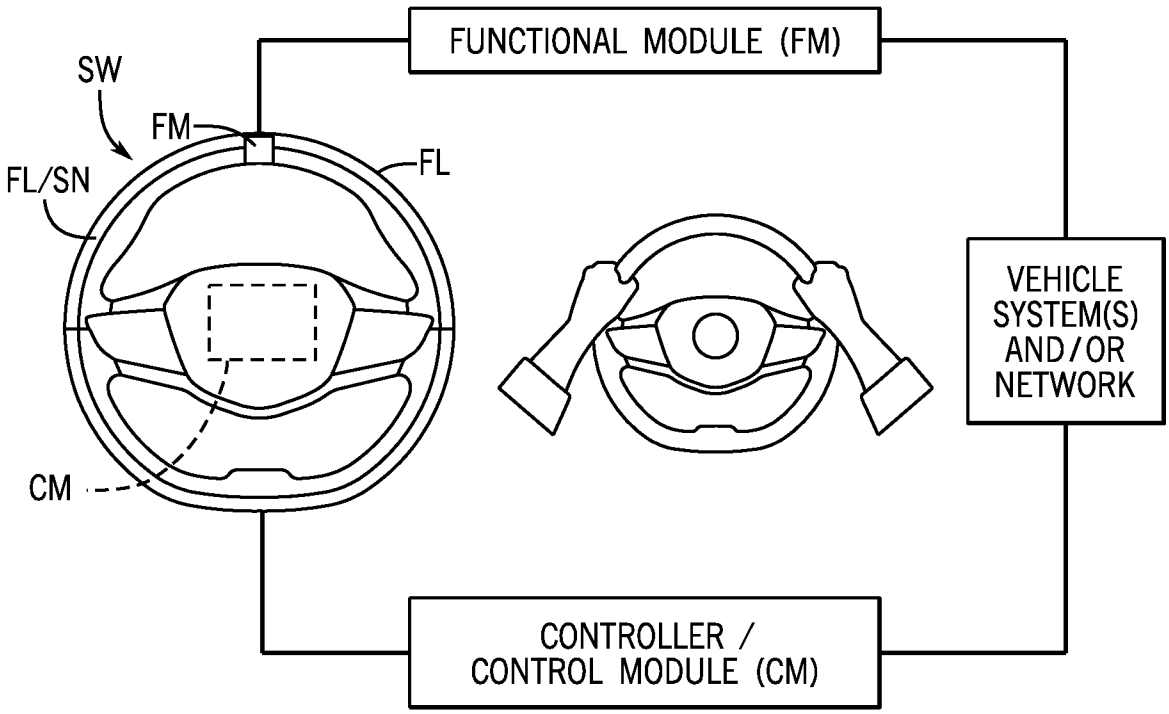


FIG. 26B

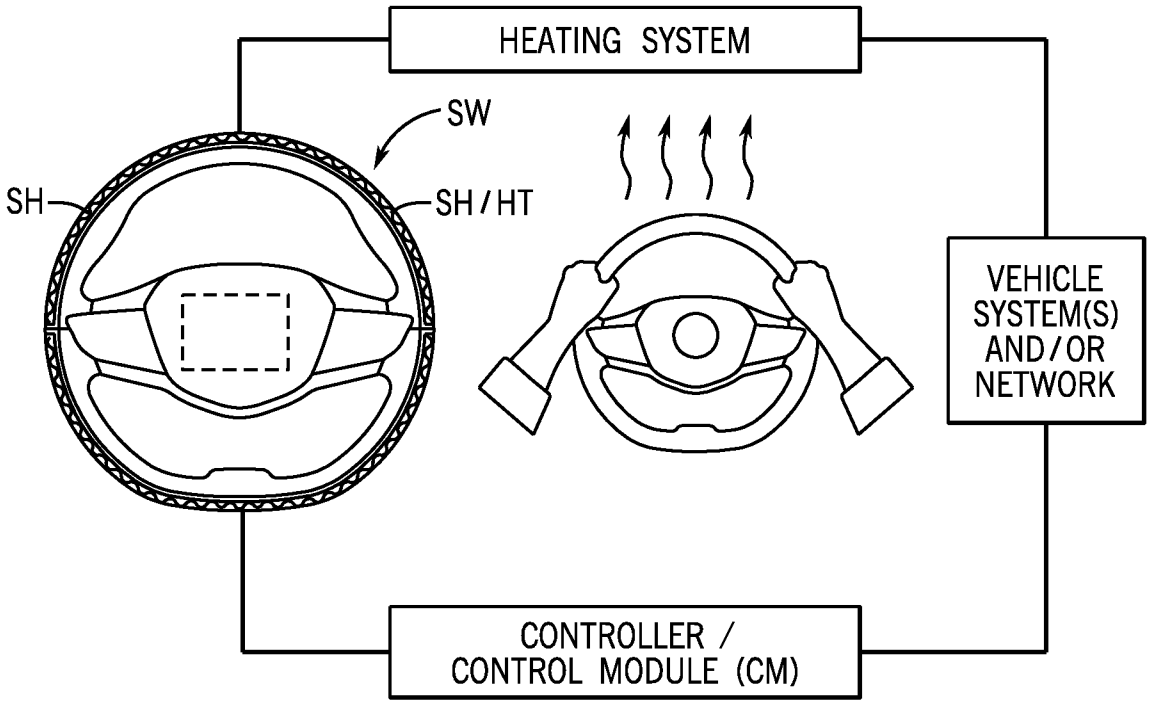

HEATING SYSTEM
SW
SH
SH / HT
VEHICLE SYSTEM(S) AND / OR NETWORK
CONTROLLER / CONTROL MODULE (CM)

