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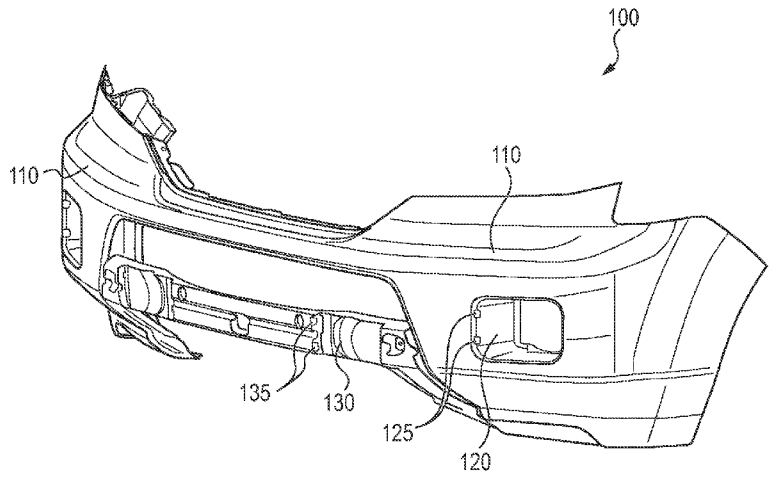

FIG. 1

(57) Abstract: Various components for a vehicle are described. A vehicle body panel such as a front bumper face and system and method for temporarily attaching an accessory component such as a fog light cover, to the vehicle body panel prior to a painting operation are described. A vehicle light assembly that includes a light cover and a cap is also described. The light cover includes a light blocking, sealing rib that prevents undesirable light leakage around a housing of the light assembly. A support member for attaching a vehicle fascia such as a front bumper fascia, to a vehicle frame or other support component is also described. The support member includes a bracket at one end of the member and various fasteners for attachment to the vehicle fascia. A vehicle bulkhead cover and vehicle front assembly using the cover are also described.

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VEHICLE COMPONENTS

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority upon previously filed applications US Serial No. 12/331,014 filed December 9, 2008, which claims priority upon US Serial No. 61/040,841 filed March 31, 2008; US Serial No. 12/331,036 filed December 9, 2008, which claims priority upon US Serial No. 61/040,846 filed March 31, 2008; US Serial No. 12/331,047 filed December 9, 2008, which claims priority upon US Serial No. 61/040,852 filed March 31, 2008; and US Serial No. 12/331,074 filed December 9, 2008, which claims priority upon US Serial No. 61/040,859 filed March 31, 2008.

FIELD OF THE INVENTION

[0002] The present invention relates to a vehicle body panel such as a front bumper face, and a related method involving the panel, that eliminates the requirement for a painting jig for accessories that are typically concurrently painted with the body panel and subsequently installed on the panel after painting of the accessory and the panel.

[0003] The present invention also relates to a cover and cap assembly for a vehicle light. The invention particularly relates to a cover that can be readily attached across the face of a light housing. The cover includes an opening for light to pass therethrough, and a cap that may be selectively retained within the opening.

[0004] The present invention also relates to vehicle front end assemblies, and particularly to front bumper fascias and support members therefor.

[0005] The present invention also relates to vehicle front assemblies and particularly, structures for forming particular air flows therein prior to such air entering an engine air intake.

BACKGROUND OF THE INVENTION

[0006] Vehicular accessories that attach to a vehicle and typically, a body panel of a vehicle are well known. Examples of such accessories include, but are not limited to, trim strips, moldings, frames for lighting elements, splash guards, running boards, mirror housings, and aerodynamic components such as air dams, spoilers, and the like. Typically these accessories are designed as removable components and thus are not integrally formed with the vehicle body panel of interest. For example, it may be desired to enable the accessory to be easily removable, such as for vehicle lighting elements to enable the lighting element to be replaced.

[0007] Frequently, it is desired to provide the accessory or other component with an exterior having the same color as the vehicle or a particular exterior portion of the vehicle. Accordingly, it is necessary or at least preferred, to paint that accessory or component the same color as the vehicle or exterior portion thereof. As will be appreciated by those skilled in the art, it is difficult to achieve a match between painted components particularly if the components are painted from different sources of paint, painted at different times, and/or painted under different conditions. As a result, painting operations typically use one or more jigs or other support structures to support the accessory alongside the vehicle so that the accessory can be painted at the same time as the vehicle or vehicle panel to which the accessory will be subsequently attached. Artisans have developed numerous designs for such jigs or support structures such as described in US Patents 6,036,779 and 5,707,450. In

addition, US Patent 5,301,411 describes a complex vehicle painting and assembly system that utilizes numerous jigs for holding components during painting.

[0008] Although satisfactory in many respects, the use of such jigs increases the amount of floor space needed in a painting facility such as a paint booth. And, stocking the relatively large number of such jigs required in a large scale vehicle painting operation increases costs and time requirements in using, maintaining, and eventually repairing or replacing such jigs.

[0009] Recognizing the desirability in painting all vehicle body components in the same operation and using the same paint source, a technique and assembly was described in US Patent 3,486,481 which attempted to eliminate separate stand-alone painting jigs. The '481 patent describes an apparatus for temporarily supporting vehicle body panels during painting. The apparatus attaches to a main portion of the vehicle and the body panel of interest prior to painting. The apparatus enables the body panel to be moved to a variety of different positions during painting while the panel is attached to the vehicle.

[0010] Although the strategy of the '481 patent would likely eliminate the need for separate stand alone painting jigs for certain large body panels, the method of the '481 patent still requires significant assembly and removal operations associated with the support apparatus. And, the strategy of the '481 patent still requires a support apparatus, although it does not occupy valuable floor space. In addition, it would be expected that corresponding costs would also be associated with the support apparatuses. Accordingly, a need remains for a system and method by which vehicle accessories or components can be supported without the use of a separate jig or support apparatus while they are painted, preferably during the same painting operation as the vehicle to which they are subsequently attached.

[0011] Vehicle accessory lights, particularly those for lighting exterior regions around a vehicle, are typically designed to reside within receptacles or housings in the vehicle body. The housings of such lights frequently reside below or behind the exterior surface of the vehicle, and a lens cover is typically used to cover the interior of the housing and one or more lighting elements contained therein.

[0012] Frequently, housings for vehicle accessory lights are integrally formed in a vehicle body panel. Or, alternatively, the vehicle body panel is formed with an integral recessed support structure that readily receives a separate light housing.

[0013] Generally, the light housing is a dish shaped or otherwise recessed receptacle that retains one or more lighting elements. The interior surface of the housing is typically reflective to promote the emission of light from the housing.

[0014] For certain applications, one or more light covers may be used in conjunction with a light housing, by placement of the cover over the open light emitting face of the housing. A light cover may be used for aesthetic reasons such as to provide a particular shaped opening through which the emitted light passes. Thus, for example a rectangular shaped light housing can be made to appear circular by placement of a light cover having a circular opening over the face of the rectangular housing. In addition, light covers can be colored or painted as desired to provide a particular appearance around a light. Light covers may also provide functional features by providing protection from stones and other debris that could impact the housing or lighting element. Although a lens cover is used in most applications, light covers can provide additional protection from such impacts.

[0015] A significant drawback with certain light covers is a result of "light leaks" around the periphery of the cover. "Light leaks" refers to spaced regions between a peripheral edge of the light cover and a side wall or portion of a housing within which

the light cover is received. The spaced regions allow light emitted from the lighting element to pass through those regions. This is undesirable particularly if the light cover that is being used has an opening of a particular shape or configuration. Unintended light leaks near such opening can detract from the overall intended effect and aesthetics of the light cover.

[0016] Accordingly, it would be desirable to provide an assembly and technique for eliminating such light leaks around vehicle exterior lights.

[0017] Certain vehicle exterior accessory lights are provided with provisions so that a cap or sealing element may be removably attached over the open face of the light or a light cover attached along the face of the light. Such caps or sealing elements may be useful for various aesthetic and/or functional purposes such as those previously described with regard to light covers. In addition, such caps or sealing elements may in certain instances be used to cover an opening in a body panel if the underlying light is removed or simply not installed.

[0018] Depending upon the shape or configuration of the cap or sealing element, that component can become dislodged or otherwise loosened from its state of initial installation. This occurrence may result from vibration, differences in thermal expansion properties, and wearing of materials at the engagement interfaces. Loosening or otherwise becoming dislodged from an initial installation is undesirable for a lighting cap or cover. Such loosening may create an unsightly appearance. In addition, if the cap is allowed to become excessively loosened, the cap may become completely detached from its mounting provisions on the vehicle, and lost.

[0019] Accordingly, a need exists for an assembly and technique for reducing the likelihood of a vehicle lighting cap or sealing element from loosening or otherwise becoming dislodged.

[0020] Front vehicle assemblies are designed to meet a variety of requirements. The assemblies must absorb shocks and impacts from collisions. The assemblies must also have provisions for accommodating and supporting numerous components such as certain engine components, driving lights, vehicle accessory lights, hood engagement mechanisms, and depending upon the vehicle, may include various structures for improving vehicle aerodynamics. In addition, front vehicle assemblies are designed to exhibit favorable aerodynamic characteristics themselves, even if they are to receive additional aerodynamic components such as air dams or the like. Furthermore, vehicle front assemblies should be attractive and exhibit desirable aesthetic qualities.

[0021] Front bumper fascias are typically large panels that are designed to extend across the front of a vehicle, cover the shock absorbing components, improve vehicle aerodynamics, and provide an attractive appearance. Front bumper fascias are preferably one-piece, integrally formed components. A trend in the current vehicle market, is to use these large, one-piece front bumper fascias since they can be readily formed by injection molding techniques and designed to exhibit attractive styling and good aerodynamic properties.

[0022] One-piece bumper fascias are becoming increasingly complex. That is, many current vehicle fascias exhibit an array of compound curvatures and changing shapes at different regions of the fascia. This trend, coupled with such fascias being a single, integral piece, requires unique supporting structures for such fascias. Various designs have been proposed for supporting such fascias to a vehicle

support frame or other member, such as described in US Patents 5,061,108; 5,580,109; 6,997,490; and 7,273,246. Although satisfactory, a need remains for yet further improvements in supporting a geometrically complex vehicle fascia.

[0023] More recently, increasing demands for lighter weight vehicles has prompted the use of fascias with thinner walls. It is typical for vehicle fascia walls to be less than 5 mm, less than 4 mm, and in certain applications, less than 3 mm. A consequence of using such relatively thin fascia walls, is that the resulting fascia is less rigid and thus prone to excessive deformation. Although a low rigidity and relatively flexible fascia can be made rigid by using an abundance of support members, the greater the number of support members used, the more complex is the resulting assembly. Such complex assemblies are time consuming and expensive to install.

[0024] Accordingly, a need exists for a single support member that can support a relatively large region of a front vehicle fascia, such as a front bumper fascia, to thereby eliminate the requirement for multiple support members and the attendant complexity, assembly time demands, and costs associated therewith.

[0025] A particular difficulty in supporting a geometrically complex fascia is the large number of peripheral regions resulting from an irregular fascia perimeter or outer edge. These peripheral regions typically extend within three dimensions. For example, a fascia having non-linear perimeter edges for accommodating an adjacent hood or light assembly presents regions of material in multiple dimensional planes that if not sufficiently supported, can fracture or deform if excessively loaded, can create unacceptable dimensional tolerances with respect to adjacent panels, excessively vibrate, and detract from the overall aesthetics of the vehicle.

[0026] Therefore, a need exists for a single support member that can support a peripheral region of a geometrically complex fascia, to thereby impart structural rigidity to that region and the rest of the fascia, maintain as-installed dimensional tolerances between the fascia and adjacent panels, and render that region relatively immune to excessive vibration.

[0027] It is well known to design air channeling structures in frontal regions of automobiles and direct air into one or more engine intakes, radiators, and/or around the engine.

[0028] Although desirable characteristics for air flows to engine intakes and those for radiators share many common attributes such as high flow rates, and maintaining low temperatures; air flows for engine intakes have several additional desirable characteristics. First, such air flows should be free or substantially free, of entrained particles of dirt, dust, water, snow, ice, and the like. Although air directed to an engine intake subsequently passes through one or more filter elements, it is preferred that such air streams be free of entrained particles which would otherwise be collected at the filter elements and thus block or interfere with air flow at that location. It is also desirable that the amount of air directed to an engine intake be relatively high, or at least in excess of demands from the engine.

[0029] It is known in the fields of material handling and particularly, in gas-solid separations, that entrained particles can be separated from a moving air flow by causing sudden changes in the direction of the air flow. Due to differences in mass and thus inertia between such particles relative to air, entrained particles can be diverted away from a redirected air flow. Cyclones and labyrinth separators are based upon this phenomenon.

[0030] Vehicle designers have incorporated a range of structures for directing air flows from the front and/or underside of a vehicle to an engine intake. For example, US Patent Publication 2005/0230162 describes a front structure for a vehicle that collects and directs air through a tortuous flow path to attempt to rid the air flow from entrained snow or rain.

[0031] A significant advance was described in a collection of patents and published patent applications to the same assignee as the present application, namely US Patents 7,234,555; 7,237,635; and 2006/0006011 for example. In Fig. 8 of each of these documents, an S-shaped air flow is described in which air is collected behind a grill and then reversed in direction as it passes through a screen provided in a bulkhead cover. After passing through such cover, the air flow is then reversed in direction and sent to an engine intake.

[0032] Although the air intake system described in the noted patent documents of the assignee provide numerous benefits, ever-changing vehicle designs and increasingly demanding requirements create a need for yet further improvements.

SUMMARY OF THE INVENTION

[0033] The present invention relates to various aspects of vehicles, vehicle body panels, and components typically provided or utilized within a front region of the vehicle. Specifically, the invention is directed to a front bumper face, a front accessory light cover assembly, a front fascia support member, and a front bulkhead cover and air flow system.

[0034] The difficulties and drawbacks associated with previous-type systems are overcome in the present method and apparatus for a body panel having provisions

for temporarily engaging an accessory component so that the panel and the component can be painted together.

[0035] In one aspect, the present invention comprises a vehicle body panel comprising a panel defining a first region for installation engagement of a removable accessory. The panel includes at least one fastener element in the first region adapted to engage a corresponding fastener element of the accessory. The panel also defines a second region for temporary engagement of the accessory. The panel also includes at least one fastener element in the second region adapted to temporarily engage a corresponding fastener element of the accessory.

[0036] In another aspect, the present invention provides a vehicle body panel and accessory assembly. The assembly comprises a vehicle accessory including at least one fastener element. The assembly also includes a vehicle panel defining a first region and a second region. The panel includes (i) a first fastener element in the first region adapted for installation engagement with the at least one fastener element of the accessory, and (ii) a second fastener element in the second region adapted for temporary engagement of the at least one fastener element of the accessory.

[0037] In yet another aspect, the present invention comprises a method of supporting an accessory component while painting the component and a vehicle panel to which the component is to be subsequently engaged. The method comprises providing a vehicle panel having a first fastener element and a second fastener element, each element adapted to engage an accessory component. The method also comprises providing an accessory component adapted to engage the first and second fastener elements of the vehicle panel. The method additionally comprises temporarily engaging the accessory component to the first fastener

element of the vehicle panel prior to painting. The method further comprises painting the vehicle panel and the accessory temporarily engaged thereto. After painting of the vehicle panel and the accessory component, the accessory component is disengaged from the first fastener element of the vehicle panel. The method then comprises engaging the accessory component to the second fastener element of the vehicle panel.

[0038] The difficulties and drawbacks associated with previous type systems are overcome in the present method and apparatus for a cover and cap assembly for a vehicle light.

[0039] In one aspect, the present invention provides a vehicle light cover adapted to releasably attach to and overlay a light emitting face of a vehicle light assembly. The light cover comprises a panel defining a front face and an oppositely directed rear face, the rear face directed toward the vehicle light assembly upon attachment of the light cover thereto. The panel defines an edge extending around the perimeter of the panel, the panel defining an opening extending through the panel, the opening sized and shaped for light passing therethrough. The light cover also comprises a plurality of flexible engagement members projecting rearwardly from the panel. The plurality of engagement members are disposed at spaced intervals along the perimeter of the panel, each engagement member being flexible between a laterally outward position and a laterally inward position. The plurality of engagement members are positioned so as to receive and engage a portion of the vehicle light assembly. And, the light cover further comprises a light blocking rib extending rearwardly from the rear face of the panel, the rib located between the plurality of engagement members and the opening defined in the panel. The rib is spaced from the perimeter of the panel along the rear face of the panel a distance

such that upon attachment of the light cover to the vehicle light assembly and engagement of the plurality of engagement members to the vehicle light assembly, the rib extends alongside an interior wall of the vehicle light assembly thereby blocking light otherwise passing between an interface of the light assembly and the light cover.

[0040] In another aspect, the present invention provides a vehicle light cover assembly adapted to releasably attach to and overlay a light emitting face of a vehicle light assembly. The light cover assembly comprises a panel defining a front face and an oppositely directed rear face. The rear face is directed toward the vehicle light assembly upon attachment of the light cover thereto. The panel defines an edge extending around the perimeter of the panel. The panel also defines an opening extending through the panel, the opening sized and shaped for light passing therethrough. The panel further defines a slot accessible from the opening. The panel includes a plurality of flexible engagement members projecting from the panel, the plurality of engagement members adapted to receive and engage a vehicle light assembly and thereby attach the light cover thereto. And, the light cover assembly additionally comprises a cap sized and shaped to be releasably engaged in the opening defined in the panel. The cap defines a front face and an oppositely directed rear face. The cap includes a plurality of flexible engagement members projecting rearwardly from the cap, the plurality of engagement members adapted to receive and engage the panel of the light cover assembly and thereby attach the cap thereto. The cap also includes at least one retention member extending outward from at least one of the flexible engagement members and adapted to be disposed in the slot defined in the panel to thereby provide further securing of the cap with respect to the panel of the light cover assembly.

[0041] In yet another aspect, the present invention provides a vehicle light assembly comprising a light housing including a plurality of walls extending from a base. The walls and base define a hollow interior accessible from a light emitting face. The base is adapted to receive and retain a light emitting element. The walls define a lip extending around the periphery of the light emitting face, the lip disposed proximate a distal region of the walls with respect to the base. The light assembly also comprises a panel defining a front face and an oppositely directed rear face. The panel defines an edge extending around the perimeter of the panel. The panel defines an opening extending through the panel, and a slot accessible from the opening. The panel includes a plurality of flexible engagement members projecting from the panel, the plurality of engagement members adapted to receive and engage the lip of the light housing and thereby attach the panel thereto. And, the light assembly additionally comprises a cap sized and shaped to be releasably engaged in the opening defined in the panel. The cap defines a front face and an oppositely directed rear face. The cap includes a plurality of flexible engagement members projecting rearwardly from the cap, the plurality of engagement members adapted to receive and engage the panel and thereby attach the cap thereto. The cap also includes a retention member extending from an engagement member and adapted to be disposed in the slot defined in the panel to thereby provide further securing of the cap with respect to the panel.

[0042] The difficulties and drawbacks associated with previous-type systems are overcome in the present method and apparatus for a support member particularly adapted for supporting a vehicle panel.

[0043] In one aspect, the present invention provides a support member adapted for supporting a vehicle fascia. The support member comprises a longitudinal

member having a first end, a second end opposite from the first end, and a body extending between the first and second ends. The body defines a front face, an oppositely directed rear face, and a top face extending between the front and rear faces. The support member also comprises a bracket projecting from the longitudinal member and disposed proximate the first end of the longitudinal member. The bracket is adapted for mounting to a vehicle structural component. The support member additionally comprises a first fastener affixed to the body of the longitudinal member. The first fastener is adapted to engage a vehicle fascia and provide support for the fascia against displacement out of a first plane. And, the member also comprises a second fastener affixed to the longitudinal member proximate the second end of the longitudinal member. The second fastener is adapted to engage the vehicle fascia and provide support for the fascia against displacement out of a second plane different than the first plane. The support member further comprises a third fastener affixed to the longitudinal member proximate the second end of the longitudinal member. The third fastener is adapted to engage the vehicle fascia and provide support for the fascia against displacement out of a third plane different than the first plane and the second plane.

