



- (51) International Patent Classification:  
*B60B 7/08* (2006.01)      *B60B 7/18* (2006.01)  
*B60B 7/06* (2006.01)
- (21) International Application Number:  
PCT/US2014/030356
- (22) International Filing Date:  
17 March 2014 (17.03.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
61/798,486      15 March 2013 (15.03.2013)      US
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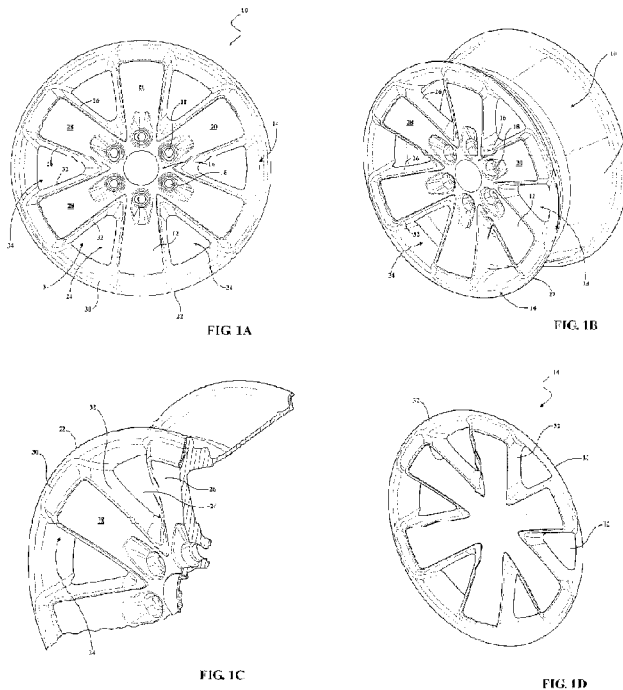
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PARTIAL WHEEL CLADDING



(57) Abstract: A wheel assembly including a cover portion permanently attached to a wheel. The wheel includes a wheel central hub portion, a wheel outer peripheral rim portion, a plurality of wheel spoke portions extending between the wheel central hub portion and the wheel outer peripheral rim portion, and a plurality of wheel turbine openings disposed between adjacent ones of the plurality of wheel spoke portions. A cover portion is configured to overlie a portion of the wheel portion. The cover portion is configured to overlie one or more of the wheel central hub portion; the plurality of wheel spoke portions, and the plurality of turbine openings or the wheel outer periphery. An adhesive is disposed between an outboard surface of the wheel and the inboard surface of the cover portion to permanently secure the cover portion to the wheel portion. When the cover portion is secured to the wheel, substantial portions of the plurality of wheel spokes, the wheel central hub, or wheel outer periphery remain exposed.

WO 2014/145565 A1

**Published:**

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

## **PARTIAL WHEEL CLADDING**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] The present application claims priority to U.S. Provisional Patent Application Serial No. 61/798,486, filed March 15, 2013 and entitled "Partial Wheel Cladding", which is hereby incorporated by reference as though set forth fully herein.

### **TECHNICAL FIELD**

[0002] The present disclosure relates generally to a cladding for permanent attachment to a vehicle wheel. More particularly, the present disclosure relates to a cladding for permanent attachment to a vehicle wheel that leaves portions of the underlying wheel exposed for aesthetic purposes as well as to reduce wheel weight and improve wheel and vehicle aerodynamics.

### **BACKGROUND OF THE INVENTION**

[0003] With recent efforts directed toward energy conservation along with the continuing escalation of fuel prices, the automotive industry has put an emphasis on increasing the fuel economy of vehicles that are put onto the road. Efforts to improve the fuel economy of vehicles have resided in improving the operation and efficiency of their engines, reducing the weight of their bodies and chassis, and improving the aerodynamic characteristics of their bodies. While great strides have been made in enhancing vehicle fuel economy as a result of improvements in these areas, there is still significant room for further advancement.

[0004] The impact of the wheels and their effect on vehicle aerodynamics as well as on vehicle fuel economy has been largely unappreciated. While there have been efforts to design and manufacture lighter weight wheels, such as through the removal of material from the spokes or the backsides of the wheel, the primary driver of these efforts has generally been cost considerations and not aerodynamics or fuel economy.

**[0005]** More recently, the potential aerodynamic impact of vehicle wheels themselves has been considered. These considerations have, however, largely ignored the fact that most wheel assemblies today employ covers or other structures over the wheel outboard surface that are designed to enhance the aesthetics of the wheel. Any aerodynamic benefit that may result from the design of the wheel alone is not maximized when a wheel cover or other aesthetic feature is secured to the outboard surface of the wheel that does not take into account the aerodynamics of the overall wheel assembly. Also, these claddings have been constructed to cover the entirety of the wheel exterior surface. This is done primarily for two main reasons. First, the aesthetic goal has been for a cladding to appear as an integral part of a wheel and having the cladding cover the entire wheel front surface has served that purpose. Second, vehicle wheel exterior surfaces are relatively unattractive from an aesthetic standpoint and it is thus desirable to cover the entirety of the wheel surface with the cladding. However, employing a full face cladding requires the use of additional material, which increases the total cost of the wheel assembly.