FIG. 27

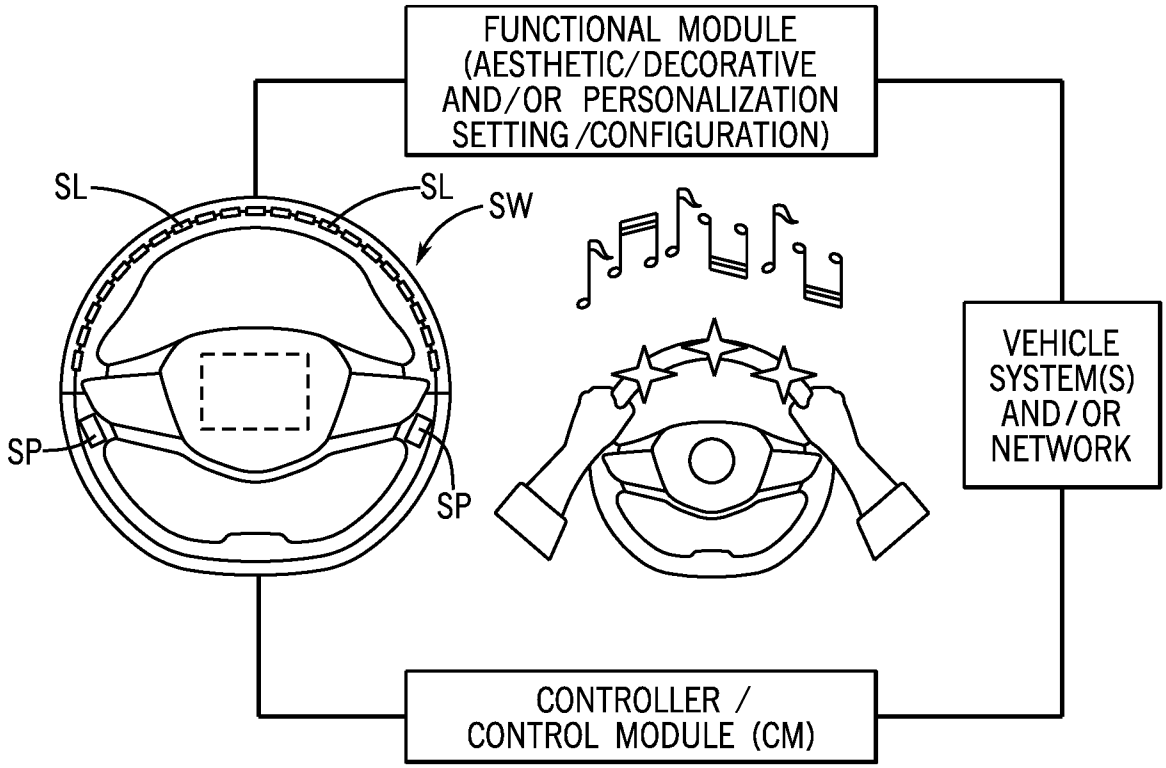

FUNCTIONAL MODULE (AESTHETIC/DECORATIVE AND/OR PERSONALIZATION SETTING/CONFIGURATION)
SL
SL
SW
SP
SP
VEHICLE SYSTEM(S) AND / OR NETWORK
CONTROLLER / CONTROL MODULE (CM)