[0044] In another aspect, the present invention provides a support member adapted to support a vehicle panel having a plurality of engagement members disposed along an inner face of the panel. The support member comprises a longitudinal member including (i) a first end for mounting to a vehicle support, (ii) a second end opposite the first end, and (iii) a body extending between the first end and the second end, in which the body defines a top face. The support member also comprises at least one fastener disposed on the top face of the body and adapted to engage an engagement member disposed on an inner face of the vehicle panel.

The at least one fastener on the top face of the body provides support for the panel from being displaced out of a first plane generally parallel with a longitudinal axis of the body. And, the support member comprises at least one fastener disposed on the second end of the longitudinal member and adapted to engage an engagement member disposed on the inner face of the vehicle panel. The at least one fastener on the second end of the longitudinal member provides support for the panel from being displaced out of a second plane generally transverse to the longitudinal axis of the body. The support member further comprises at least one fastener disposed on the second end of the longitudinal member and adapted to engage an engagement member disposed on the inner face of the vehicle panel. The at least one fastener on the second end of the longitudinal member provides support for the panel from being displaced out of a third plane generally parallel with the longitudinal axis of the body.

[0045] The difficulties and drawbacks associated with previous-type systems are overcome in the present method and apparatus for vehicle front assemblies and particularly, structures for forming particular air flows therein prior to such air entering an engine air intake.

[0046] In one aspect, the present invention provides an air flow system for a vehicle. The air flow system is adapted to collect air from a frontal region of the vehicle and direct the air to an engine intake. The air flow system comprises at least one air entryway, the at least one air entryway disposed along a frontal region of the vehicle. The air flow system also comprises a passageway in flow communication with the at least one air entryway and disposed downstream of the air entryway. And, the air flow system comprises a cover including a first wall having a screen region, a second wall spaced from the first wall, and a floor extending between the

first and second walls. The first and second walls and the floor define a basin. The basin is disposed downstream of the passageway and in flow communication therewith via the screen region. And, the basin is disposed upstream of and in communication with the engine intake.

[0047] In another aspect, the present invention provides an air flow system for a vehicle. The air flow system is adapted to collect air from a frontal region of the vehicle and direct the air to an engine intake. The air flow system comprises at least one air entryway disposed along a frontal region of the vehicle. The air flow system further comprises a bulkhead cover including a screened portion. The bulkhead cover is disposed upstream of an engine intake and in flow communication therewith via the screened portion. And, the air flow system comprises a passageway disposed between the at least one air entryway and the bulkhead cover and in flow communication with the at least one air entryway and the screened portion of the bulkhead cover. The passageway includes a plurality of walls spaced from one another and arranged so as to define a flow path wherein air flowing through the passageway from the at least one air entryway to the bulkhead cover undergoes at least two reversals in direction.

[0048] In yet another aspect, the present invention provides a bulkhead cover adapted for use in a vehicle engine compartment. The bulkhead cover comprises a generally planar member defining an upper face and an oppositely directed lower face. The bulkhead cover also comprises a basin accessible from an upper face of the planar member and contiguous therewith. The basin includes a first wall extending from the lower face, a second wall facing the first wall and spaced therefrom, the second wall extending from the lower face, and a floor extending between the first and second walls and generally parallel to the lower face. The

basin defines a recessed region disposed below the lower face. The first wall defines a plurality of openings adapted to enable and promote passage of an air flow therethrough.

[0049] As will be realized, the invention is capable of other and different embodiments and its several details are capable of modifications in various respects, all without departing from the invention. Accordingly, the drawings and description are to be regarded as illustrative and not restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0050] Fig. 1 illustrates a preferred embodiment front bumper panel in accordance with the present invention.

[0051] Fig. 2 illustrates a preferred embodiment assembly including the front bumper panel of Fig. 1 and an accessory such as a light cover to be engaged therewith in accordance with the present invention.

[0052] Fig. 3 is a detailed view of the assembly of Fig. 2 illustrating a region of the bumper panel at which the accessory is temporarily engaged.

[0053] Fig. 4 is a perspective view of a front face of a preferred embodiment light cover in accordance with the present invention.

[0054] Fig. 5 is a perspective view of a rear face of the preferred embodiment light cover depicted in Fig. 4.

[0055] Fig. 6 is a front view of the preferred embodiment light cover of Fig. 4.

[0056] Fig. 7 is a cross section view of the preferred embodiment light cover taken across section line BB in Fig. 6.

[0057] Fig. 8 is a cross section view of the preferred embodiment light cover taken across section line AA in Fig. 6.

[0058] Fig. 9 is a schematic view illustrating the preferred embodiment light cover of Fig. 4 and its engagement with a light assembly disposed in a vehicle body panel.

[0059] Fig. 10 is a detailed schematic view illustrating a portion of the preferred embodiment light cover, the light assembly, and the vehicle body panel depicted in Fig. 9.

[0060] Fig. 11 is a perspective view of a preferred embodiment light cover cap in accordance with the present invention.

[0061] Fig. 12 is a side view of the preferred embodiment light cover cap shown in Fig. 11.

[0062] Fig. 13 is a front and partial perspective view of the preferred embodiment light cover cap shown in Fig. 11.

[0063] Fig. 14 is a cross section view of the preferred embodiment light cover cap, taken across section line CC in Fig. 13.

[0064] Fig. 15 is another perspective view of the preferred embodiment light cover cap illustrating in greater detail a fastener and a retention element on the fastener in accordance with the preferred embodiment.

[0065] Fig. 16 is a detailed view of a fastener shown in Fig. 15, illustrating a preferred embodiment retention element.

[0066] Fig. 17 is a partial schematic view illustrating engagement between the retention element of the light cover cap, and an engagement slot defined in the preferred embodiment light cover.

[0067] Fig. 18 is an exploded schematic view of a preferred embodiment system comprising a preferred embodiment cap, a preferred embodiment light cover, and a light assembly, in accordance with the present invention.

[0068] Fig. 19 is a perspective view of a vehicle front fascia and representative location of a preferred embodiment support member in accordance with the present invention.

[0069] Fig. 20 is a schematic view of the inner face of a portion of the vehicle front fascia depicted in Fig. 19, illustrating a rear face of a preferred embodiment support member engaged thereto.

[0070] Fig. 21 is a perspective view of the preferred embodiment support member shown in Fig. 20, illustrating a front face of the support member.

[0071] Fig. 22 is another perspective view of the preferred embodiment support member illustrating the front face of the member.

[0072] Fig. 23 is a planar view of the preferred embodiment support member.

[0073] Fig. 24 is an end view of the preferred embodiment support member.

[0074] Fig. 25 is a front elevational view of the preferred embodiment support member.

[0075] Fig. 26 is a perspective view of the preferred embodiment support member illustrating a first fastener or first set of fasteners provided on the member that provide support against displacement of the support member out of a plane illustrated as plane X.

[0076] Fig 27 is another perspective view of the preferred embodiment support member illustrating a second fastener or second set of fasteners provided on the member that provide support against displacement of the support member out of a plane illustrated as plane Y.

[0077] Fig. 28 is another perspective view of the preferred embodiment support member illustrating a third fastener or third set of fasteners provided on the member

that provide support against displacement of the support member out of a plane illustrated as plane Z.

[0078] Fig. 29 is a perspective view of a preferred embodiment bulkhead cover in accordance with the present invention.

[0079] Fig. 30 is a planar view of the preferred embodiment bulkhead cover depicted in Fig. 29.

[0080] Fig. 31 is a front elevational view of the preferred embodiment bulkhead cover depicted in Fig. 29.

[0081] Fig. 32 is a schematic illustration of a preferred embodiment vehicle front assembly using the preferred embodiment bulkhead cover, illustrating the resulting air flow in accordance with the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0082] The present invention relates to various aspects of vehicles, vehicle body panels, and components typically provided or utilized within a front region of the vehicle. Specifically, the invention is directed to a front bumper face, a front accessory light cover assembly, a front fascia support member, and a front bulkhead cover and air flow system.

FRONT BUMPER FACE

[0083] The present invention provides a system and related method that include a vehicle body panel and one or more accessories that are subsequently installed with the body panel after painting of the body panel and the accessories. Although the present invention includes a wide array of vehicle body panels, for purposes of describing the present invention, the panel shown in the accompanying drawings is

depicted as a front bumper panel. The present invention provides a vehicle body panel having provisions to temporarily retain one or more accessories to be installed or otherwise affixed to the panel after a painting operation. The accessories can be temporarily attached to the panel at a region different than that at which the accessories are to be finally installed, so that during painting, the accessories can be painted at the same time, and from the same source of paint as the body panel, without the requirement of any support structures such as painting jigs. After painting the body panel and the accessories temporarily attached thereto, once dried or sufficiently cured so that they may be handled, the accessories are removed and installed in their various designated regions on the panel.

[0084] Before turning attention to the preferred embodiments of the present invention, it is instructive to consider various terms used herein. The terms "installation engagement" and "temporary engagement" are periodically used herein to refer to two different modes of attaching a vehicle accessory or component to a vehicle such as a body panel of the vehicle. Installation engagement refers to a secure attachment in which the accessory is retained in its final, as-installed position relative to the body panel. Temporary engagement refers to a state of attachment in which the accessory, although retained and supported on the panel, can be readily removed therefrom. Typically, temporary engagement is such that the accessory is not entirely received or otherwise positioned within a receiving region defined in the panel.

[0085] Fig. 1 shows the general configuration of a front bumper panel, which is an example of a vehicle body panel to which the present invention is directed. Specifically, Fig. 1 depicts a preferred embodiment front bumper panel 100 having a front face 110. The front face 110 in its final form, receives one or more coatings of

paint. The bumper panel 100 defines an accessory receiving region 120, and includes one or more fastener elements 125 for use in engaging an accessory to the panel at that region 120. The receiving region 120 preferably includes a recessed region for receiving the accessory. In the present description, a representative accessory is described herein as a lighting assembly which includes a housing that retains a light emitting element, and a cover plate extending over the front face of the housing. One or more components of the lighting assembly are painted to match the exterior color of the vehicle. In its final installation in the front bumper panel 100, the lighting assembly is disposed in the receiving region 120. The bumper panel 100 also defines an accessory temporary receiving region 130, and includes one or more fastener elements 135 generally in or around that region for use in temporarily engaging the accessory to the panel at that region 130. The temporary receiving region 130 preferably includes a recessed region for receiving the accessory. In the present description, as described in greater detail herein, the temporary receiving region 130 and its associated fastener elements serve to temporarily receive and retain the lighting assembly.

[0086] Fig. 2 is an illustration of a preferred embodiment system in accordance with the present invention comprising the bumper panel of Fig. 1 and a cover or faceplate 200, such as a fog light cover. The accessory receiving region 120 defined in the bumper panel 100 is adapted to fittingly receive the faceplate 200. In addition, the receiving region 120 may also include one or more recessed supporting elements 122 that serve to support and contact a lighting element (not shown) that may be received within the receiving region 120. The receiving region 120 may also define one or more apertures such as aperture 124 that extend through the panel 100 and allow the lighting element to be flush or recessed with respect to the exterior

surface of the front face 110 of the bumper panel 100. The one or more apertures may also serve to provide access to the rear of the lighting element, for instance to enable repair or maintenance of the lighting element while installed in the panel, without removal of the lighting element from the panel 100. Preferably disposed along the periphery of the receiving region 120 are the fastener elements 125. As explained in greater detail herein, the type and arrangement of the fastener elements 125 correspond to the fastener elements provided for the faceplate 200.

[0087] Fig. 2 also illustrates an example of a preferred embodiment faceplate 200 for subsequent final installation in the body panel, at region 120. As noted, the faceplate 200 is depicted as a fog light cover. The faceplate 200 defines a front face 210 that includes an exterior surface or region. That exterior surface or region, or a portion thereof, will in its final form, receive one or more coatings of paint. The faceplate 200 includes one or more fastener elements 225 which are described in greater detail herein.

[0088] Fig. 2 further illustrates the accessory temporary receiving region 130, and the one or more fastener elements 135 provided generally in or around that region for use in temporarily engaging the faceplate to the panel at that region 130. As described in greater detail herein, the temporary receiving region 130 is preferably defined at or along a portion of the body panel 100 that will not be visible upon final installation of the panel in the vehicle of interest. However, the present invention includes the use of temporary receiving regions that are defined in regions of a body panel that are or will be visible upon final installation. The temporary receiving region 130 may be in any region or portion of the panel 100 and can be along any face, such as a front face which will be exposed to the exterior upon final installation, or a rear face which will not be exposed upon final installation of the

panel. Most preferably, the temporary receiving region 130 is defined along a portion of the panel 100 such that the region 130 will not be readily viewable or otherwise exposed to view upon final installation of the panel in the vehicle of interest. Also, it is generally preferred that the region 130 be relatively close to the accessory receiving region 120 defined in the panel 100 so as to reduce the amount of travel of the faceplate 200 when transferring it from the temporary receiving region 130 to the final installation region 120.

[0089] Fig. 3 is a detailed view of the assembly of Fig. 2 illustrating the temporary receiving region 130 of the bumper panel 100 at which the faceplate 200 is temporarily engaged therewith. The one or more fastener elements 135 of the temporary receiving region 130 are evident. These fastener elements 135 are adapted to engage with one or more fastener elements 225 provided on the faceplate 200, and preferably along a rear region or face of the faceplate. This configuration enables the front face 210 of the faceplate 200 to be oriented outward so that the exterior surface of the front face can receive paint during a painting operation.

[0090] The fastener elements 135 used in the temporary receiving region 130 and the fastener elements 125 in the receiving region 120 can independently be of any type typically used in the automotive arts for attaching accessories to body panels. For example, the fastener elements can be in the form of threaded fasteners such as bolts and screws; clamps; clasps; clips; peg and receiving members; rivots; pins such as clevis pins or cotter pins; retaining rings; bands of elastic material; snap engagement members; straps; staples; tacks; miscellaneous ties; hook and loop fasteners; and zipper type fasteners. It is also contemplated that for certain applications, adhesives could be used to temporarily attach the faceplate 200 to the

panel of interest. Preferably, the fastener elements in both the receiving regions in the body panel of interest are snap-type elements selected from female receiving elements adapted to slidingly receive and engage flexible male elements on the faceplate 200, flexible male elements adapted to slidingly engage female elements in the faceplate, or a combination of both. Preferably, the fastener elements, such as fastener elements 135, in the temporary receiving region 130 are of the same type and arranged as are the fastener elements 125 in the accessory receiving region 120 shown in Figs. 1 and 2. Most preferably, the fastener elements in the temporary receiving region 130 are identical to the fastener elements 125 in the receiving region 120. It is also preferred that the fastener elements 135 in the temporary receiving region 130 be adapted to readily engage the fastener elements 225 of the faceplate 200. For example, snap-type engagement elements are most preferred so that the accessory can be quickly engaged to the panel at the temporary receiving region 130, and then after painting, can be quickly and easily removed therefrom so that the faceplate can be subsequently installed in the accessory receiving region 120. The fastener elements 225 of the faceplate 200 can be of the same type to engage with the fasteners 125 and 135 previously noted for the receiving regions 120 and 130, respectively of the body panel of interest. Preferably, the fastener elements 225 of the faceplate 200 are snap-type elements selected from female receiving elements adapted to slidingly receive and engage flexible male elements in the region(s) of the panel, flexible male elements adapted to slidingly engage female elements in the region(s) of the panel, or a combination of both.

[0091] In addition to eliminating the requirement for painting jigs or other support assemblies for the accessories or faceplates, the present invention temporary engagement provisions on the body panel of interest, can also serve to retain the

accessory after painting and during one or more curing operations, Thus, in certain applications, it is contemplated that the accessory may be left temporarily attached to the panel, and then subjected to one or more heating operations or other paint curing stages.

[0092] The present invention provides a strategy by which one or more accessories such as faceplates are temporarily attached to a vehicle body panel and then the collection of accessories and panel are painted and optionally subjected to a drying or paint curing operation. Once the accessories can be handled, they are removed from the panel and then installed at their final intended location(s) on the panel. This strategy eliminates the need for separate support structures such as painting jigs to hold the accessories during painting.

[0093] It will be appreciated that the present invention can be utilized with respect to nearly any vehicle body panel besides a front bumper face as described herein. For example, the invention can be utilized in conjunction with rear bumper panels, rear quarter panels or fenders, side panels, doors, front quarter panels or fenders, hoods, roof panels, rocker panels, front panels such as grills, rear deck panels such as trunk lids, and any combination of vehicle panels. It is further contemplated that the present invention can be used in conjunction with body panels from vehicles besides automobiles. For example, the invention can be used in associated with panels used in trucks, vans, off-road vehicles, leisure vehicles, recreation vehicles, and the like. And, as previously noted, it will be appreciated that the invention can be used in association with any type of accessory or component that is to be painted and then installed on the vehicle.

FRONT ACCESSORY LIGHT COVER ASSEMBLY

[0094] Figs. 4 and 5 are perspective views showing a front face and a rear face, respectively, of a preferred embodiment light cover 100' in accordance with the present invention. The light cover or panel 100' defines a front face 110', an oppositely directed rear face 120', and an opening or aperture 130' for emission of light through the cover 100'. Upon attachment of the light cover 100' to a vehicle light assembly, the rear face 120' of the cover 100' is directed toward the vehicle light assembly and the front face 110' is directed toward the direction of light emission. As described in greater detail herein, the cover 100' also defines an optional engagement slot 140' that is accessible from the aperture 130'. The cover 100' includes an outer edge or periphery 150' generally extending around the perimeter of the cover 100'. Preferably extending around the periphery 150' of the cover 100' is a lip 160'. Defined on the rearwardly directed face of the lip 160', is a lip surface 162'. The cover also preferably includes one or more fasteners 170' disposed around the periphery 150' of the cover 100'. As described in greater detail herein, the one or more fasteners 170' are preferably in the form of flexible engagement members. Preferably, the fasteners 170' are disposed at spaced intervals along the perimeter of the cover 100'. Each fastener 170' is preferably positionally flexible between a laterally outward receiving position and a laterally inward engagement position. The collection of fasteners 170' are positioned so as to receive and engage a portion of a housing or other component of the vehicle light assembly. The number of fasteners 170' provided along an outer region of the cover 100' can range from one to twenty or more. However, it is generally preferred that the fasteners 170' range in number from four to twelve, more preferably from six to ten, and most preferably number eight per cover.

[0095] Preferably disposed along the rear face 120' of the cover 100' is a light blocking sealing rib 180'. The rib is preferably located between the collection of fasteners 170' and the aperture 130' defined in the cover 100', along the rear face 120' of the cover 100'. The sealing rib 180' may be continuous such that it forms a single integral component, or may be in the form of a plurality or collection of sealing ribs spaced apart from one another. The preferred form of the rib 180' is a single continuous rib, and so that version will be described herein. For versions of the light cover using a continuous sealing rib, it is preferred that the rib extends rearwardly along an outer periphery of the cover. The outer periphery may include the perimeter of the cover, or a region extending alongside the perimeter. The rib 180' defines an outwardly directed first face 182' and an oppositely directed inner second face 184'. A distal edge 186' is defined along the interface of the first and second faces 182' and 184'.

[0096] Fig. 6 is a front view of the preferred embodiment light cover 100' depicted in Figs. 4 and 5. It will be appreciated that although the opening or aperture 130' is depicted as having a round shape, the present invention includes a wide array of other shapes and configurations for the aperture 130'. Preferably, the aperture 130' is sized and shaped for light passing therethrough. The aperture is sized so that the aperture is large enough so that a relatively high proportion of light emitted from a lighting element can pass through the aperture. The aperture is shaped so that the aperture exhibits an aesthetically pleasing appearance, particularly upon actuation of the light. For example, the aperture in the preferred embodiment light cover can be square, rectangular, polysided, slotted, irregular in shape, or triangular. It is also contemplated that the light cover can define a plurality

of apertures, such as two, three, four, or more in number. And, these various apertures can be the same in shape, or have different shapes.