FIG. 28

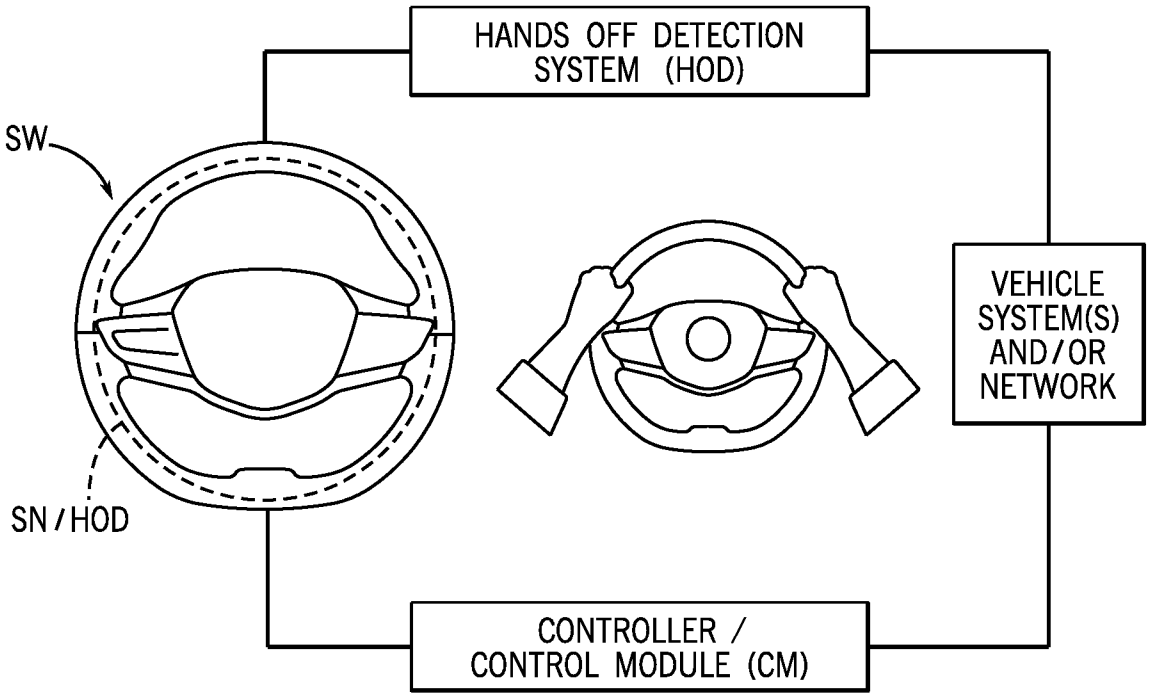

HANDS OFF DETECTION SYSTEM (HOD)
SW
SN / HOD
VEHICLE SYSTEM(S) AND / OR NETWORK
CONTROLLER / CONTROL MODULE (CM)

FIG. 29

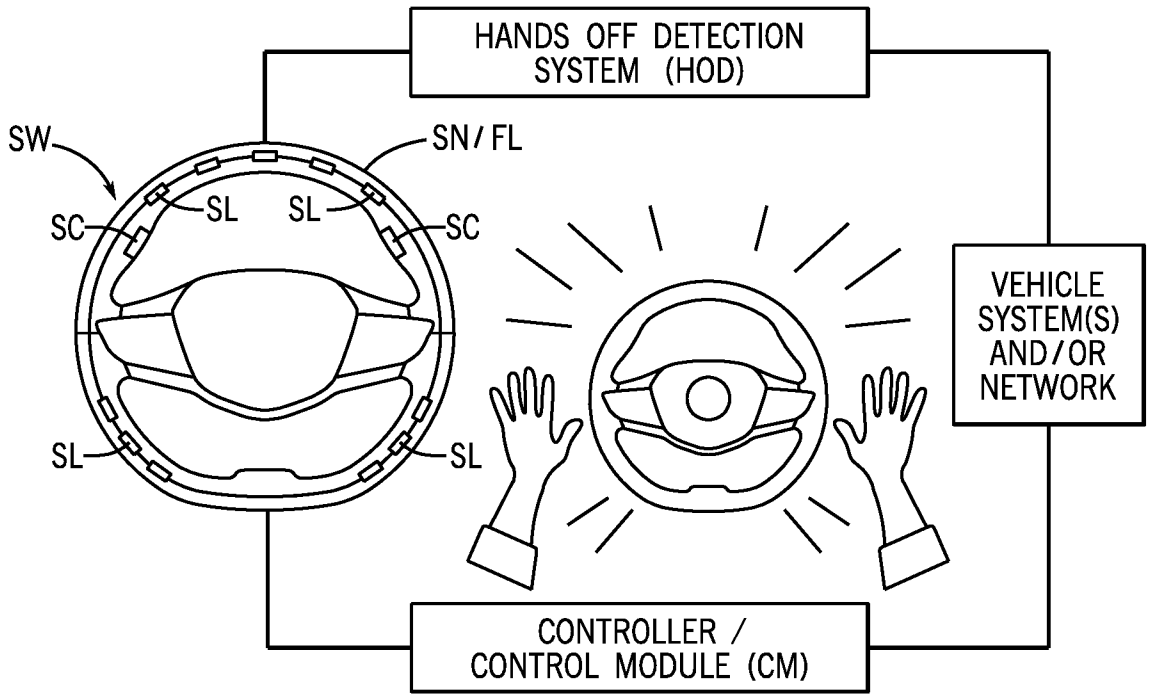

HANDS OFF DETECTION SYSTEM (HOD)
SW
SN / FL
SC
SL
SL
SC
SL
SL
VEHICLE SYSTEM(S) AND / OR NETWORK
CONTROLLER / CONTROL MODULE (CM)

FIG. 30

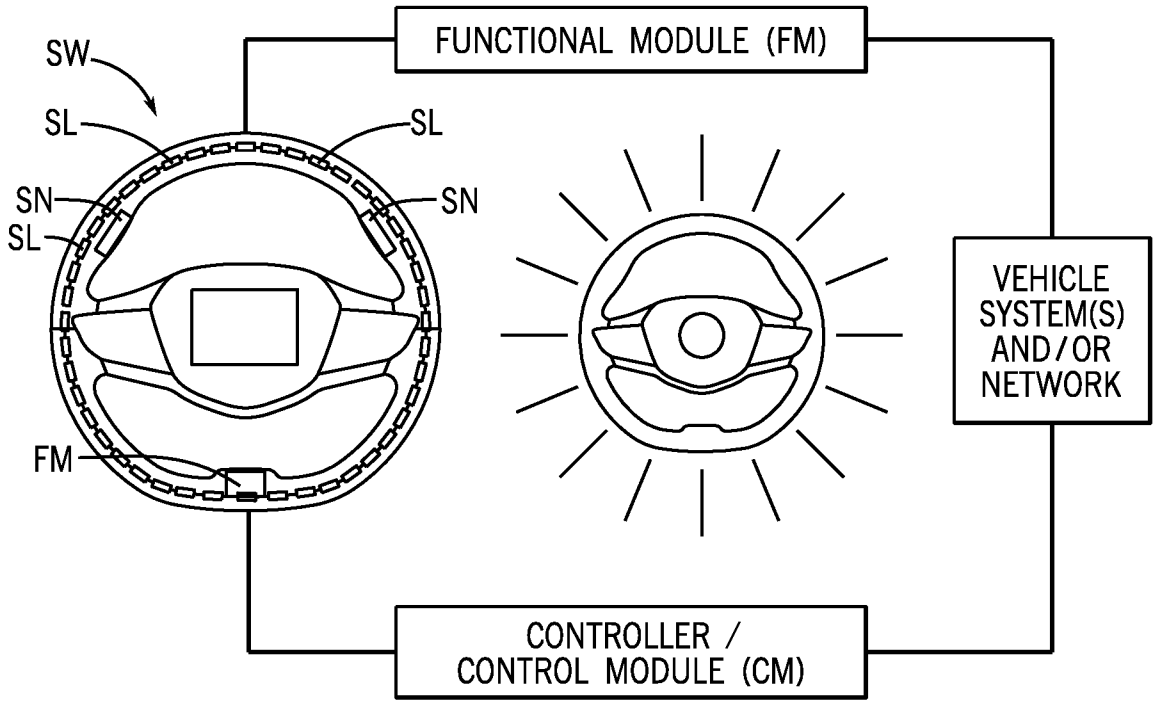

FUNCTIONAL MODULE (FM)
SW
SL
SL
SN
SN
SL
FM
VEHICLE SYSTEM(S) AND/OR NETWORK
CONTROLLER / CONTROL MODULE (CM)