[0097] Fig. 7 is a cross section view of the preferred embodiment light cover 100' taken across section line BB in Fig. 3. Fig. 7 illustrates a typical configuration of the lip 160' and sealing rib 180' of the cover 100'. Fig. 7 also illustrates fasteners 170' disposed along an outer region of the lip 160'. Preferably, the fasteners 170' project rearwardly and in the same general direction as the sealing rib 180'. It is also preferred that the fasteners 170' are spaced outwardly from the sealing rib 180' by the lip surface 162'. The fasteners 170' and the sealing rib 180' preferably extend rearwardly from the rear face 120' of the light cover 100', and may be independently oriented from the rear face 120' by an angle of from about 30° to about 150°. Regardless of the angle of the fasteners 170' and the sealing rib 180' with respect to the rear face 120' of the cover 100', it is preferred that the fasteners 170' and rib 180' are generally parallel to one another as depicted in Fig. 7. Fig. 7 also illustrates a sealing rib 180' extending from the rear face 120' of the cover 100' and the oppositely directed faces 182' and 184' and edge 186' of the rib 180'.

[0098] Fig. 8 is a cross section view of the preferred embodiment light cover 100' taken across section line AA in Fig. 6. Fig. 8 further illustrates a typical configuration of the lip 160' and the sealing rib 180' of the cover 100'. Fig. 8 also illustrates the fasteners 170' disposed along an outer region of the lip 160'. Preferably, the fasteners 170' project rearwardly and in the same general direction as the sealing rib 180'. It will be appreciated that the angle at which the fasteners 170' and the sealing rib 180' extend relative to the rear face 120' of the cover 100' may vary depending upon the location along the rear face 120' at which such assessment is made. As noted in the description of Fig. 7, it is preferred that the

fasteners and the rib 180' extend in a parallel fashion. Regarding Fig. 8, it is to be understood that although the section line AA in Fig. 6 does not pass through a fastener 170', such fasteners would still be evident, hence their inclusion in Fig. 8. Moreover, the location of fasteners 170' is not crucial, and the present invention includes positioning fasteners 170' at any location along the periphery 150' of the cover 100'.

[0099] Fig. 9 is a schematic view illustrating the preferred embodiment light cover 100' of Fig. 4 and its engagement with a light assembly 300' disposed in a vehicle body panel 200'. Specifically, the cover 100' extends across an open face of the light assembly 300'. The aperture 130' is preferably located such that upon attachment of the cover 100' to the light assembly 300', the aperture 130' is directly adjacent to and aligned with a light element 320'. Preferably, the light blocking rib 180' is spaced from the perimeter of the cover 100' along the rear face of the cover 100' a distance such that upon attachment of the cover 100' to the vehicle light assembly 300' and engagement of the collection of fasteners 170' to a housing 310' of the vehicle light assembly 300', the rib 180' extends alongside an interior wall of the housing 310' thereby blocking light otherwise passing between an interface of the cover 100' and the light assembly 300'. Fig. 9 depicts a typical installation of the light assembly 300' within a vehicle body panel 200'. One or more support members 210' associated with the vehicle body panel, or the vehicle itself, may serve to support the light assembly 300'. Upon engagement of the light cover 100' to the light housing 310', it is preferred that the cover 100' be flush or recessed with respect to an adjacent outer surface 205' of the vehicle body panel 200'.

[00100] Fig. 10 is a detailed schematic view illustrating a portion of the preferred embodiment light cover 100', the light assembly 300', and the vehicle body panel

200' depicted in Fig. 9. Fig. 10 illustrates a preferred embodiment engagement configuration between the light cover 100' and the light assembly 300'. Preferably, the lip 160' of the light cover 100' is received by the light housing 310', such that the lip surface 162' contacts or is in very close proximity to a support ledge 315' defined by the housing 310'. The sealing rib 180' is preferably oriented such that the rib 180' extends alongside an inner face 312' of the light housing 310'. As shown in Fig. 10, this configuration between the sealing rib 180' and the light housing 310' precludes the emission of light between the interface of those two components, which if occurring, is referred to herein as light leakage.

[00101] Fig. 11 is a perspective view of a preferred embodiment light cover cap 400' in accordance with the present invention. The cap 400' defines a front face 410', an oppositely directed rear face 420', an outer edge 430' extending between those faces, and one or more fasteners 440'. The fasteners preferably extend rearwardly from the cap 400', and most preferably from the outer edge 430' or the rear face 420' of the cap 400'. The fasteners are preferably flexible members that are adapted to flexibly deform to receive and engage regions of the previously described light cover 100' best shown in Figs. 4-6, and particularly regions of the cover 100' proximate the aperture 130' defined in the cover 100'. As described in greater detail herein, at least one retention member 450' is disposed on one or more fasteners 440'. Upon engagement of the cap 400' within the aperture 130' of the light cover 100', the retention member is preferably aligned with and positioned within the engagement slot 140' of the cover 100'. This configuration reduces or preferably, essentially eliminates the possibility of the cap 400' becoming disengaged or otherwise detached from the light cover 100'.

[00102] Fig. 12 is a side view of the preferred embodiment light cover cap 400' shown in Fig. 11. Fig. 12 depicts a version of the preferred embodiment cap 400' in which a retention member 450' is provided on two or more fasteners 440'. It is to be understood however, that the present invention includes the use of a single retention member 450' on only one of a plurality of fasteners 440'.

[00103] Fig. 13 is a front view of the preferred embodiment light cover cap 400' shown in Fig. 11. Depending upon the preferences of the vehicle designer or owner, it may be preferred to paint the front face 410' of the cover 400' with the same paint as applied to the front face 110' of the cover 100'. It is also contemplated to provide one or more markings or other decorative indicia along the front face 410' of the cap 400'. In addition, one or more raised regions or recessed regions can be provided or otherwise formed along the front face 410' of the cap 400'.

[00104] Fig. 14 is a cross section view of the preferred embodiment light cover cap 400', taken across section line CC in Fig. 13. Fig. 14 illustrates a preferred configuration and orientation of the fasteners 440' extending rearwardly from the cap 400'. Fig. 14 illustrates that in certain embodiments, it may be preferred that the fasteners 440' although extending parallel to one another, extend at some angle other than 90° from the rear face 420' of the cap 400'. It will be appreciated that the present invention includes embodiments of the cap in which one or more fasteners independently extend rearwardly at angles of from about 30° to about 150°.

[00105] Fig. 15 is another perspective view of the preferred embodiment light cover cap 400' illustrating in greater detail a fastener 440' and a retention element 450' on the fastener in accordance with the preferred embodiment. The number of fasteners 440' per cap may vary from one to as many as twelve or more. However, typically, three to five are sufficient to retain the cap to the light cover. The fasteners

are preferably equally spaced from each other around the periphery of the cap. And, it is also preferred that the fasteners are all of the same type, configuration, size and shape. However, it is to be appreciated that the present invention includes the use of different types, sizes, shapes, and configurations of fasteners on a single cap.

[00106] Fig. 16 is a detailed view of the fastener 440' shown in Fig. 15, illustrating a preferred embodiment retention element 450'. The preferred embodiment fastener 440' includes an outwardly extending projection 442' and a retention member 444' that provides a distal tip 448' of the projection 442'. The projection 442' defines a front face 443' and an oppositely directed rear face 445'. Preferably, the retention member 444' defines an inclined engagement surface 446' which, upon engagement of the cap 400' to the light cover 100', contacts a portion of the cover 100'. Depending upon the particular configuration of the fastener 440' and the light cover 100', it is generally preferred that the engagement surface 446' is inclined relative to the longitudinal axis of the projection 442'. As noted, it is preferred that the fastener 440' be flexible, and so, upon engagement of the fastener 440' with a portion of the light cover 100', such as during installation of the cap 400' with the cover 100', the engagement surface 446' is contacted with a surface of the cover 100' and particularly an inner edge of the cover defining the opening 130'. The angled orientation of that surface 446' relative to the cover surface causes the projection 442' to be flexibly and temporarily deformed until the edge of the aperture 130' passes an apex 447' of the fastener 440'. After the edge of the cover 100' passes the apex 447', the projection 442' returns to its original position such that the front face 443' of the projection 442' of the fastener 440' contacts or is at least in very close proximity to, the rear face 120' of the light cover 100', and particularly the rear face 120' adjacent the aperture 130'.

[00107] Fig. 17 is a partial schematic view illustrating engagement between the retention element 450' disposed on a fastener 440' of the light cover cap 400', and the engagement slot 140' defined in the preferred embodiment light cover 100'. Preferably, the retention element 450' is of a size and shape so as to be received within the slot 140'. Upon engagement within the slot 140', the retention element 450' prevents movement of the cap 400' retained within the aperture 130' of the light cover 100'. Specifically, the retention element 450' precludes rotation of the cap 400'. As previously explained, it is common for such retained caps, particularly if round, to become dislodged of otherwise disengaged from a cover to which they were attached as a result of vibrations or impacts with road debris.

[00108] Fig. 18 is an exploded schematic view of a preferred embodiment system 500' comprising a preferred embodiment cap 400', a preferred embodiment light cover 100', and a light assembly 300', in accordance with the present invention. Fig. 18 illustrates a preferred configuration such that the cap 400' is engagable with the cover 100' by placement of the cap 400' over the aperture 130' defined in the cover 100'. The cap 400' is oriented such the fastener 440' having the retention element 450' is aligned with the slot 140'. Upon pressing the cap 400' over the aperture 130', the retention element 450' is received and engaged in the slot 140'. It will be understood that the distal portions of the fasteners 440' are urged inwardly during placement of the cap 400' over the aperture 130' and then released or otherwise allowed to return to their initial state after a distal portion of each fastener passes the rear face of the light cover 100' thereby engaging the cap 400' to the cover 100'. Similarly, the cover 100' is engaged to the light housing 310' by pressing the cover 100' onto the open face of the housing 310'. The plurality of fasteners 170' are urged

inward so that the cover can be fittingly engaged to and in close contact with the open face of the housing 310'.

[00109] The light cover and the cap can be formed from a wide array of materials. That is, nearly any type of material typically used in the automotive arts can be used, such as metals and various polymeric materials. For polymeric materials, it is preferred that resins be used such as polystyrene, ABS or acrylonitrile butadiene styrene (a ter-polymer or mixture of compounds), nylon (chemically resistant, heat resistant, tough and flexible), polypropylene (tough and flexible), polyethylene, and polyvinyl chloride or PVC. Preferably, both the light cover and the cap are formed from polypropylene.

[00110] The light cover and cap can be formed to exhibit a desired color or combination of colors. Often this determination will depend upon the exterior color of the vehicle. Color can be imparted to the light cover and to the cap by including a dye or coloring agent in the resin material prior to molding. Alternatively, the part, once molded, can be subjected to a painting operation. It is also contemplated to form the light cover and/or the cap from one or more materials that are translucent. This may provide a desired aesthetic effect upon actuation of the light assembly. Thus, in this contemplated embodiment, the cap could be formed from a yellow, green, blue, red, or other color so as to provide a tinted translucent material. Upon placement of the cap over the aperture defined in the light cover, a unique lighting effect can be realized. However, it is generally preferred that both the light cover and the cap be opaque.

[00111] It will be appreciated that the presently described light covers and caps are for use with either a left hand version of a light assembly, or a right hand version of such an assembly. That is, the covers and caps described herein are depicted in

the referenced figures as configured for only one side of a vehicle. It will be understood that a corresponding set of light cover and cap configured for the other side would be essentially identical to those described and shown herein, except that the corresponding set would be a mirror image thereof.

[00112] The light covers and caps described herein can be formed in a variety of fashions, primarily depending upon the material(s) selected for forming the covers and caps. For polymeric materials, it is generally preferred to form the covers and caps by one or more injection molding operations.

[00113] The present invention light covers and caps can be used in association with a wide array of vehicle lights. For example, the inventive light covers and caps can be used in conjunction with vehicle fog lights, accessory lights, front exterior lights, side exterior lights and the like.

VEHICLE FRONT FASCIA SUPPORT MEMBER

[00114] The present invention provides a support member adapted for supporting a vehicle panel, and particularly a region of a geometrically complex vehicle fascia. The support member can be attached to a vehicle frame or other structure at only one end. The cantilevered mounting of the present invention member enables the member to provide support for a specific desired region or portion of a vehicle fascia. Moreover, the unique configuration of fasteners at a distal end of the member and/or along the length of the member provide a wide range of applications for the support members of the present invention.

[00115] Fig. 19 is a perspective view of a vehicle front fascia 10" and representative location of a preferred embodiment support member 100" in accordance with the present invention. The fascia defines an upper edge 20", a

lower edge 30", a first side edge 40" generally extending between the upper edge 10" and the lower edge 30", and a second side edge 50" generally extending between the upper edge 20" and the lower edge 30". The fascia also defines one or more component openings 60", such as openings for lights or air entryways. Typically, the fascia 10" may define one or more fascia projections 70" that are generally thin, outwardly extending portions of the main fascia member which result from two or more converging outer edges meeting. Typically, projections 70" are located at or along the interface of the front fascia 10" and an adjacent panel or other vehicle component such as a hood or headlight (not shown). The fascia also defines an outer face 80" which typically receives one or more layers of paint in the desired exterior color(s), and an oppositely directed inner face 90".

[00116] Fig. 20 is a schematic view of the inner face 90" of a portion of the vehicle front fascia 10" depicted in Fig. 19, illustrating the preferred embodiment support member 100" engaged thereto. Fig. 20 also illustrates a plurality of ribs 95" provided along the inner face 90" of the fascia 10". The ribs 95" can serve a variety of functions such as providing strength and improved rigidity to the fascia 10", providing a point of attachment to the fascia, or a combination of these functions. As explained in greater detail herein, the ribs 95" may be oriented in a variety of different fashions and configurations. For example, a first rib or first set of ribs 95a" extends along the inner face 90" of the fascia 10", and is disposed in relatively close proximity to the upper edge 20" of the fascia. The first rib or first set of ribs 95a" may also extend in relatively close proximity to an edge of the fascia that defines the fascia projection 70". Preferably, the rib 95a" extends in a parallel direction as the upper edge 20". A second rib or second set of ribs 95b" extends along the inner face 90" of the fascia 10", and is disposed in relatively close proximity to an edge of

the fascia that defines the fascia projection 70". A third rib or third set of ribs 95c" extends along another edge of the fascia 10", and preferably that defines the fascia projection 70". The orientation of these various ribs and corresponding fasteners on the preferred embodiment support member 100" are described in greater detail herein.

[00117] Fig. 21 is a perspective view of the preferred embodiment support member 100" shown in Fig. 20, illustrating a front face 140" of the support member. The support member 100" defines a first end 110", a second end 120" opposite from the first end 110", and includes a longitudinal body or member 130" extending between the first and second ends 110" and 120", respectively. The longitudinal member 130" preferably defines a front face 140", a rear face 150" generally directed in an opposite direction as compared to the front face 140", a top face 160" generally extending between the front and rear faces 140" and 150", respectively, and a bottom face 170", generally opposite from the top face 160". It will be appreciated that the body 130" can have a greater or lesser number of faces and so can exhibit a wide array of cross sectional shapes. The support member also defines a bracket 200" extending from the first end 110" of the member 100". The bracket 200", as described in greater detail herein, preferably extends rearwardly from an end, such as the first end 110", of the longitudinal member 130". The member 130" may include, or be formed to define, a collection of partition members such as a first set of partition members 132" and a second set of partition members 134". The plurality of partitions define a collection of interior hollow regions. As will be appreciated, this configuration can be used to reduce the weight of the member while promoting the overall strength and rigidity of the member. Also provided on the preferred embodiment member 100" is a first or first set of fasteners 300", shown in

the figures as 300a", 300b", 300c", 300d", and 300e"; a second or second set of fasteners 400", shown in the figures as 400a"; and a third or third set of fasteners 500", shown in the figures as 500a". These fasteners 300", 400", and 500" and their engagement with corresponding regions of attachment on the fascia 10", such as ribs 95", are described in greater detail herein.

[00118] Fig. 22 is another perspective view of the preferred embodiment support member 100" illustrating the front face 140" of the member 100". Fig. 22 illustrates a preferred configuration of the bracket 200" and its orientation with regard to the longitudinal member 130". Preferably, the bracket 200" projects rearwardly, i.e. towards the same direction as that to which the rear face 150" is generally directed. The bracket 200" also preferably extends from the first end 110" of the support member 100". The bracket 200" defines one or more apertures such as aperture 205" for mounting the support member 100" to a vehicle frame or other structure. Disposed at the other end, opposite the bracket 200", are the fasteners 400" and 500".

[00119] Fig. 23 is a planar view of the preferred embodiment support member 100", illustrating the top face 160" of the member 100". The plurality of fasteners 300" are evident along the top face 160" of the longitudinal member 130". Also, it will be appreciated that although a slight curvature along the front face 140" is evident in Fig. 23, the present invention includes support members that exhibit different curvatures or configurations including one in which the front face 140" is straight or essentially planar.

[00120] Fig. 24 is an end view of the preferred embodiment support member 100", illustrating the second end 120" of the member 100". As previously noted, disposed at the second end 120" are preferably the second or second set of

fasteners 400" and the third or third set of fasteners 500". Fig. 24 also illustrates a preferred configuration for the bracket 200", that it have a triangular shape when viewed from its side. This configuration provides an increased area for mounting the bracket to a vehicle frame or other structure.

[00121] Fig. 25 is a front elevational view of the preferred embodiment support member 100", depicting the front face 140" of the member 100". Fig. 25 shows an exemplary arrangement of the first set of fasteners 300", depicted as fasteners 300a", 300b", 300c", 300d", and 300e". It will be understood that the present invention includes a greater or lesser number of the fasteners 300". It is also contemplated that the fasteners 300" could be provided along a bottom face of the longitudinal member 130". Fig. 25 also shows an exemplary arrangement for the second set of fastener(s) 400", depicted as a single fastener 400a". It will be understood that the invention includes the use of two or more fasteners 400", and that such fasteners 400" can be located along other regions of the support member 100" in addition to, or instead of, the second end 120". Fig. 25 also shows an exemplary arrangement for the third set of fastener(s) 500", depicted as a single fastener 500a". It will be understood that the invention includes the use of two or more fasteners 500", and that such fasteners 500" can be located along other regions of the support member 100" in addition to, or instead of, the second end 120".

[00122] Fig. 26 is a perspective view of the preferred embodiment support member 100" illustrating a first fastener 300" or first set of fasteners 300a", 300b", 300c", 300d", and 300e" provided on the member 100" that provide support against displacement of the support member 100" out of a plane designated as X. That is, the support member 100" provides support against forces or loads applied in a

direction generally transverse to plane X. This is explained by reference to Fig. 20. As previously explained, Fig. 20 illustrates a rib 95a" extending along an inner face 90" of the fascia 10". By engaging the support member 100" to the rib 95a" by use of the fasteners 300a"-300e", the fascia 10" and particularly fascia projection 70" can be supported against displacement out of plane X. It is to be appreciated that although reference is made to plane X, most fascias that are engaged with the fasteners 300" will not be planar along the entire length of the support member 100". Hence, the designation to plane X may also include two dimensional boundaries or regions having a slight curvature in that they follow the contour of the front face of the member 100". Preferably, the plane X is parallel or substantially so, to a longitudinal axis of the longitudinal member 130". Preferably, the fastener(s) 300" are oriented to engage a horizontal rib extending from the vehicle fascia. It is also recognized that the fastener 300" or set of fasteners 300a"-300e" can provide support against displacement of the member 100" out of other planes.