FIG. 31

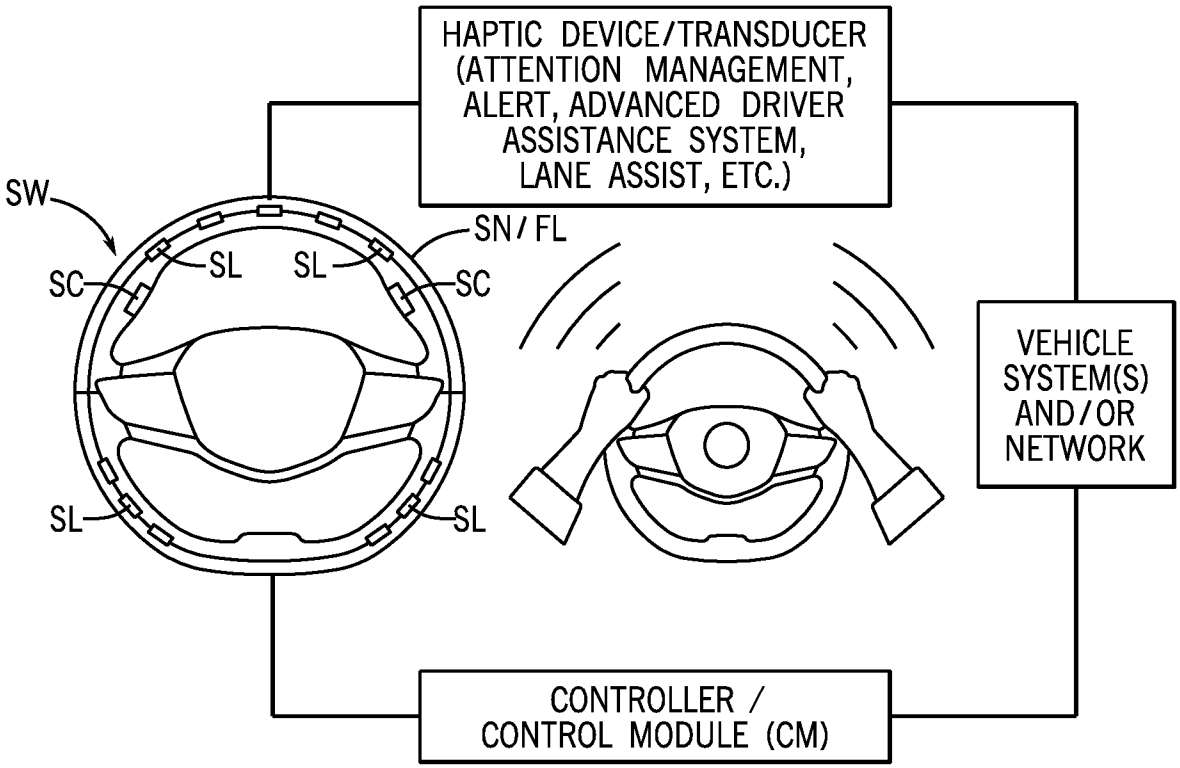

HAPTIC DEVICE/TRANSDUCER (ATTENTION MANAGEMENT, ALERT, ADVANCED DRIVER ASSISTANCE SYSTEM, LANE ASSIST, ETC.)
SW
SN/FL
SC
SL
SL
SC
SL
SL
VEHICLE SYSTEM(S) AND/OR NETWORK
CONTROLLER / CONTROL MODULE (CM)