[00123] Fig 27 is another perspective view of the preferred embodiment support member 100" illustrating a second fastener 400" or second set of fasteners 400a" provided on the member 100" that provide support against displacement of the support member 100" out of a plane designated as Y. Specifically, the support member 100" provides support against forces or loads applied in a direction generally transverse to plane Y. Referring to Fig. 20, by engaging the support member 10" to the rib 95b" by use of the fastener 400a", the fascia 10" and particularly fascia projection 70", can be supported against displacement out of plane Y. Preferably, the plane Y is generally transverse to the longitudinal axis of the longitudinal member 130". Preferably, the fastener 400" is oriented to engage a

vertical rib extending from the vehicle fascia. It is recognized that fastener 400" can also provide support for the member 100" from being displaced in other directions.

[00124] Fig. 28 is another perspective view of the preferred embodiment support member 100" illustrating a third fastener 500" or third set of fasteners 500a" provided on the member 100" that provide support against displacement of the support member 100" out of a plane designated as Z. Support member 100" provides support against forces or loads applied in a direction generally transverse to plane Z. Referring to Fig. 20, by engaging the support member 100" to the rib 95c" by use of the fastener 500a", the fascia 10", and particularly fascia projection 70", can be supported against displacement out of plane Z. Preferably, the plane Z is generally parallel to the longitudinal axis of the longitudinal member 130". Preferably, the fastener 500" is oriented to engage a horizontal rib extending from the vehicle fascia. And, it will be understood that fastener 500" can also provide support for the member 100" from being displaced in other directions.

[00125] Preferably, the present invention support member, such as support member 100", includes appropriately positioned and appropriately oriented fasteners so that when engaged to a fascia, the support member provides support to resist displacement out of at least one of planes X, Y, and Z; preferably to resist displacement out of at least two of planes X, Y, and Z; and most preferably to resist displacement out of all three planes X, Y, and Z.

[00126] The present invention support member can be used as a sole support member to stabilize, retain, and engage a relatively large region of a vehicle fascia, and particularly, an outwardly projecting peripheral region of a fascia.

[00127] The present invention support member can be formed from a wide range of materials, such as but not limited to metals, polymeric materials such as plastics,

composite materials, or combinations thereof. Preferably the support members are formed from a plastic material having suitable physical characteristics. The present invention support member is preferably formed by one or more molding operations.

[00128] The fasteners used for fasteners 300", 400", and 500" can be nearly any type of fastener as typically used in the art. It is preferred that the fasteners be integrally formed with the support member. The fasteners can be resilient blind plastic clips with self-locking provisions as known in the art.

FRONT BULKHEAD COVER AND AIR FLOW SYSTEM

[00129] Fig. 29 is a perspective view of a preferred embodiment bulkhead cover 100'" in accordance with the present invention. The bulkhead cover 100'" is generally in the form of a planar member and defines an upper face 110'", an oppositely directed bottom face 112'", and forward, rearward, and lateral edges 102'", 104'", 106'" and 108'", respectively, that extend around the perimeter of the cover 100'". The bulkhead cover 100'" also defines a plurality of mounting apertures 120'" and one or more component openings 122'" that extend through the thickness of the cover. As will be appreciated, the mounting apertures 120'" are adapted to receive fasteners that extend through the cover 100'" and attach the cover to a support structure within the vehicle. The component openings 122'" are provided to receive various components or portions of components that may extend through the cover 100'". The bulkhead cover 100'" is installed within a vehicle, and specifically within an engine compartment. The cover 100'" is typically positioned over a radiator and forwardly of the engine. A preferred installation of the cover 100'" and its incorporation within a vehicle front assembly is described in greater detail herein.

[00130] In accordance with the present invention, the preferred embodiment bulkhead cover 100''' includes a basin 130'''. The basin 130''' is preferably a recessed region formed or otherwise defined in the cover 100'''. The basin 130''' may be defined in nearly any region of the cover 100''', such as for example, on the left portion of the cover 100''', on the right portion of the cover 100''' (as depicted in Fig. 29), in the front portion of the cover 100''' (as also depicted in Fig. 29), in the rear portion of the cover 100''', in the center of the cover 100''', or in one or more combinations of these portions. The particular location of the basin 130''' primarily depends upon the configuration of an engine air intake and other components within the engine compartment or region of a vehicle. These aspects are described in greater detail in conjunction with Fig. 32, described below.

[00131] Referring further to Fig. 29, the basin 130''' preferably includes a front basin wall 132''' that includes a screen region 134'''. The basin 130''' also includes a rear basin wall 136''' spaced rearwardly from the front basin wall 132'''. The basin 130''' also includes a floor 138''' extending between the front and rear basin walls 132''' and 136''', respectively. Depending upon the configuration of the basin, one or more side walls may also be provided, such as a first side wall 139''' and a second side wall 140'''. The side walls extend between the front and rear basin walls 132''' and 136'''. The interior surfaces of the front wall 132''', the screen region 134''', the rear wall 136''', the floor 138''', and the side walls 139''' and 140''', if used, collectively define a basin interior surface 142'''. The interior of the basin 130''' is accessible from the upper face 110''' of the cover 100'''.

[00132] Fig. 30 is a planar view and Fig. 31 is a front elevational view of the preferred embodiment bulkhead cover 100''' depicted in Fig. 29. These figures reveal additional structural aspects of the cover 100''', and particularly the basin 130'''.

Specifically, Fig. 31 illustrates the screen region 134"', and a plurality of apertures 135"' defined in that region. The apertures 135"' are adapted to enable and promote air flow through the screen region 134"', and so are designed to promote minimal frictional resistance to a passing air flow. This may include providing smooth surfaces and rounded edges for the apertures 135"'. It is preferred that the number of apertures and relative size of each aperture be such that a relatively high percentage of area openings is defined across the screen region. For example, preferably, the percentage of openings or total area of the openings, expressed relative to the total area of the screen region is at least 50%, more preferably at least 60%, and most preferably at least 70%. It will be understood that the upper limit for the proportion of the openings in the screen region is typically limited by a requirement for some type of supporting structure for the screen region. Typically, the area of such structure in the screen region will occupy at least 5% of the total area of the screen region.

[00133] A wide array of shapes may be used for the apertures 135"' in the screen region 134"'. The preferred embodiment bulkhead cover 100"' depicted in the referenced figures is shown as having slotted or oval shaped apertures 135"'. This shape is preferred as it provides a relatively high percentage of openings in the screen region 134"', yet also enables a relatively strong and rigid support structure to extend across the screen region. However, it will be appreciated that the present invention includes numerous other shapes for the screen apertures 135"' such as, but not limited to, circles, squares, rectangles, triangles, polysided shapes, and irregular shapes.

[00134] Typically, the screen region 134"' may be formed by molding a desired pattern of apertures in the front basin wall 132"'. However, it is also contemplated

that the present invention could utilize one or more wire mesh screen assemblies or other components that are installed in one or more openings formed in the basin wall(s).

[00135] The preferred embodiment bulkhead cover 100''' is preferably formed in one or more molding operations. Although the cover can be formed by assembling or joining multiple components, it is preferred that the cover 100''' and particularly the basin 130''' be integrally formed. Thus, the basin walls such as walls 132''' and 136''' are preferably contiguous with the other portions of the cover 100'''.

[00136] Fig. 32 is a schematic illustration of a preferred embodiment vehicle front assembly 200''' in a frontal region of a vehicle using the preferred embodiment bulkhead cover 100''', illustrating a resulting air flow AF and its path through the assembly in accordance with the present invention. The vehicle front assembly 200''' is typically disposed proximate one or more vehicle body panels 210''' and is supported by one or more vehicle support members 220'''. Depending upon the particular configuration of the vehicle, the assembly 200''' is generally disposed above a front bumper face 230'''. The vehicle front assembly 200''' comprises one or more vehicle front members 240''' that define or otherwise provide air entryway opening(s) 242''' that enable air to enter the front region of the vehicle. Fig. 32 illustrates air flow AF entering the assembly 200''' through openings 242'''. One or more grill sections 250''' may be disposed across the openings 242''' to guard against entry of debris or other items with which the vehicle may come into contact. The grill sections 250''', if sufficiently visible from the exterior of the vehicle, may also serve to provide a particular aesthetic function and improve the appearance of the front exterior region of the vehicle.

[00137] Fig. 32 illustrates a preferred mounting configuration of the preferred embodiment bulkhead cover 100'''. The cover 100''' is disposed generally above and rearward of the opening(s) 242''' through which the air flow AF enters. One or more enclosure panels 260''' are preferably provided below the cover 100''' and most preferably, directly below the basin 130''' of the cover 100'''. The enclosure panel(s) 260''' are preferably oriented vertically, or substantially so, for reasons described later herein. The cover 100''' is also preferably disposed frontwardly of an engine air intake 300'''. The intake 300''', or plenum or section thereof, can be directly mounted to the cover 100''', and share a common mounting aperture 120'''.

[00138] Fig. 32 also illustrates another feature of the preferred embodiment bulkhead cover 100''', and particularly the configuration of the basin 130'''. As shown in Fig. 32, it is preferred that at least one of the front basin wall 132''' and the rear basin wall 136''' extend at an angle from the lower face 112''' of the cover 100'''. Preferably, both the front wall 132''' and the rear wall 136''' extend at an angle or angles, with respect to the lower face 112''' of the cover 100'''. It is preferred that this angle(s) is other than 90°. Generally, the angle(s) at which the front and rear walls extend can be from about 30° to about 60°, and preferably about 45°. Although the present invention includes a basin configuration in which the front and rear basin walls extend transversely, i.e., 90°, from the lower face 112''' of the bulkhead cover 100''', it is preferred that these walls extend toward one another, so as to reduce the space requirements for the bulkhead cover. In addition, it is believed that configuring the rear basin wall 136''' to extend at an angle of from about 30° to about 60° also promotes efficient deflection of an air stream entering the basin as described below.

[00139] Before turning attention to additional aspects of the present invention, it is instructive to consider various terminology used herein in describing air flows in and

around a vehicle front assembly. Air flowing into a front region of a vehicle is flowing in a direction toward the rear of the vehicle, and so is referred to herein as flowing rearwardly or in a rearward direction. Similarly, air flowing toward the front of the vehicle is referred to as flowing forwardly or in a forward direction. It will be understood that these terms do not require the air flow to travel in a direction parallel with a longitudinal axis of the vehicle, but that the direction of travel merely contain a component vector that is either forward or rearward. Also, the terms "upstream" and "downstream" are periodically used herein to describe locations or components in the air flow path. It will be appreciated that the term upstream refers to a location or component in the path of a flow that is before or prior to something. That is, upstream refers to a location or component in a flow path that is closer to the source of the flow than another location or component. And, the term downstream refers to a location or component in the path of a flow that is after something. Specifically, downstream refers to a location or component in a flow path that is further from the source of the flow than another location or component.

[00140] Description will now be provided of a significant feature of the present invention, the unique air flow resulting from the preferred embodiment assembly 200''' and use of the preferred embodiment bulkhead cover 100'''. Referring to Fig. 32, entering air flow is shown as the arrow AF. Air entering the vehicle passes through the grill or grill section 250'''. The air flows to location A, at which its rearward direction is diverted and preferably reversed by one or more enclosure panel(s) 260''' (not shown at this location in Fig. 32). Preferably, the air flow is diverted upward and the direction of the air flow is reversed so that the air flow is now in a forward direction to location B, downstream of location A. At about location B, the direction of the air flow is again reversed so that the air flows in a rearward direction to location

C, downstream of location B. One or more interior faces of the vehicle front member 240''' preferably divert the air flow at location B, however enclosure panel(s) 260''' could also be used. The air flow continues to location C in the vehicle assembly 200''', at which the direction of the air is again significantly altered, and preferably reversed by the enclosure panel 260''' to a frontward direction to location D, downstream of location C. One or more interior faces of the vehicle front member 240''' preferably divert the air flow at location D, however enclosure panel(s) 260''' could also be used. From location D, the air flow is again in a rearward direction and enters the front wall 132''' of the basin 130''' of the cover 100'''. Specifically, the air flow enters the screen region 134''' of the basin 130''' and continues to about location E within the basin 130''' of the cover 100'''. At location E, downstream of location D, the direction of the air flow is again altered, typically by the rear basin wall 136'''. The air flow continues to location F, downstream of location E, at which the air flow is again diverted to a direction consistent with the engine air intake 300'''. The intake 300''' is downstream of location F. The air flow can be diverted at location F by one or more panels, or the underside of the vehicle hood may serve to accomplish such diversion.

[00141] The preferred embodiment air flow strategy of the present invention exhibits various features. One feature relates to the number of reversals in air flow direction. Preferably, the present invention front vehicle assembly achieves at least two reversals in air flow direction. That is, the air flow is caused to change to a forward direction at least twice (or change to a rearward direction at least twice) after entering the front vehicle assembly and prior to entering the engine air intake. The use of multiple directional changes, particularly in relatively rapid succession, results in a large proportion of entrained particles to be separated from the air flow. This in

turn results in less interference for the air flow at one or more filter elements downstream in the engine air intake because there is less potential for blockage at the filter elements from collected particles. Another feature of the present invention is that after passing through the screen region 134''' of the preferred embodiment bulkhead cover 100''', the air flow, although diverted in direction, is not caused to reverse in direction. This feature promotes maintenance of velocity of the air flow at this location and thus increases or at least maintains a relatively high total air volume to the engine air intake. Yet another benefit provided by the present invention, is that the majority of the tortuous path provided by the assembly, such as assembly 200''', occurs upstream of the basin or prior to passage of air through the bulkhead cover. Thus, a very large proportion of entrained particles have already been separated from the air flow before entering the basin 130''' of the preferred embodiment cover 100'''. This in turn results in less accumulation of dirt, debris, and moisture in the basin and on surfaces of the cover 100'''.

[00142] The present invention such as embodied in the preferred vehicle front assembly 200''', can take a variety of different forms. Accordingly, the invention is not limited to the particular structure or resulting air flow shown in Fig. 32. Instead, the present invention includes a wide array of air flow passageway(s) formed or otherwise defined in vehicle front regions, disposed between one or more air entryways typically located along a front region of a vehicle and a bulkhead cover, all of which are disposed upstream of an engine air intake. The passageway of the present invention includes a plurality of spaced apart walls arranged so as to define a flow path wherein air flowing through the passageway from the vehicle air entryway to the engine air intake, and preferably prior to passing through a bulkhead cover, undergoes at least two reversals in direction. The reversals in direction can be

reversals in any pair of opposing directions. And so, the present invention includes passageways that cause air flows to undergo at least two reversals in a vertical plane, a horizontal plane, or any planes therebetween, or combinations of planes. Preferably, the passageway is configured to cause an air flow to undergo at least two reversals in direction in a generally vertical plane as depicted in Fig. 32. However, it is preferred that the passageway be configured to cause air flows to undergo at least two reversals in any direction, and most preferably in rearward and forward directions as described herein.

[00143] Many other benefits will no doubt become apparent from future application and development of this technology.

[00144] All patents, published applications, and articles noted herein are hereby incorporated by reference in their entirety.

[00145] As described hereinabove, the present invention solves many problems associated with previous type devices. However, it will be appreciated that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art without departing from the principle and scope of the invention, as expressed in the appended claims.

WHAT IS CLAIMED IS:

1. A vehicle body panel comprising:

a panel, the panel defining (i) a first region for installation engagement of a removable accessory, the panel including at least one fastener element in the first region adapted to engage a corresponding fastener element of the accessory, and (ii) a second region for temporary engagement of the accessory, the panel including at least one fastener element in the second region adapted to temporarily engage a corresponding fastener element of the accessory.

2. The vehicle body panel of claim 1 wherein the at least one fastener element in the first region is identical to the at least one fastener element in the second region.

3. The vehicle body panel of claim 1 wherein the first region includes a recessed area of the panel.

4. The vehicle body panel of claim 1 wherein the second region includes a recessed area of the panel.

5. The vehicle body panel of claim 1 wherein the at least one fastener element in the first region of the panel is selected from the group consisting of female receiving fastener elements, flexible male fastener elements, and combinations thereof.

6. The vehicle body panel of claim 1 wherein the at least one fastener element in the second region of the panel is selected from the group consisting of female receiving fastener elements, flexible male fastener elements, and combinations thereof.

7. The vehicle body panel of claim 1 wherein the panel is a front bumper panel.

8. A vehicle body panel and accessory assembly, the assembly comprising:

a vehicle accessory including at least one fastener element;

a vehicle panel defining a first region and a second region, the panel including (i) a first fastener element in the first region adapted for installation engagement with the at least one fastener element of the accessory, and (ii) a second fastener element in the second region adapted for temporary engagement of the at least one fastener element of the accessory.

9. The panel and accessory assembly of claim 8 wherein the at least one fastener element of the accessory is selected from the group consisting of female receiving fastener elements, flexible male fastener elements, and combinations thereof.

10. The panel and accessory assembly of claim 8 wherein the accessory is a lighting faceplate.

11. The panel and accessory assembly of claim 8 wherein the at least one fastener element in the first region of the vehicle panel is identical to the at least one fastener element in the second region.

12. The panel and accessory assembly of claim 8 wherein the first region of the vehicle panel includes a recessed area of the panel.

13. The panel and accessory assembly of claim 8 wherein the second region of the vehicle panel includes a recessed area of the panel.

14. The panel and accessory assembly of claim 8 wherein the at least one fastener element in the first region of the vehicle panel is selected from the group consisting of female receiving fastener elements, flexible male fastener elements, and combinations thereof.

15. The panel and accessory assembly of claim 8 wherein the at least one fastener element in the second region of the vehicle panel is selected from the group consisting of female receiving fastener elements, flexible male fastener elements, and combinations thereof.

16. The panel and accessory assembly of claim 8 wherein the panel is a front bumper panel.

17. The panel and accessory assembly of claim 8 wherein the accessory is a lighting faceplate and the vehicle panel is a front bumper face.

18. A method of supporting an accessory component while painting the component and a vehicle panel to which the component is to be subsequently engaged, the method comprising:

providing a vehicle panel having a first fastener element and a second fastener element, each element adapted to engage an accessory component;

providing an accessory component adapted to engage the first and second fastener elements of the vehicle panel;

temporarily engaging the accessory component to the first fastener element of the vehicle panel prior to painting;

painting the vehicle panel and the accessory temporarily engaged thereto;

after painting of the vehicle panel and the accessory component, disengaging the accessory component from the first fastener element of the vehicle panel; and

engaging the accessory component to the second fastener element of the vehicle panel.

19. The method of claim 18 wherein the accessory component is a lighting faceplate and the vehicle panel is a front bumper face.

20. The method of claim 18 further comprising:

prior to engaging the accessory component to the second fastener element of the vehicle panel, drying the painted vehicle panel and the accessory.

21. A vehicle light cover adapted to releasably attach to and overlay a light emitting face of a vehicle light assembly, the light cover comprising:

a panel defining a front face and an oppositely directed rear face, the rear face directed toward the vehicle light assembly upon attachment of the light cover thereto, the panel defining an edge extending around the perimeter of the panel, the panel defining an opening extending through the panel, the opening sized and shaped for light passing therethrough;

a plurality of flexible engagement members projecting rearwardly from the panel, the plurality of engagement members disposed at spaced intervals along the perimeter of the panel, each engagement member being flexible between a laterally outward position and a laterally inward position, the plurality of engagement members positioned so as to receive and engage a portion of the vehicle light assembly; and

a light blocking rib extending rearwardly from the rear face of the panel, the rib located between the plurality of engagement members and the opening defined in the panel, the rib also being spaced from the perimeter of the panel along the rear face of the panel a distance such that upon attachment of the light cover to the vehicle light assembly and engagement of the plurality of engagement members to the vehicle light assembly, the rib extends alongside an interior wall of the vehicle light assembly thereby blocking light otherwise passing between an interface of the light assembly and the light cover.

22. The vehicle light cover of claim 21, wherein the light blocking rib is continuous and extends around an outer periphery of the panel.

23. The vehicle light cover of claim 21 wherein the flexible engagement members range in number from four to twelve per panel.