FIG. 32

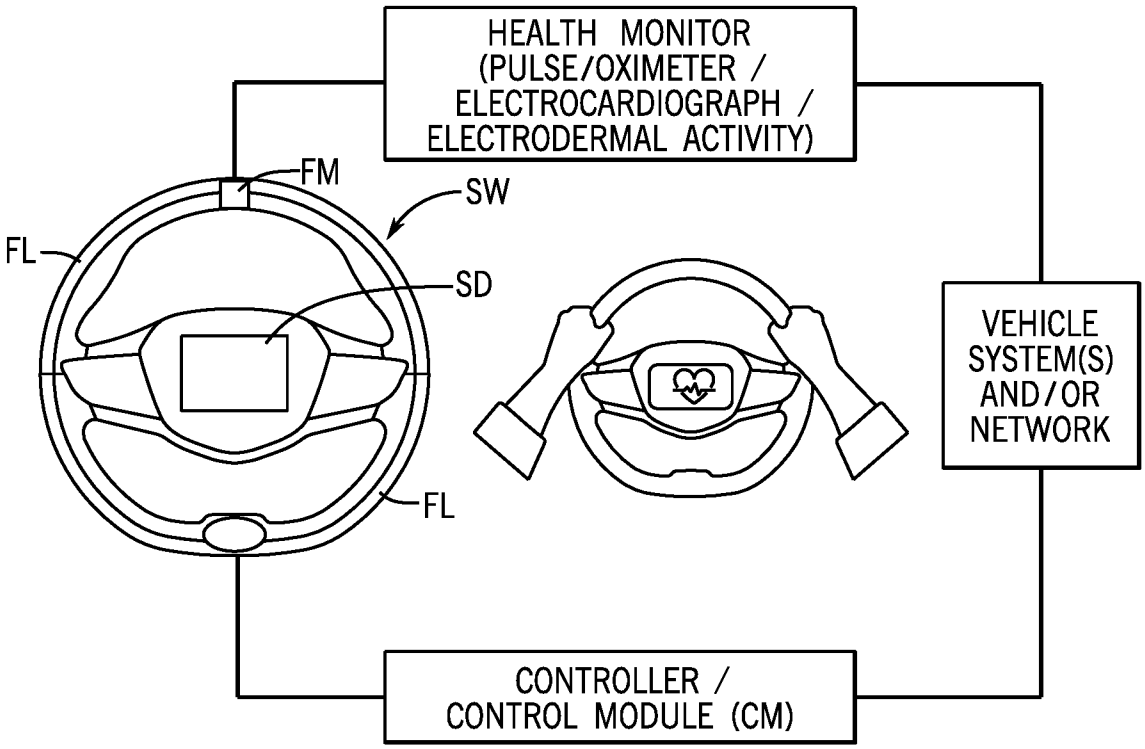


FIG. 33A

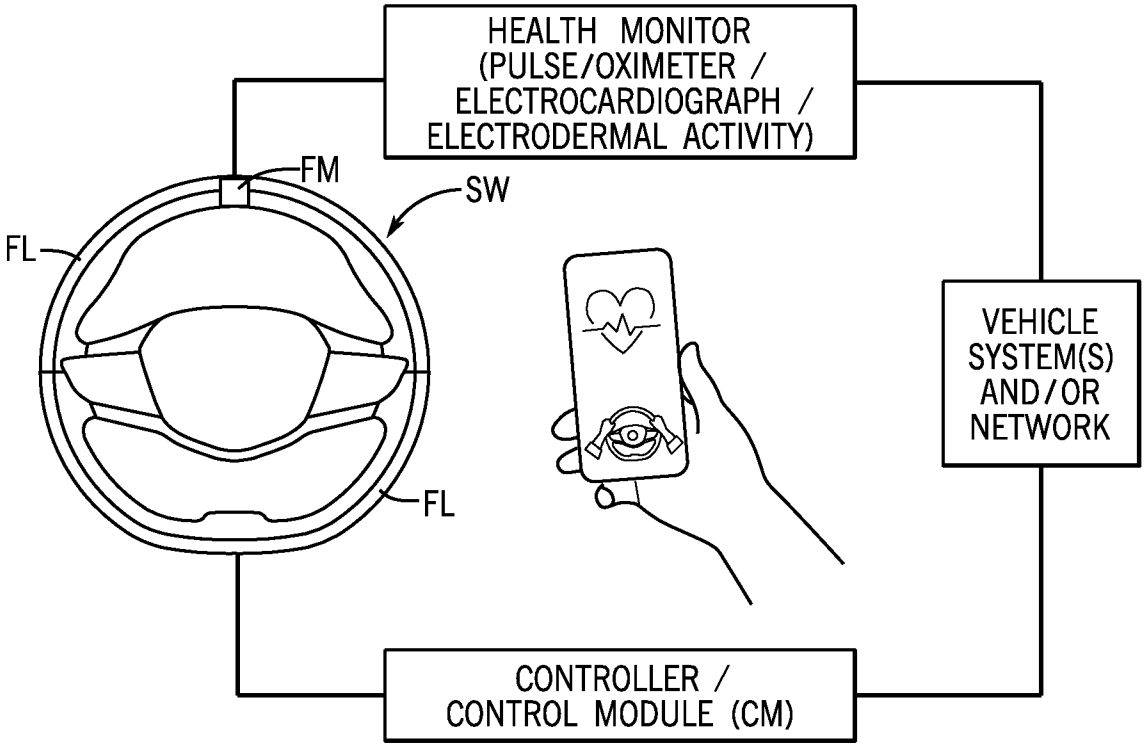


FIG. 33B

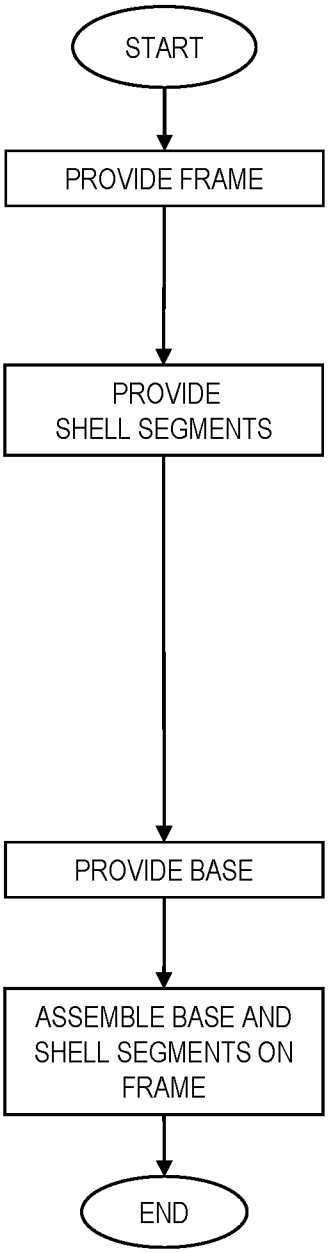


FIG. 34A

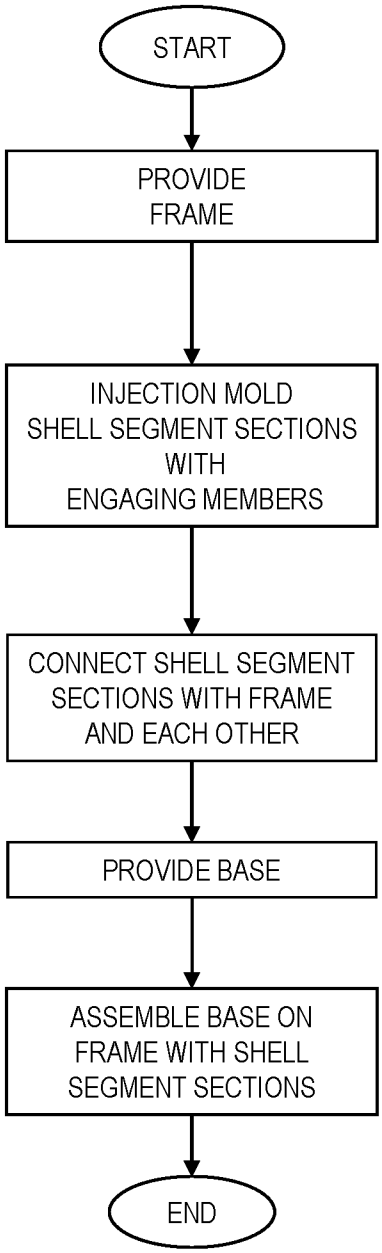


FIG. 34B

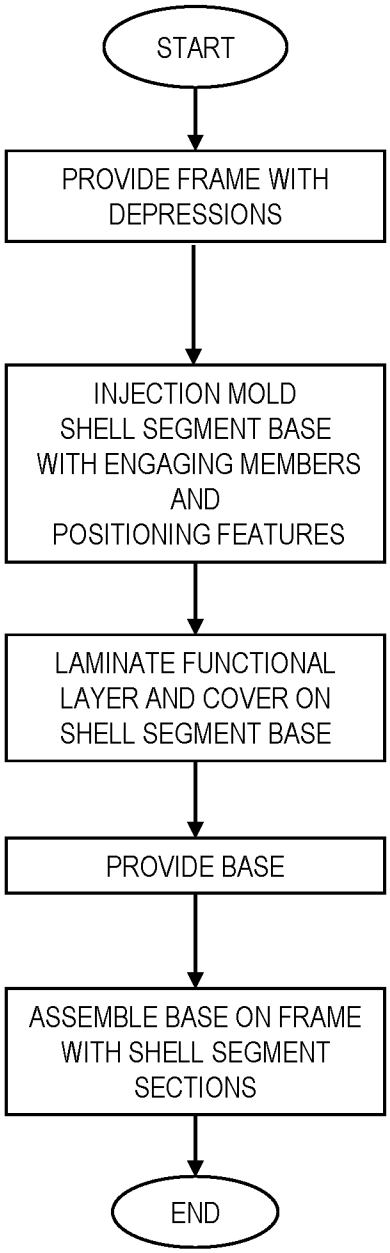


FIG. 34C

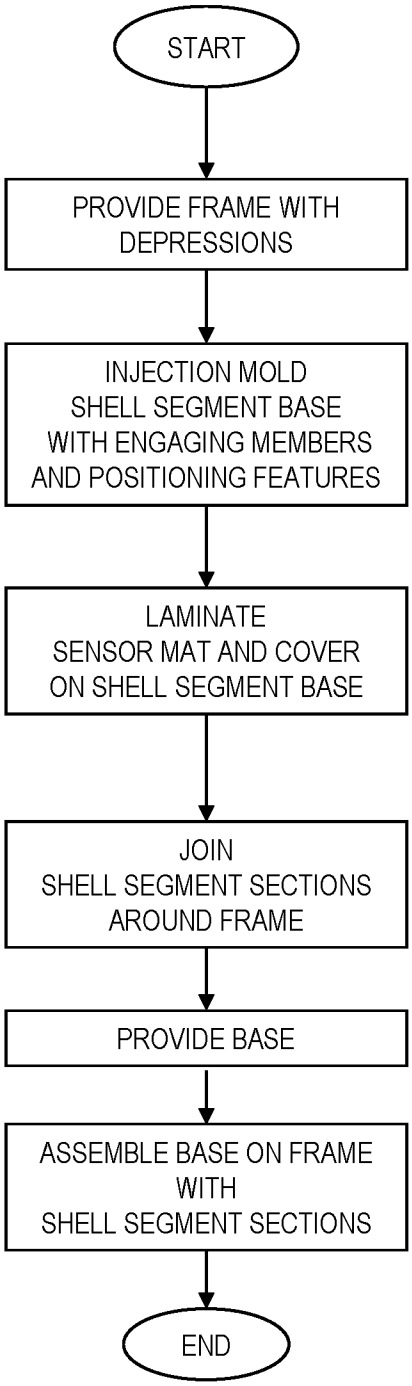


FIG. 34D

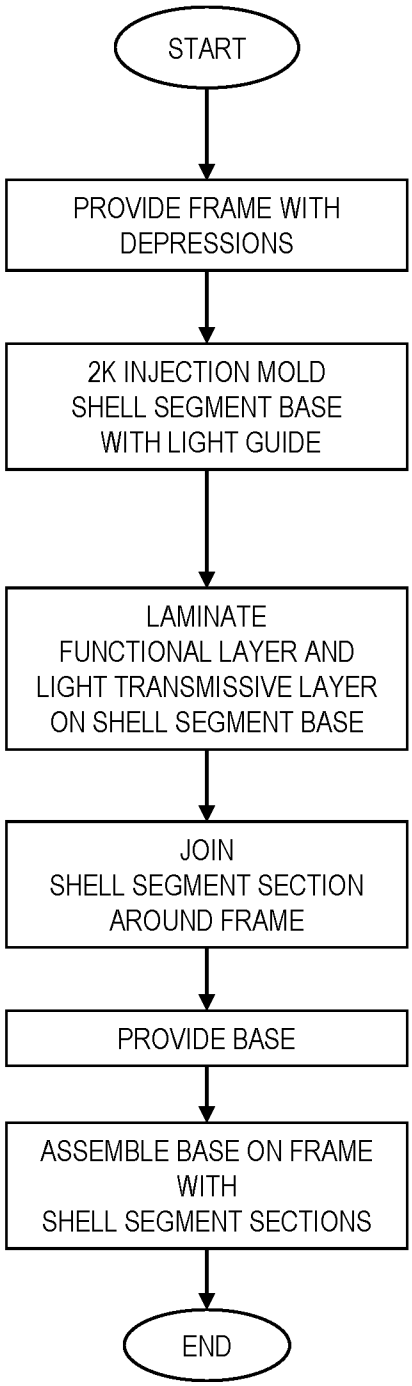


FIG. 34E

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US22/46625

A. CLASSIFICATION OF SUBJECT MATTER

IPC - INV. B62D 1/06; B62D 1/10 (2023.01)
ADD. B62D 1/08 (2023.01)