24. The vehicle light cover of claim 23 wherein the flexible engagement members number eight per panel.

25. The vehicle light cover of claim 21 wherein the opening defined in the panel is round.

26. The vehicle light cover of claim 21 wherein the panel further defines an engagement slot accessible from the opening.

27. A vehicle light cover assembly adapted to releasably attach to and overlay a light emitting face of a vehicle light assembly, the light cover assembly comprising;

a panel defining a front face and an oppositely directed rear face, the rear face directed toward the vehicle light assembly upon attachment of the light cover thereto, the panel defining an edge extending around the perimeter of the panel, the panel defining an opening extending through the panel, the opening sized and shaped for light passing therethrough, the panel further defining a slot accessible from the opening, the panel including a plurality of flexible engagement members projecting from the panel, the plurality of engagement members adapted to receive and engage a vehicle light assembly and thereby attach the light cover thereto; and

a cap sized and shaped to be releasably engaged in the opening defined in the panel, the cap defining a front face and an oppositely directed rear face, the cap including a plurality of flexible engagement members projecting rearwardly from the cap, the plurality of engagement members adapted to receive and engage the panel of the light cover assembly and thereby attach the cap thereto, the cap also including at least one retention member extending outward from at least one of the flexible engagement members and adapted to be disposed in the slot defined in the panel to thereby provide further securing of the cap with respect to the panel of the light cover assembly.

28. The vehicle light cover assembly of claim 27 wherein the panel further includes a light blocking rib extending rearwardly from the rear face of the panel.

29. The vehicle light cover assembly of claim 28, wherein the light blocking rib is continuous and extends around an outer periphery of the panel.

30. The vehicle light cover assembly of claim 27 wherein the flexible engagement members of the panel range in number from four to twelve per panel.

31. The vehicle light cover assembly of claim 30 wherein the flexible engagement members number eight per panel.

32. The vehicle light cover assembly of claim 27 wherein the opening defined in the panel is round.

33. The vehicle light cover assembly of claim 27 wherein the cap includes a total of from one to twelve of the flexible members.

34. The vehicle light cover assembly of claim 33 wherein the cap includes a total of three to five flexible engagement members.

35. The vehicle light cover assembly of claim 27 wherein the cap includes a first retention member extending outward from a first flexible engagement member, and a second retention member extending outward from a second flexible engagement member.

36. A vehicle light assembly comprising:

a light housing including a plurality of walls extending from a base, the walls and base defining a hollow interior accessible from a light emitting face, the base adapted to receive and retain a light emitting element, the walls defining a lip extending around the periphery of the light emitting face, the lip disposed proximate a distal region of the walls with respect to the base;

a panel defining a front face and an oppositely directed rear face, the panel defining an edge extending around the perimeter of the panel, the panel defining an opening extending through the panel, the panel further defining a slot accessible from the opening, the panel including a plurality of flexible engagement members projecting from the panel, the plurality of engagement members adapted to receive and engage the lip of the light housing and thereby attach the panel thereto; and

a cap sized and shaped to be releasably engaged in the opening defined in the panel, the cap defining a front face and an oppositely directed rear face, the cap including a plurality of flexible engagement members projecting rearwardly from the cap, the plurality of engagement members adapted to receive and engage the panel and thereby attach the cap thereto, the cap also including a retention member extending from an engagement member and adapted to be disposed in the slot defined in the panel to thereby provide further securing of the cap with respect to the panel.

37. The vehicle light assembly of claim 36 wherein the panel further includes a light blocking rib extending rearwardly from the panel.

38. The vehicle light assembly of claim 37 wherein the light blocking rib is continuous and extends around an outer periphery of the panel.

39. The vehicle light assembly of claim 36 wherein the opening defined in the panel is round.

40. The vehicle light assembly of claim 36 wherein the cap further includes a second retention member extending from another engagement member.

41. A support member adapted for supporting a vehicle fascia, the support member comprising:

a longitudinal member having a first end, a second end opposite from the first end, and a body extending between the first and second ends, the body

defining a front face, an oppositely directed rear face, and a top face extending between the front and rear faces;

a bracket projecting from the longitudinal member and disposed proximate the first end of the longitudinal member, the bracket adapted for mounting to a vehicle structural component;

a first fastener affixed to the body of the longitudinal member, the first fastener adapted to engage a vehicle fascia and provide support for the fascia against displacement out of a first plane;

a second fastener affixed to the longitudinal member proximate the second end of the longitudinal member, the second fastener adapted to engage the vehicle fascia and provide support for the fascia against displacement out of a second plane different than the first plane; and

a third fastener affixed to the longitudinal member proximate the second end of the longitudinal member, the third fastener adapted to engage the vehicle fascia and provide support for the fascia against displacement out of a third plane different than the first plane and the second plane.

42. The support member of claim 41 wherein the first fastener is disposed on the top face of the body of the longitudinal member between the first end and the second end.

43. The support member of claim 41 wherein the first plane is generally parallel to a longitudinal axis of the longitudinal member.

44. The support member of claim 41 wherein the second plane is generally transverse to the longitudinal axis of the longitudinal member.

45. The support member of claim 41 wherein the third plane is generally parallel to a longitudinal axis of the longitudinal member.

46. The support member of claim 41 wherein the longitudinal member includes a plurality of partitions that define a plurality of interior hollow regions.

47. The support member of claim 41 wherein the bracket projects rearwardly from the longitudinal member.

48. The support member of claim 41 wherein the member is formed from a polymeric material.

49. The support member of claim 41 wherein the first fastener is oriented to engage a horizontal rib extending from the vehicle fascia.

50. The support member of claim 41 wherein the second fastener is oriented to engage a vertical rib extending from the vehicle fascia.

51. The support member of claim 41 wherein the third fastener is oriented to engage a horizontal rib extending from the vehicle fascia.

52. A support member adapted to support a vehicle panel having a plurality of engagement members disposed along an inner face of the panel, the support member comprising:

a longitudinal member including (i) a first end for mounting to a vehicle support, (ii) a second end opposite the first end, and (iii) a body extending between the first end and the second end, the body defining a top face;

at least one fastener disposed on the top face of the body and adapted to engage an engagement member disposed on an inner face of the vehicle panel, the at least one fastener disposed on the top face of the body providing support for the panel from being displaced out of a first plane generally parallel with a longitudinal axis of the body;

at least one fastener disposed on the second end of the longitudinal member and adapted to engage an engagement member disposed on the inner face of the vehicle panel, the at least one fastener disposed on the second end of the longitudinal member providing support for the panel from being displaced out of a second plane generally transverse to the longitudinal axis of the body; and

at least one fastener disposed on the second end of the longitudinal member and adapted to engage an engagement member disposed on the inner face of the vehicle panel, the at least one fastener disposed on the second end of the longitudinal member providing support for the panel from being displaced out of a third plane generally parallel with the longitudinal axis of the body.

53. The support member of claim 52 wherein the longitudinal member includes a plurality of partitions that define a plurality of interior hollow regions.

54. The support member of claim 52 further comprising:

a bracket projecting from the first end of the longitudinal member and adapted for mounting to the vehicle support.

55. The support member of claim 54 wherein the bracket projects rearwardly from the longitudinal member.

56. The support member of claim 52 wherein the member is formed from a polymeric material.

57. The support member of claim 52 wherein the at least one fastener on the top face of the body is oriented to engage a horizontal rib extending from the vehicle fascia.

58. The support member of claim 52 wherein at least one fastener on the second end of the longitudinal member is oriented to engage a vertical rib extending from the vehicle fascia.

59. The support member of claim 52 wherein at least one fastener on the second end of the longitudinal member is oriented to engage a horizontal rib extending from the vehicle fascia.

60. An air flow system for a vehicle, the air flow system adapted to collect air from a frontal region of the vehicle and direct the air to an engine intake, the air flow system comprising:

at least one air entryway, the at least one air entryway disposed along a frontal region of the vehicle;

a passageway in flow communication with the at least one air entryway and disposed downstream of the air entryway;

a cover including a first wall having a screen region, a second wall spaced from the first wall, and a floor extending between the first and second walls, the first and second walls and the floor defining a basin, the basin disposed downstream of the passageway and in flow communication therewith via the screen region, and the basin disposed upstream of and in communication with the engine intake.

61. The air flow system of claim 60 wherein the cover defines an upper face, and the basin defines an interior region accessible from and disposed below the upper face of the cover.

62. The air flow system of claim 60 wherein the screen region defines a plurality of apertures.

63. The air flow system of claim 62 wherein the apertures are slotted in shape.

64. The air flow system of claim 60 wherein the percentage of openings in the screen region is at least 50%.

65. The air flow system of claim 60 wherein the passageway includes a plurality of walls spaced from one another and arranged so as to define a flow path wherein air flowing through the passageway from the at least one air entryway to the basin of the cover undergoes at least two reversals in direction.

66. An air flow system for a vehicle, the air flow system adapted to collect air from a frontal region of the vehicle and direct the air to an engine intake, the air flow system comprising:

at least one air entryway disposed along a frontal region of the vehicle;

a bulkhead cover including a screened portion, the bulkhead cover disposed upstream of the engine intake and in flow communication therewith via the screened portion; and

a passageway disposed between the at least one air entryway and the bulkhead cover and in flow communication with the at least one air entryway and the screened portion of the bulkhead cover, the passageway including a plurality of walls spaced from one another and arranged so as to define a flow path wherein air flowing through the passageway from the at least one air entryway to the bulkhead cover undergoes at least two reversals in direction.

67. The air flow system of claim 66 wherein the passageway is oriented and configured to cause air flowing through the passageway to undergo at least two reversals in direction in a vertical plane.

68. The air flow system of claim 66 wherein the passageway is oriented and configured to cause air flowing through the passageway to undergo at least two reversals in rearward and forward directions.

69. The air flow system of claim 66 wherein the bulkhead cover defines a recessed basin, the basin disposed downstream of the passageway and in flow communication therewith via the screened portion.

70. The air flow system of claim 66 wherein the screened portion defines a plurality of apertures slotted in shape.

71. The air flow system of claim 70 wherein the percentage of openings in the screened portion is at least 50%.

72. A bulkhead cover adapted for use in a vehicle engine compartment, the bulkhead cover comprising:

a generally planar member defining an upper face and an oppositely directed lower face; and

a basin accessible from an upper face of the planar member and contiguous therewith, the basin including a first wall extending from the lower face of the planar member, a second wall facing the first wall and spaced therefrom, the second wall extending from the lower face of the planar member, and a floor extending between the first and second walls and generally parallel to the lower face of the planar member, the basin defining a recessed region disposed below the face,

and the first wall defining a plurality of openings adapted to enable and promote passage of an air flow therethrough.

73. The bulkhead cover of claim 72 wherein the basin further includes a first side wall disposed between the first wall and the second wall and extending between the lower face of the planar member and the floor, and a second side wall disposed between the first wall and the second wall and extending between the lower face of the planar member and the floor.

74. The bulkhead cover of claim 72 wherein the openings defined in the first wall have a slot shape.

75. The bulkhead cover of claim 72 wherein the percentage of openings in the first wall is at least 50%.

76. The bulkhead cover of claim 75 wherein the percentage of openings in the first wall is at least 60%.

77. The bulkhead cover of claim 76 wherein the percentage of openings in the first wall is at least 70%.

78. The bulkhead cover of claim 76 wherein the second wall extends from the lower face of the planar member at an angle of from about 30° to about 60°.

79. The bulkhead cover of claim 76 wherein the first wall extends from the lower face of the planar member at an angle of from about 30° to about 60°.

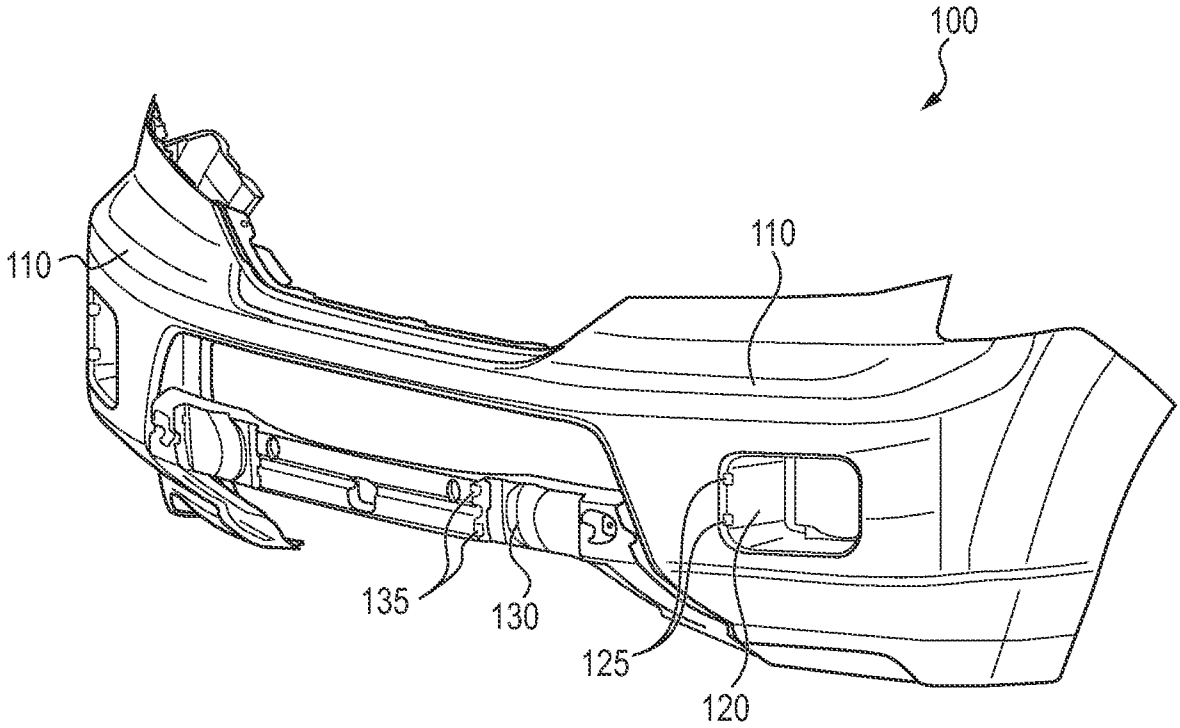


FIG. 1

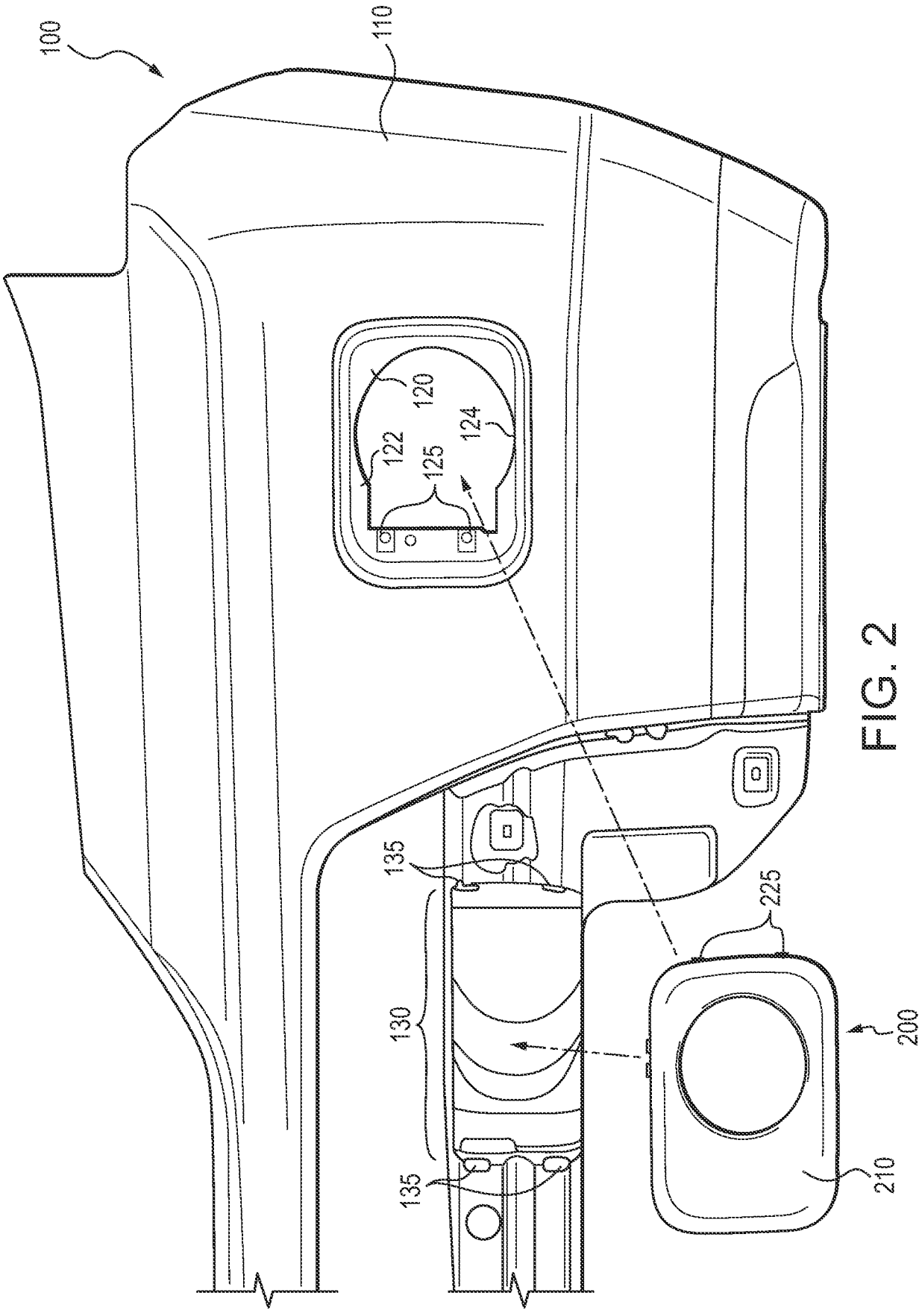


FIG. 2

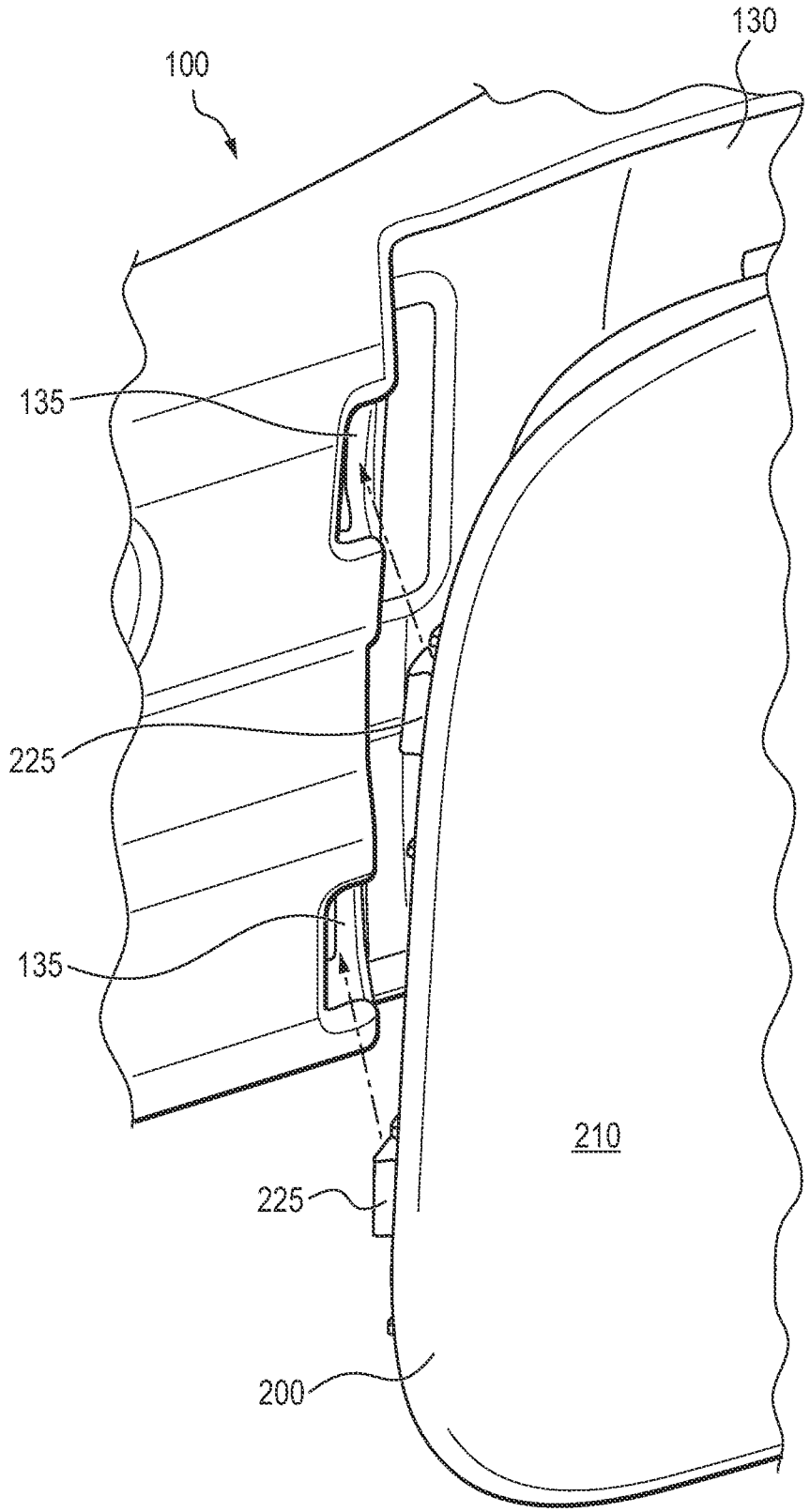
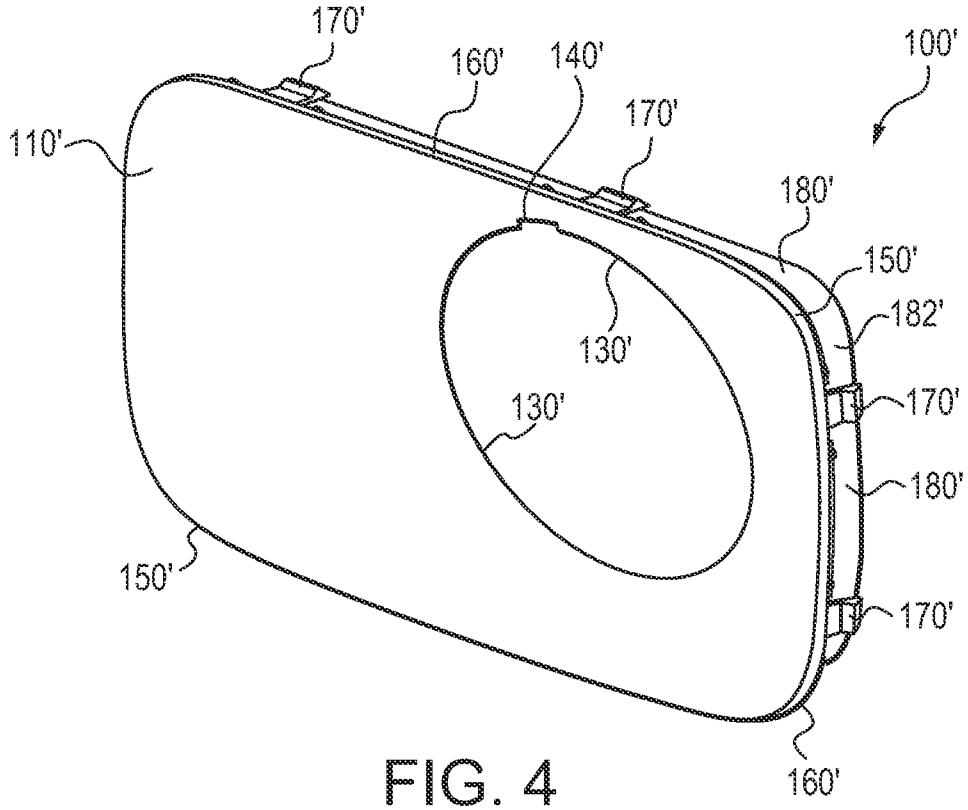


FIG. 3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110'
170'
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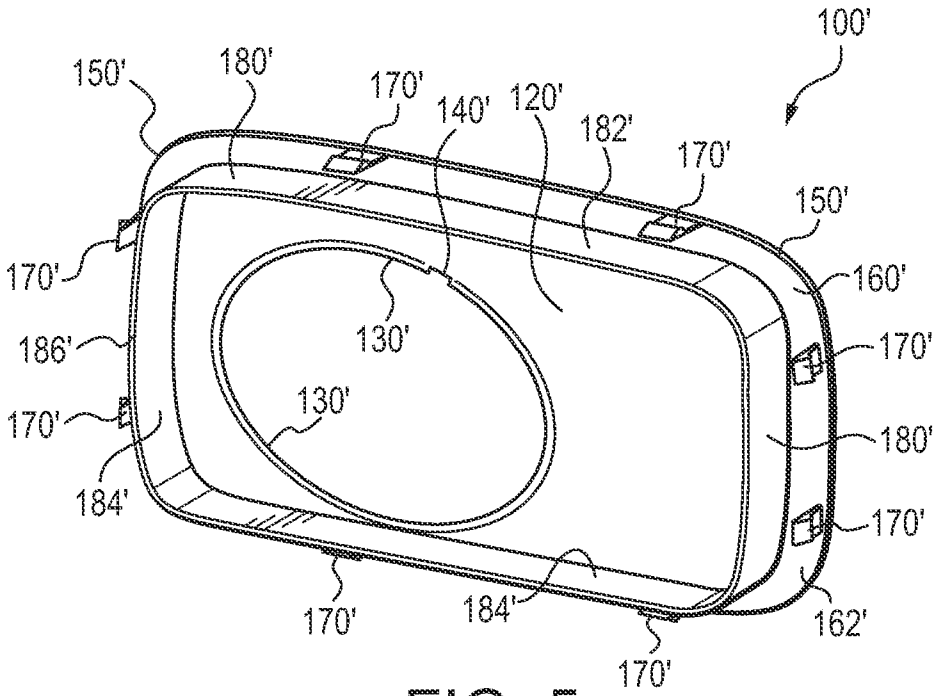
150'
182'
130'
170'
130'
180'
150'
170'
160'

FIG. 4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150'
180'
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120'
182'
170'
150'
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130'
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130'
180'
184'
170'
170'
184'
162'
170'

FIG. 5

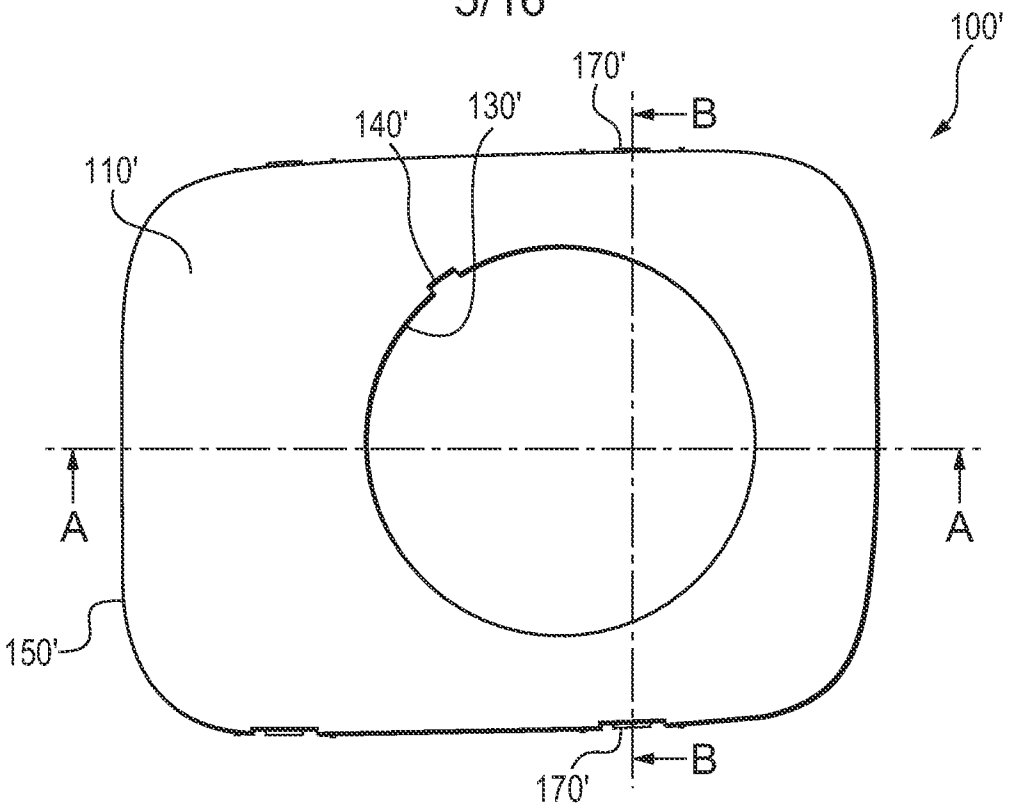


FIG. 6

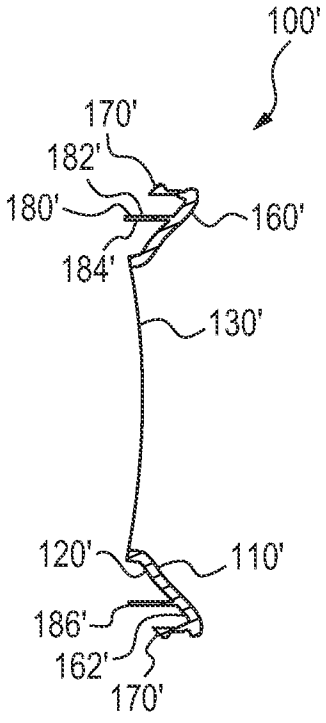


FIG. 7

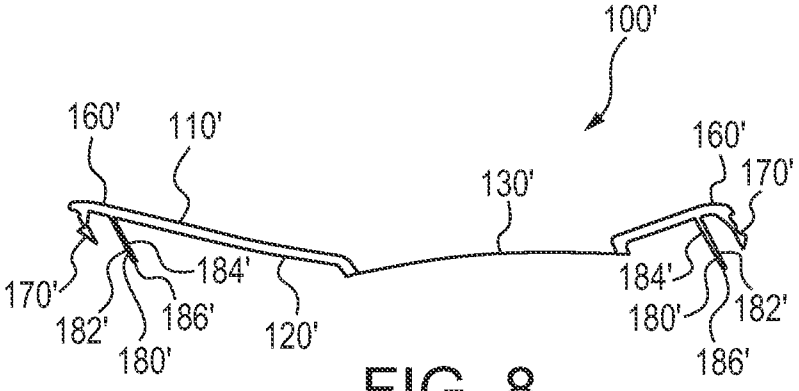
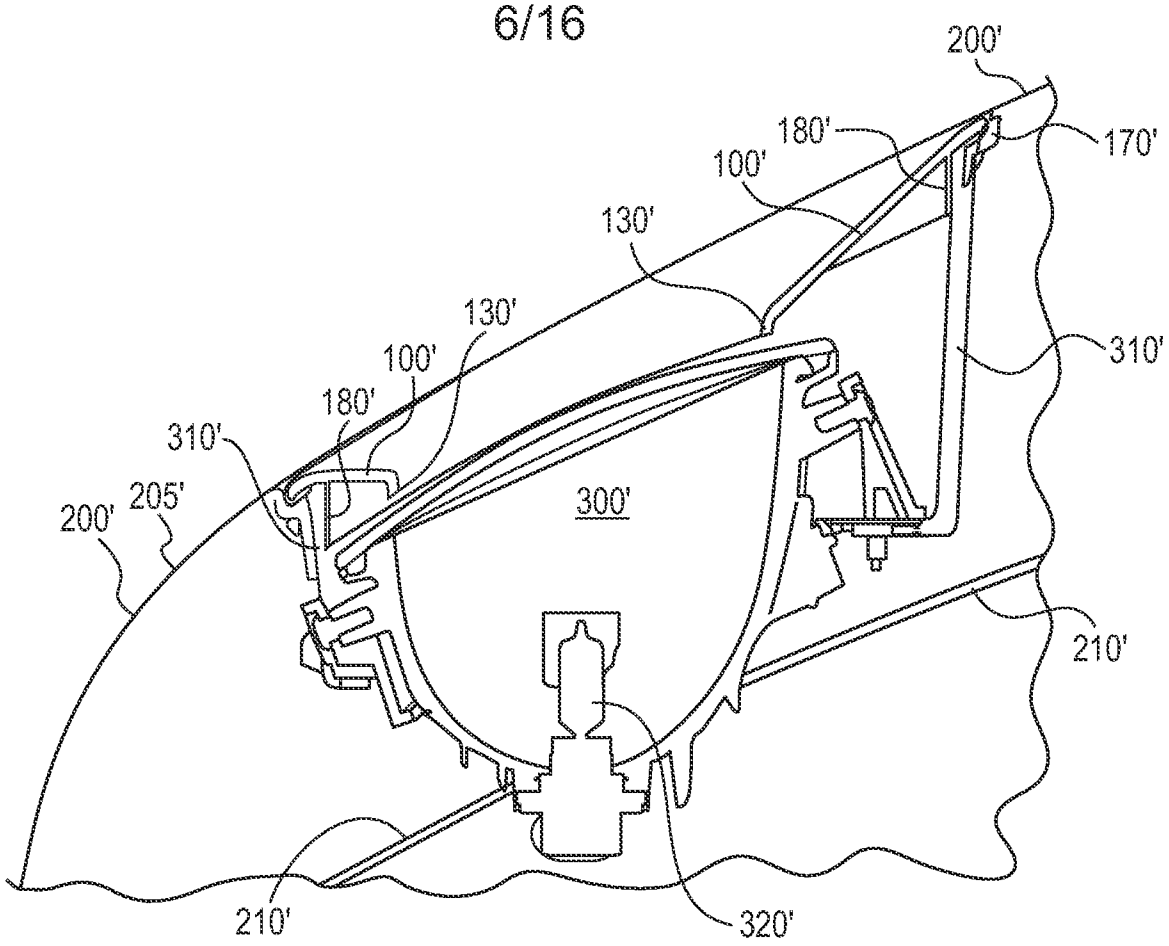


FIG. 8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180'
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180'
310'
205'
200'
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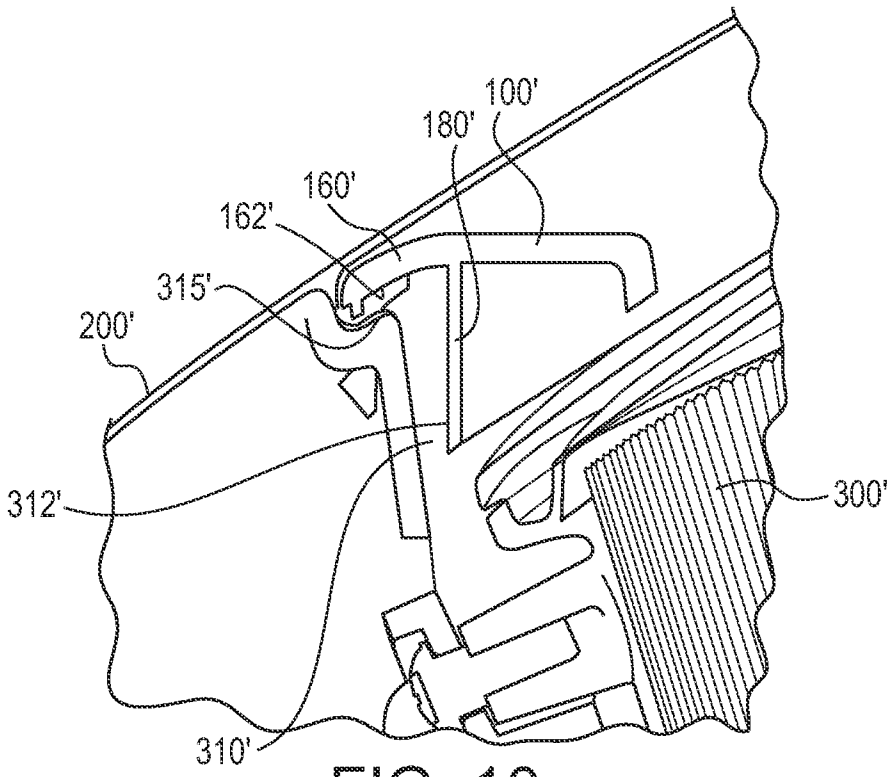
210'
210'
320'

FIG. 9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180'
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300'
310'