CPC - INV. B62D 1/06; B62D 1/10
ADD. B29L 2031/3047; B62D 1/08; Y10T 74/2087

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic database consulted during the international search (name of database and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0096012 A1 (HAYASHI MIKINE) 25 July 2002; figures 1-3; paragraphs [0098]-[0099]	1-6, 13-14, 33, 36-46, 49
X	DE 202006014964 U1 (PREVENT AUSTRIA GMBH) 14 December 2006; figures 1-3; see machine translation	1, 7-12, 15-32, 34-35
X	US 2019/0291770 A1 (NIHON PLAST CO., LTD.) 26 September 2019; figures 3A-3B; paragraphs [0036], [0062]	1, 47-48
X	DE 29822832 U1 (PETRI AG) 25 February 1999; figures 5-6b; see machine translation: paragraph [0005]	1, 50
X	US 2010/0139449 A1 (GARCIA MEJIA ARTURO AURELIO) 10 June 2010; figures 3-5; paragraphs [0037]-[0038]	1, 51
A	US 6,401,567 B1 (SUGIYAMA TOSHIYUKI) 11 June 2002; entire document	1-51

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04 February 2023 (04.02.2023)	MAR 02 2023
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US22/46625

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-***-Please See Supplemental Page-***-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Group I: Claims 1-51

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US22/46625

-***-Continued From Box No. III: Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-51 are directed toward a component for an interior of a vehicle comprising: wherein the cover layer comprises an exterior surface for the rim.

Group II: Claims 52-77 are directed toward a component for an interior of a vehicle comprising: wherein the composite structure is configured to provide a visual effect for the rim; wherein the visual effect comprises a multi-segment appearance provided by the set of shell segments.

Group III: Claims 78-145 are directed toward a component for an interior of a vehicle configured to provide a user interface for a vehicle occupant in a vehicle comprising vehicle systems comprising: wherein the functional module comprises at least one of (a) a sensor and/or (b) transducer and/or (c) a hands-off sensor and/or (d) a heating element and/or (e) a light and/or (f) a display.

Group IV: Claims 146-186 are directed toward a component for an interior of a vehicle comprising: a positioning layer/carrier; wherein a segment of the set of segments comprises at least one of a decorative segment and/or a functional segment.

The inventions listed as Groups I-IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Group I include a component for an interior of a vehicle comprising: wherein the composite structure of the rim comprises an intermediate layer under the cover (which are not present in Group IV); wherein the cover layer comprises an exterior surface for the rim (which are not present in Groups II-IV).

Group II include a component for an interior of a vehicle comprising: wherein the composite structure of the rim comprises an intermediate layer under the cover (which are not present in Group IV); wherein the composite structure is configured to provide a visual effect for the rim (which are not present in Groups I and III-IV); wherein the at least one segment comprises a set of segments (which are not present in Groups I and III); wherein the visual effect comprises a multi-segment appearance provided by the set of shell segments (which are not present in Groups I and III-IV).

Group III include a component for an interior of a vehicle configured to provide a user interface for a vehicle occupant in a vehicle comprising vehicle systems comprising: wherein the composite structure of the rim comprises an intermediate layer under the cover (which are not present in Group IV); wherein the rim comprises a functional module (which are not present in Groups I-II); wherein the functional module comprises at least one of (a) a sensor and/or (b) transducer and/or (c) a hands-off sensor and/or (d) a heating element and/or (e) a light and/or (f) a display (which are not present in Groups I-II and IV).

Group IV include a component for an interior of a vehicle comprising: wherein the composite structure may comprise a set of segments (which are not present in Groups I and III) to be assembled on the frame; wherein the composite structure comprises a positioning layer/carrier; wherein a segment of the set of segments comprises at least one of a decorative segment and/or a functional segment (which are not present in Groups I-III).

The common technical features of Groups I-IV are a component for an interior of a vehicle comprising: a steering wheel comprising a base and a rim; wherein the rim comprises a composite structure and a frame connected to the base; wherein the composite structure of the rim comprises at least one segment comprising a cover.

The common technical features of Groups I-III are an intermediate layer under a cover layer.

The common technical features of Groups II and IV are a set of segments.

The common technical features of Groups III-IV are a functional module/segment.

The common technical features of Groups I-IV are disclosed by US 6,401,567 B1 (SUGIYAMA). Sugiyama discloses a component for an interior of a vehicle (1; figure 1) comprising: a steering wheel (steering wheel 1; abstract; figure 1) comprising a base (6) and a rim (5, 7, 8, 16, 20, 21, collectively); wherein the rim comprises a composite structure (5, 8, 16, 20, 21, collectively) and a frame (7) connected to the base (as shown); wherein the composite structure of the rim comprises at least one segment comprising a cover (16).

The common technical features of Groups I-III are disclosed by Sugiyama. Sugiyama discloses an intermediate layer (8; figure 3) under a cover layer (16).

The common technical features of Groups II and IV are disclosed by Sugiyama. Sugiyama discloses a set of segments (20, 21; figure 1).

The common technical features of Groups III-IV are disclosed by Sugiyama. Sugiyama discloses a functional module/segment (finishers 20 and 21 provide gripping modules/segments; abstract; figure 1).

Since the common technical features are previously disclosed by the Sugiyama reference, the common features are not special and so Groups I-IV lack unity.