FIG. 10

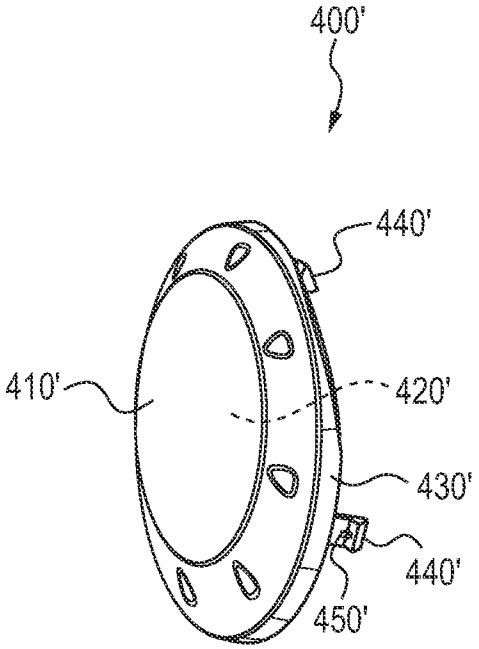


FIG. 11

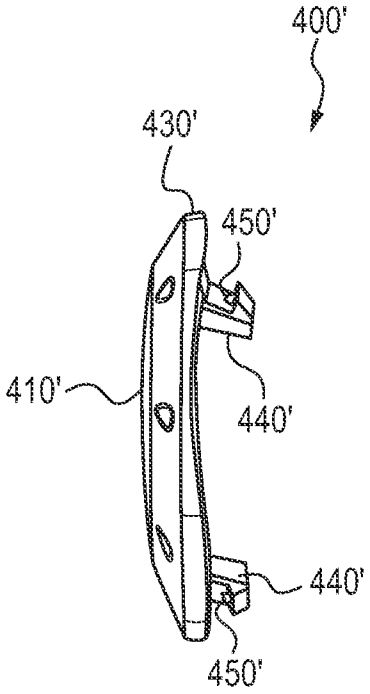


FIG. 12

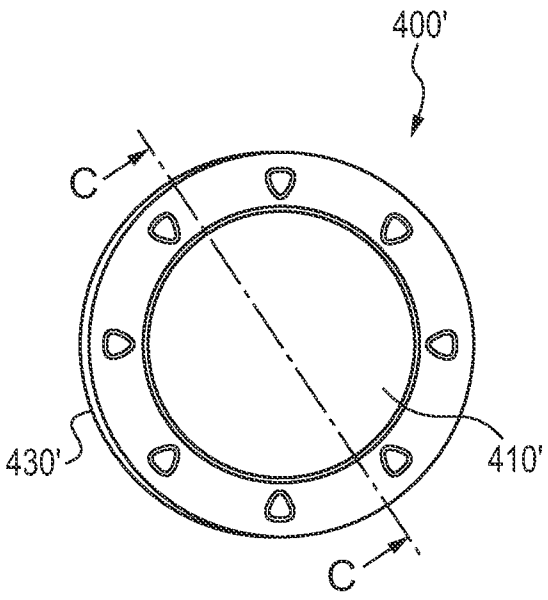


FIG. 13

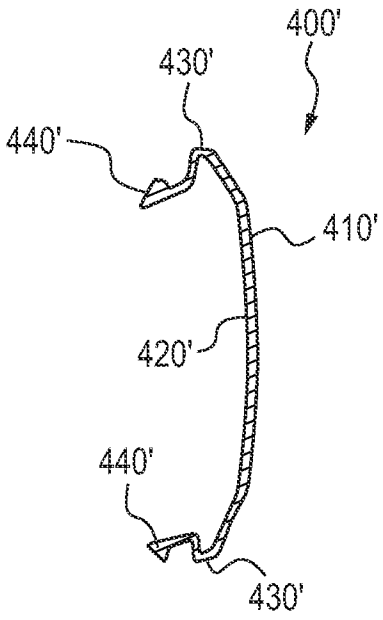


FIG. 14

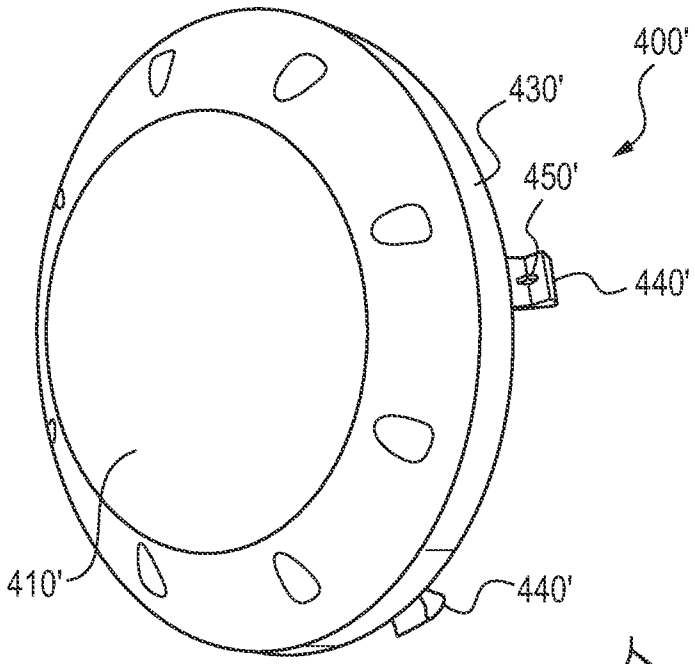


FIG. 15

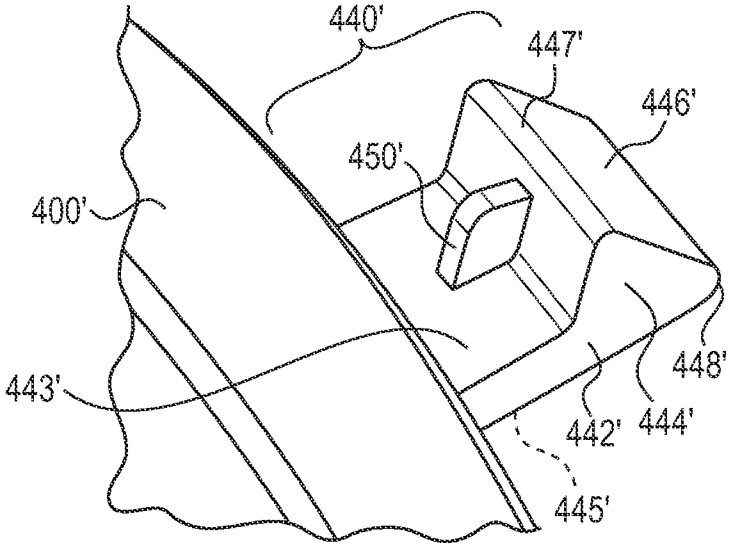


FIG. 16

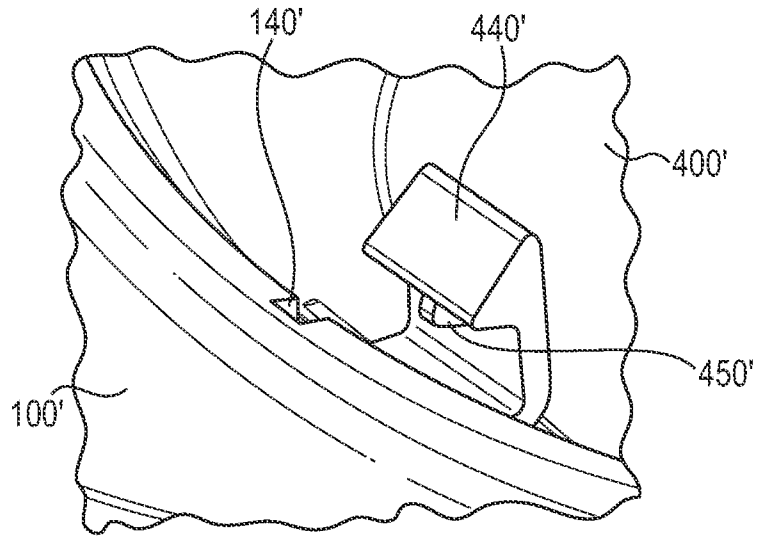
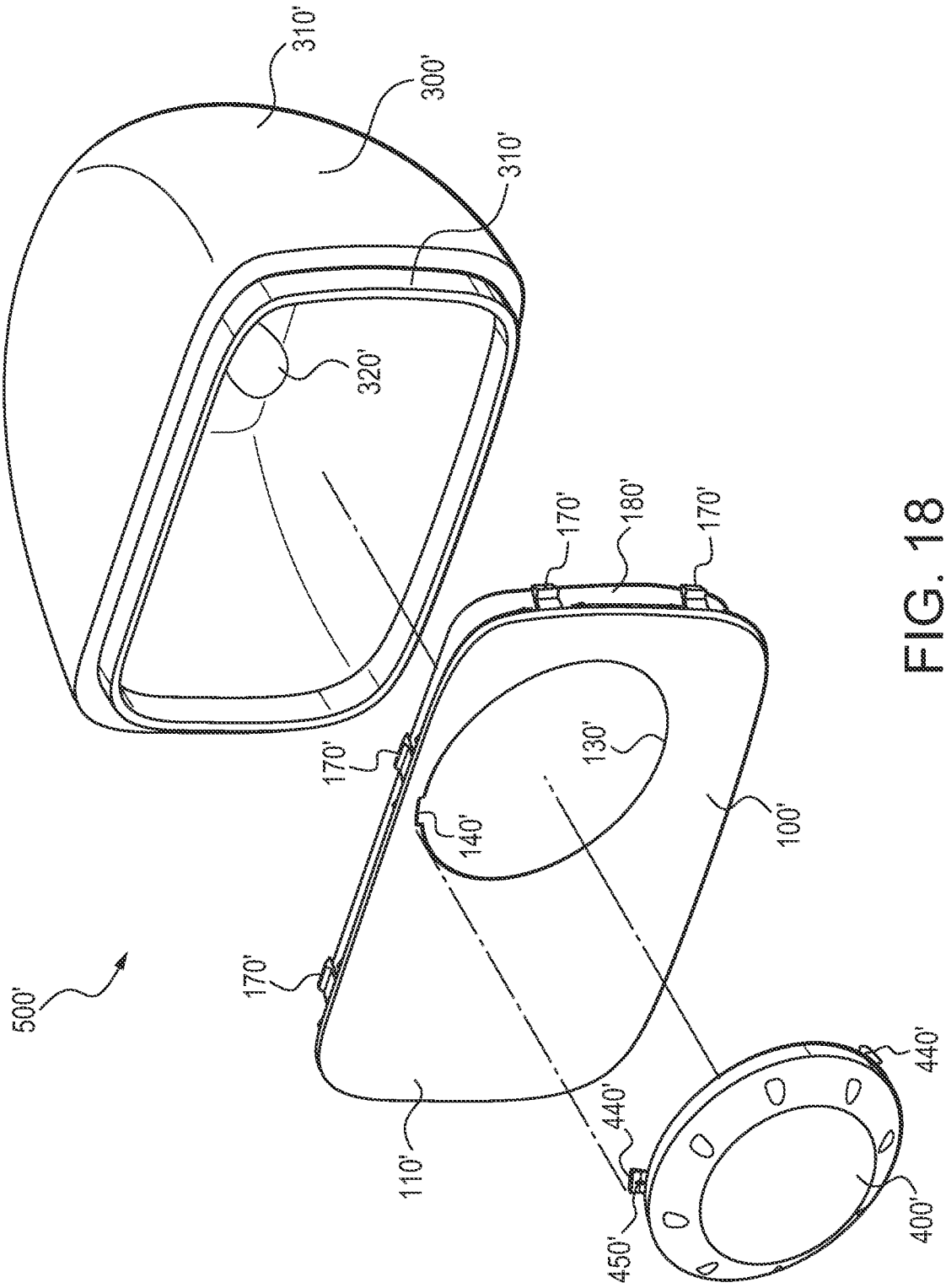


FIG. 17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300'
310'
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170'
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130'
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170'
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110'
440'
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440'
400'

FIG. 18

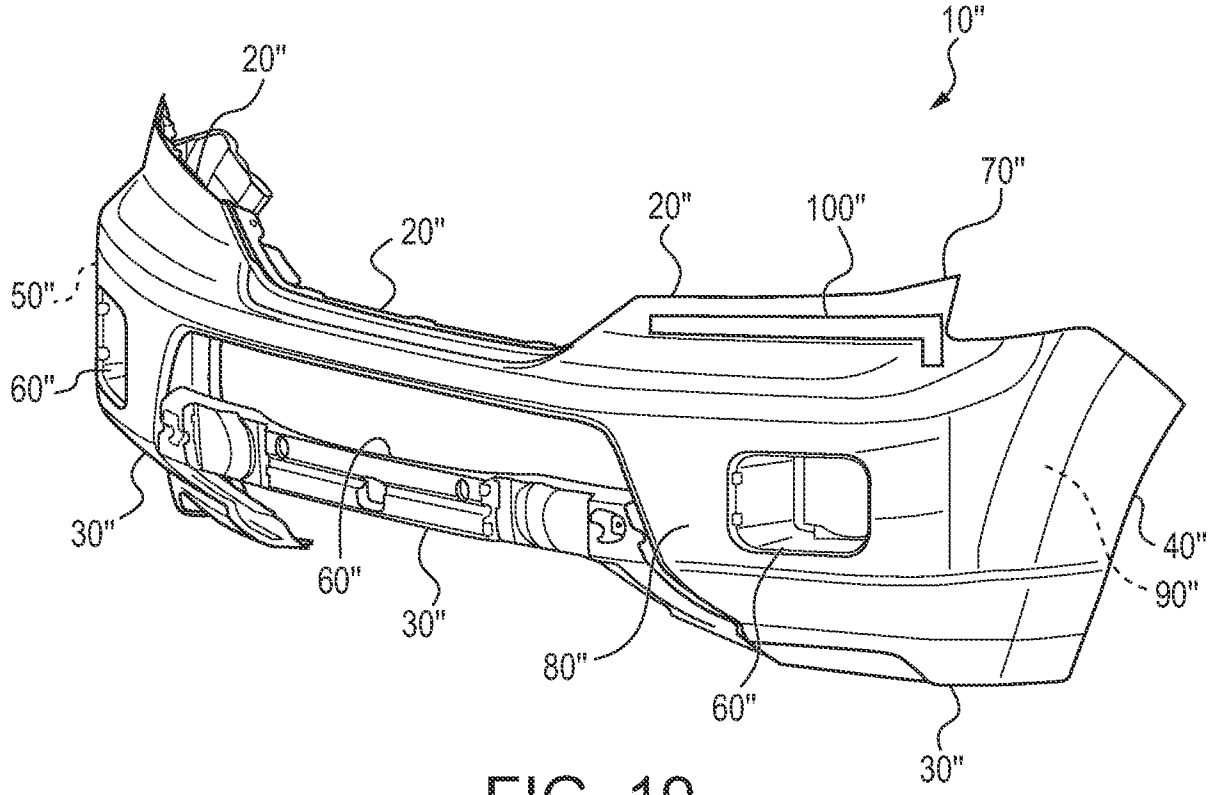
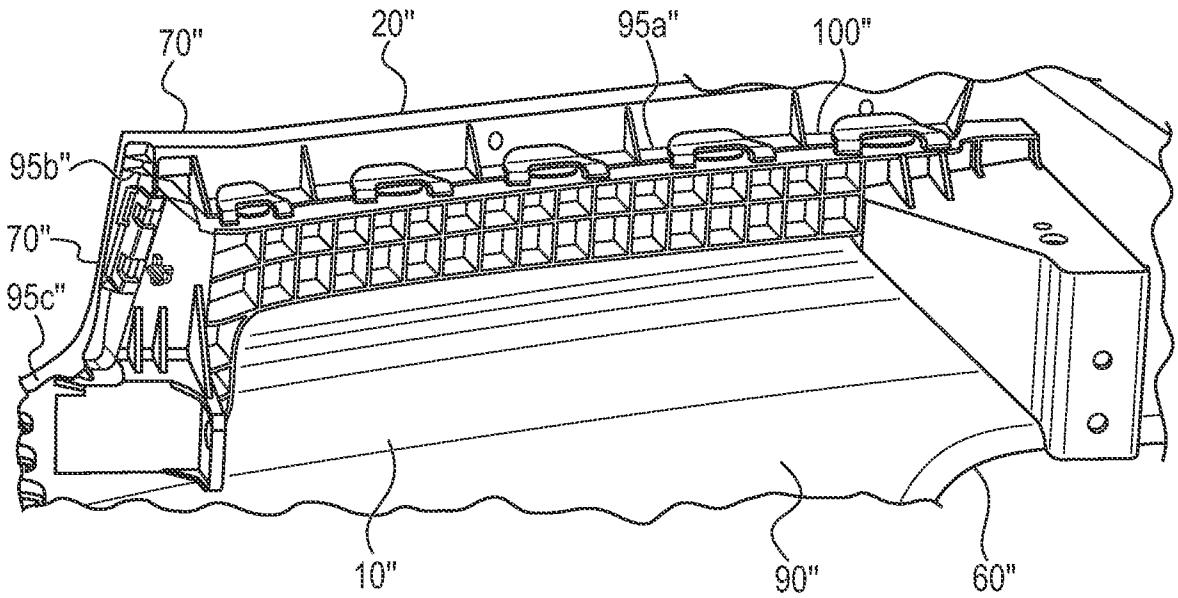

10"
20"
20"
20"
100"
70"
50"
60"
30"
60"
30"
80"
60"
30"
40"
90"

FIG. 19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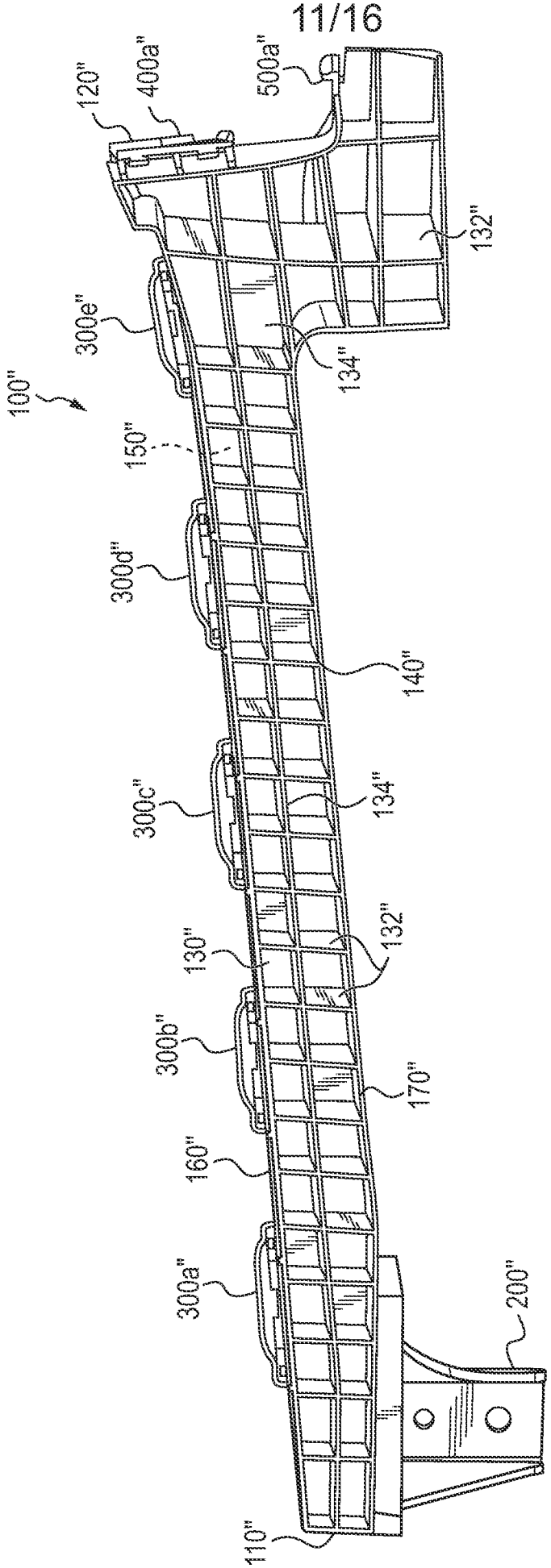
95b"
70"
95c"
10"
90"
60"

FIG. 20


120"
400a"
500a"
132"
300e"
134"
100"
150"
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134"
130"
132"
300b"
170"
160"
300a"
200"
110"

FIG. 21

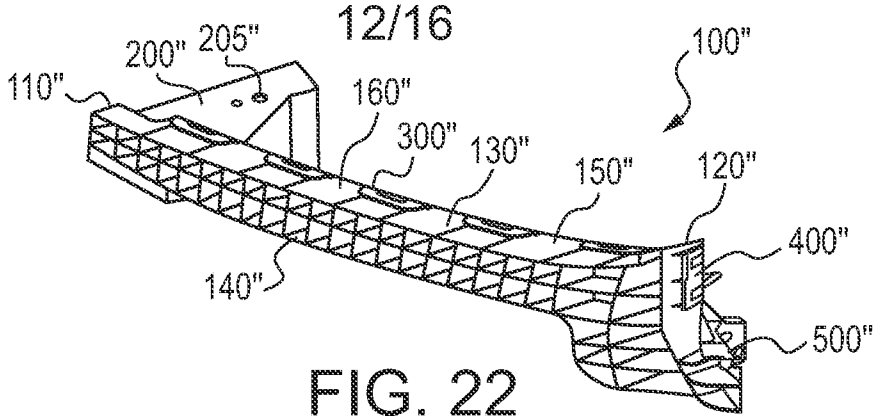

FIG. 22

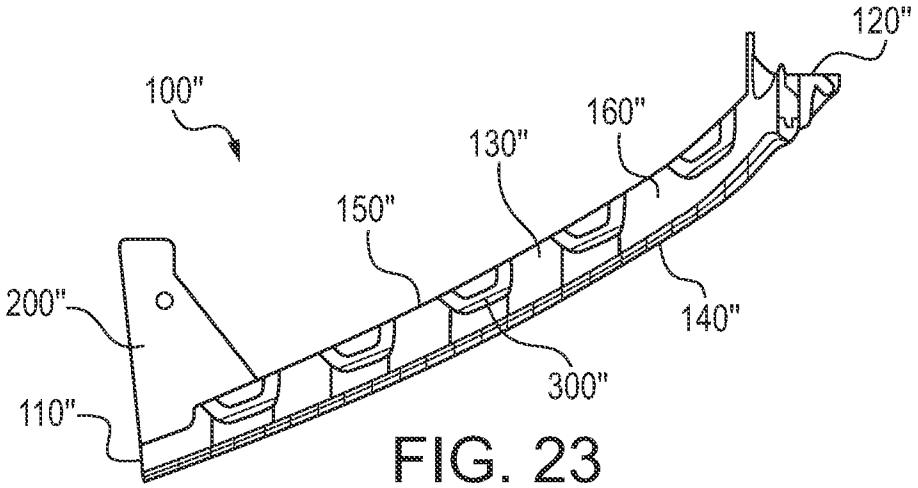

FIG. 23

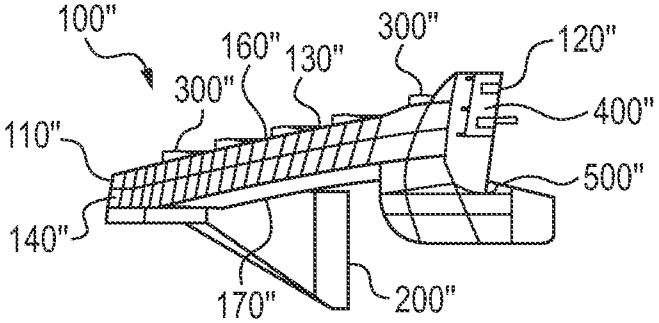

FIG. 24

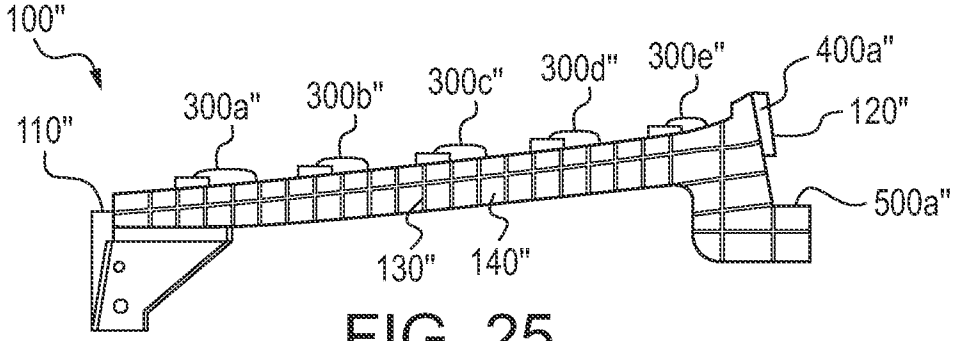

FIG. 25

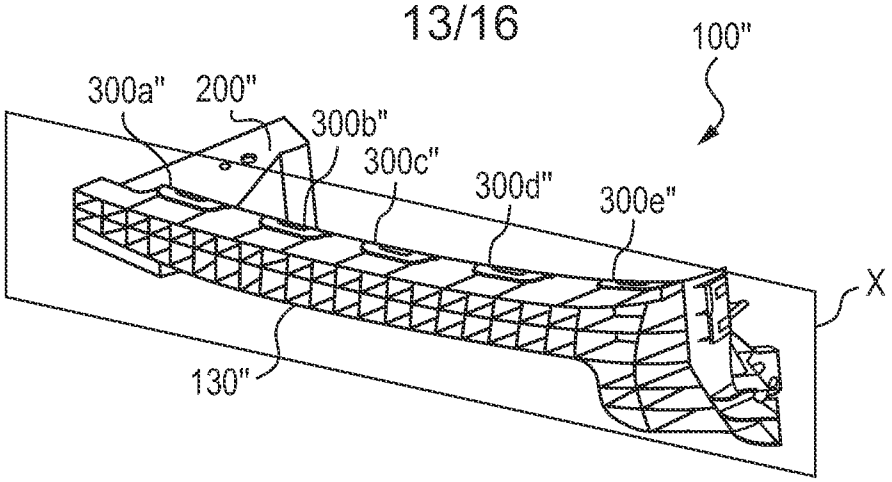

FIG. 26

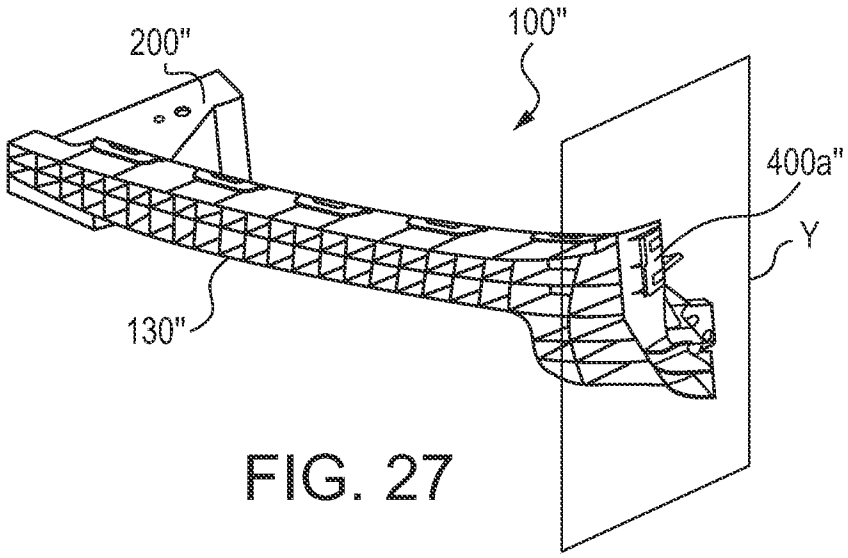

FIG. 27

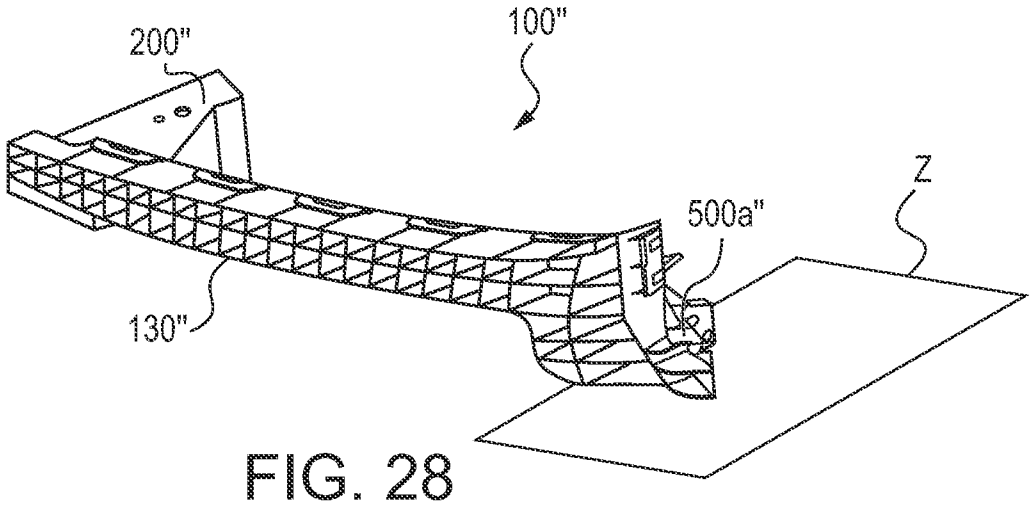

FIG. 28

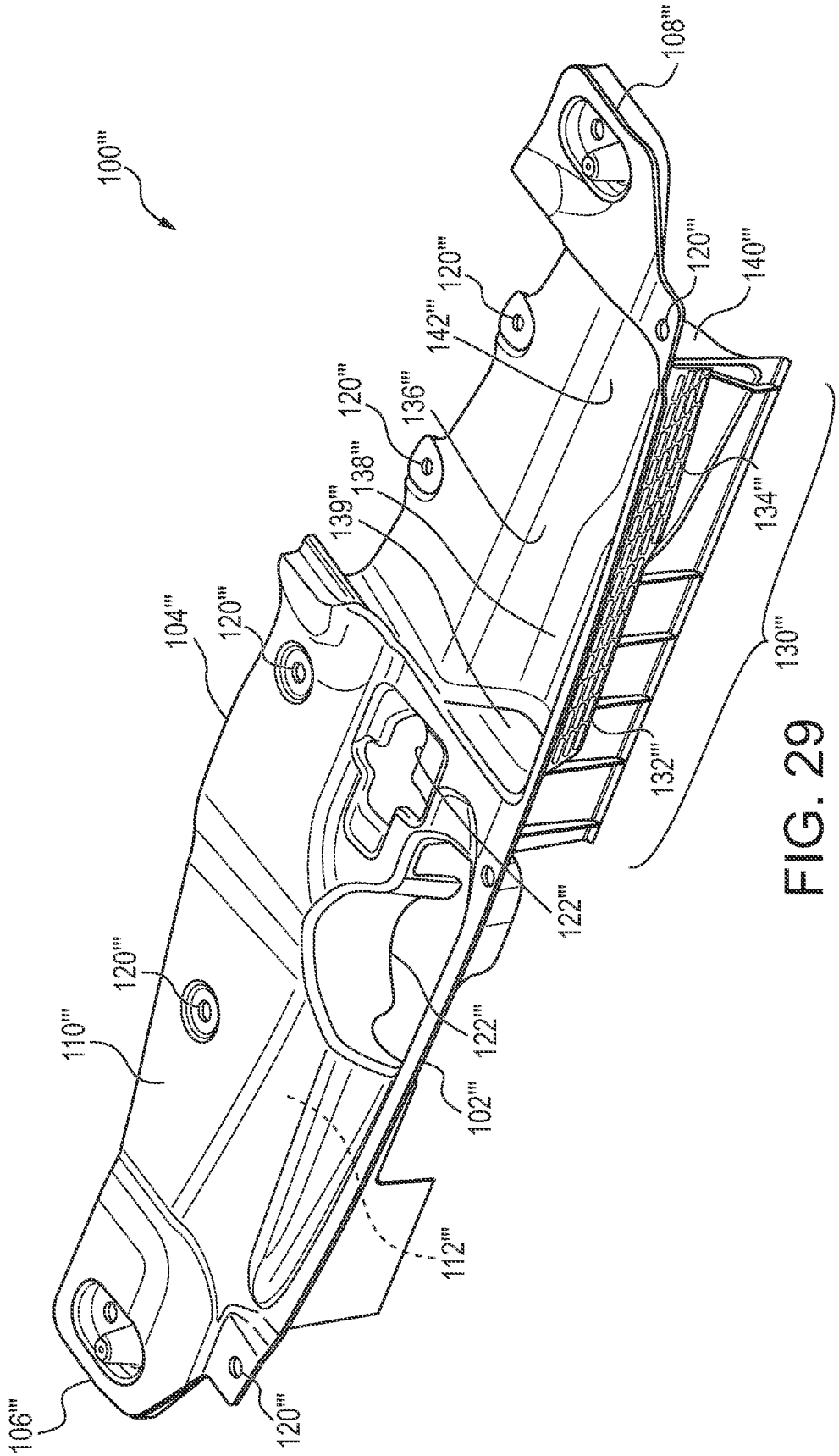
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FIG. 29

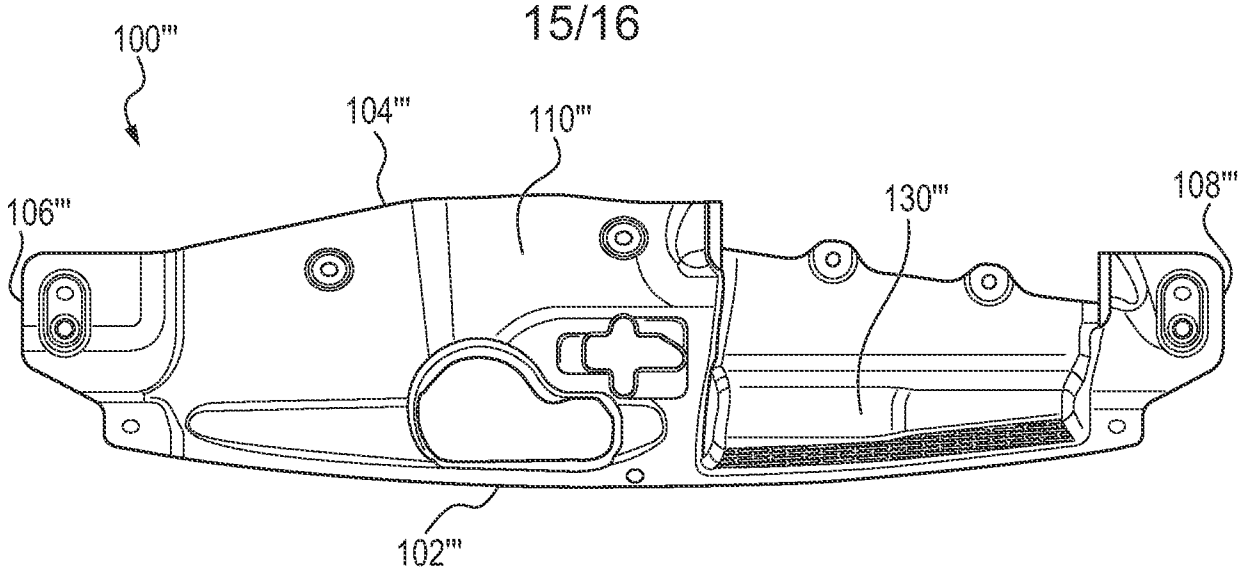


FIG. 30

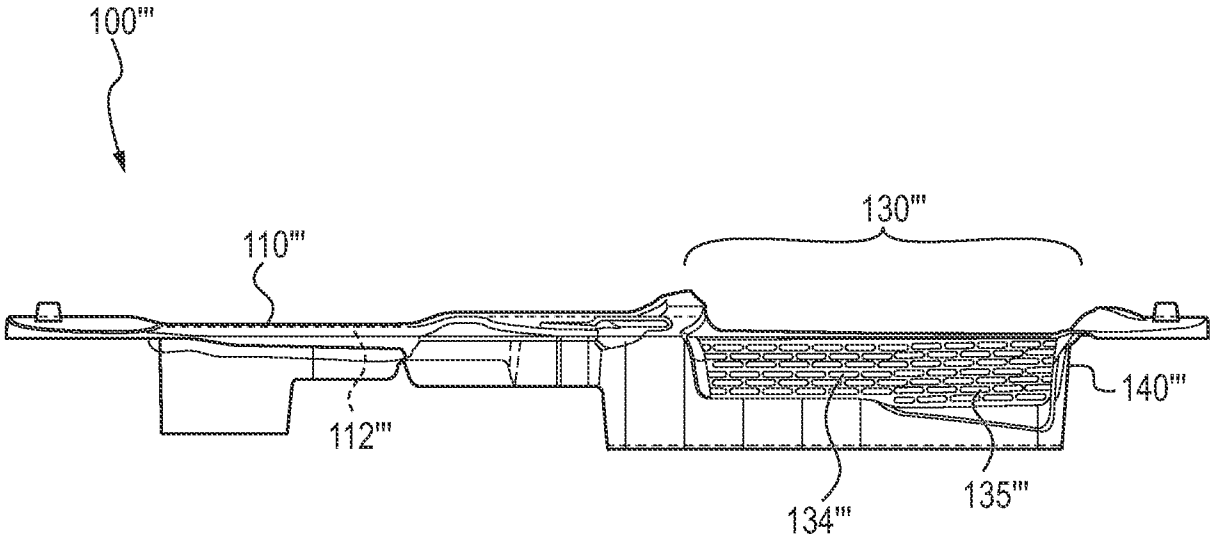
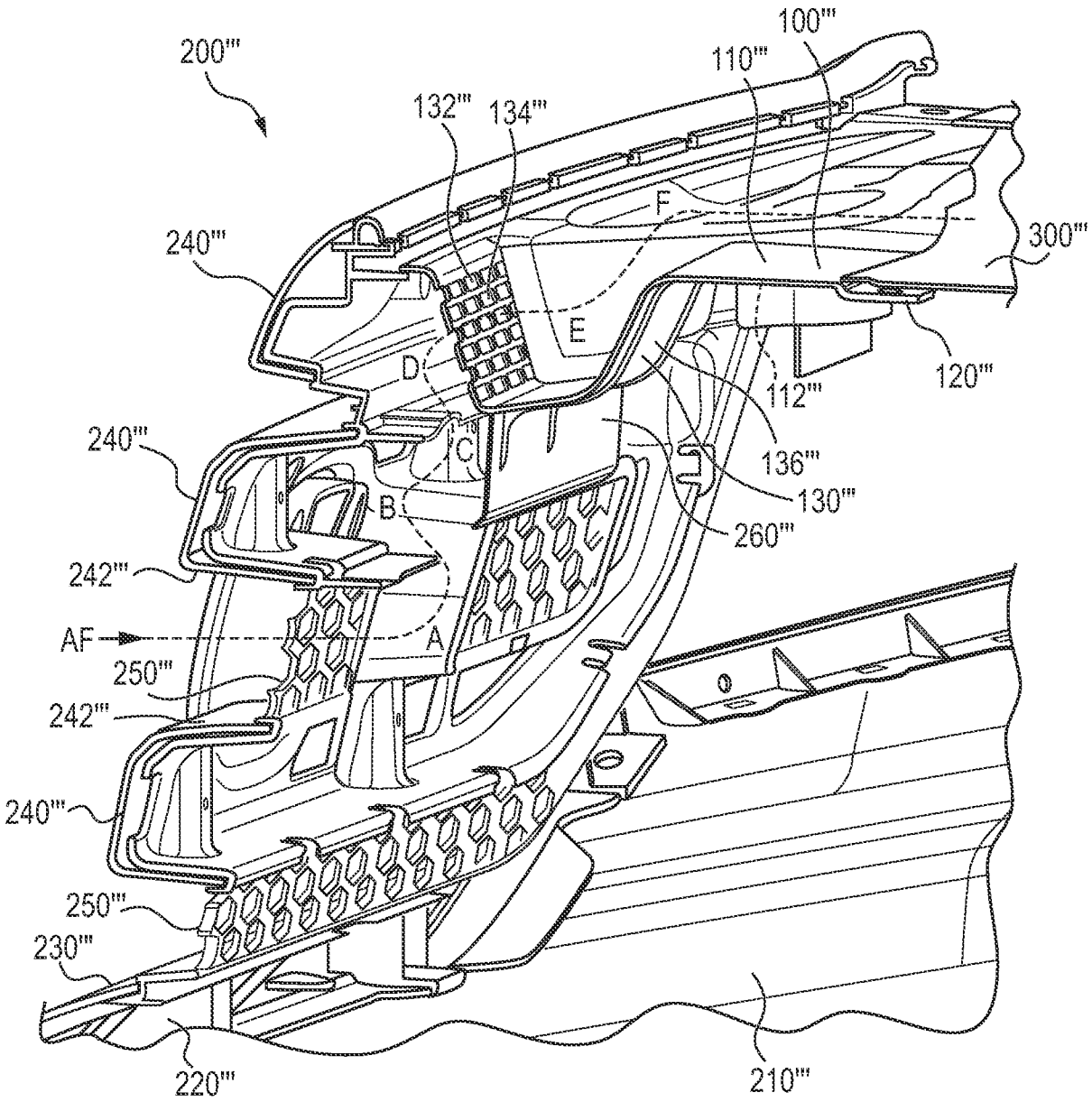


FIG. 31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300'''
E
D
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112'''
240'''
C
136'''
130'''
B
260'''
242'''
AF
A
250'''
242'''
240'''
250'''
230'''
220'''
210'''

FIG. 32

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/038719

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B05D 1/00 (2009.01)
USPC - 118/500
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)
IPC(8) - B05D 1/00, 13/02 (2009.01)
USPC - 118/500, 503

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	JP 2005-271626 A (SAWA) 06 October 2005 (06.10.2005) entire document	18 --- 1-17, 19, 20
Y	DE 37 22 869 C1 (KARCHES et al) 05 January 1989 (05.01.1989) entire document	1-17, 19, 20
Y	US 6,164,807 A (GERSTNER et al) 26 December 2000 (26.12.2000) entire document	10, 17, 19

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"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
13 July 2009	20 JUL 2009

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/038719

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:
Group I, claims 1-20 are drawn to a vehicle body panel.
Group II, claims 21-40 are drawn to a vehicle light assembly.
Group III, claims 41-59 are drawn to a support member.
Group IV, claims 60-71 are drawn to an airflow system.
Group V, claims 72-79 are drawn to a bulkhead cover.

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.:
1-20

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.