**[0006]** Additionally, attempts have been made to provide improved wheel aesthetics by attaching mechanical inserts to the wheel. These are generally undesirable as the attachment process can be labor intensive and expensive. Additionally, the inserts also have durability issues as can become easily detached from the wheel. Moreover, these attachments typically are configured as multiple different components that must each be separately attached to the wheel. Another attempt to improve wheel aesthetics involves painting the outboard wheel surface. Again, this process has limitations as it can be expensive and labor intensive.

**[0007]** Further, some vehicle wheels are configured such that any wheel cover or other aesthetic attachment would intrude upon curbside space, which would result in the wheel cover being bumped or damaged as a vehicle is being driven or parked.

[0008] It would thus be desirable to provide a wheel assembly that provides both improved aesthetics and improved wheel (and vehicle) aerodynamics.

### SUMMARY OF THE INVENTION

[0009] It is therefore an aspect of the present disclosure to provide a wheel assembly including a decorative wheel cladding that covers only a portion of an exterior front surface of a wheel.

[0010] It is another aspect of the present disclosure to provide a wheel assembly including a decorative wheel cladding, which is also constructed of lighter weight.

[0011] It is still another aspect of the present disclosure to provide a wheel assembly including a decorative wheel cladding, which employs an aerodynamically efficient shape.

[0012] It is still a further aspect of the present disclosure to provide a wheel assembly including a wheel and a permanently attached decorative cladding that can result in improved vehicle energy usage.

[0013] It is a further aspect of the present disclosure to provide a wheel assembly including a decorative wheel cladding that could be less expensive than prior claddings.

[0014] It is yet another aspect of the present disclosure to provide a wheel assembly that provides improved aesthetics.

[0015] It is still a further aspect of the present disclosure to provide a wheel assembly with a cladding that yields package savings over prior wheel assemblies.

[0016] In accordance with the above and other aspects of the present disclosure, a wheel assembly is provided, which includes a decorative multi-finish wheel surface. The decorative multi-finish wheel surface can result from a metal plated cladding structure, which is permanently attached to an exterior surface of the backbone wheel such that it covers less than the entirety of front face of the backbone wheel, so that a portion of the backbone wheel front surface remains visible after the cladding is attached thereto. In accordance with another

aspect, the wheel front face can be constructed with varying geometry that improves vehicle energy through an aerodynamically efficient design without sacrificing desirable aesthetics.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0017] Other aspects of the present disclosure will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0018] FIG 1a is a front view of a wheel assembly according to an aspect of the present disclosure;

[0019] FIG 1b is a perspective view of the wheel assembly of FIG 1a;

[0020] FIG 1c is a cross-sectional view of the wheel assembly of FIG 1a;

[0021] FIG 1d is a perspective view of a cladding for a wheel assembly according to an aspect of the present disclosure;

[0022] FIG 2a is a front view of a wheel assembly according to another aspect of the present disclosure;

[0023] FIG 2b is a perspective view of the wheel assembly of FIG 2a;

[0024] FIG 2c is a cross-sectional view of the wheel assembly of FIG 2a;

[0025] FIG 2d is a perspective view of a cladding for a wheel assembly according to another aspect of the present disclosure;

[0026] FIG 3a is a front view of a wheel assembly according to still another aspect of the present disclosure;

[0027] FIG 3b is a perspective view of the wheel assembly of FIG 3a;

[0028] FIG 3c is a cross-sectional view of the wheel assembly of FIG 3a;

[0029] FIG 3d is a perspective view of a cladding for a wheel assembly according to still another aspect of the present disclosure;

[0030] FIG 3e is a schematic illustration of an outboard portion of the wheel assembly of FIG 3a;

[0031] FIG 4a is front view of a wheel assembly according to yet another aspect of the present disclosure;

[0032] FIG 4b is a perspective view of the wheel assembly of FIG 4a;

[0033] FIG 4c is a cross-sectional view of the wheel assembly of FIG 4a;

[0034] FIG 4d is a perspective view of a cladding for a wheel assembly according to yet another aspect of the present disclosure;

[0035] FIG 5 is a perspective view of a wheel assembly according to a further aspect of the present disclosure;

[0036] FIG 6 is a perspective view of still a further aspect of the present disclosure;

[0037] FIG 7 is a perspective view of a wheel assembly according to yet a further aspect of the present disclosure;

[0038] FIG 8 is a perspective view of a wheel assembly according to still yet a further aspect of the present disclosure;

[0039] FIG 9a is a schematic illustration of a wheel assembly pallet for use in assembling a wheel assembly according to an aspect of the present disclosure;

[0040] FIG 9b is a schematic illustration of a cladding located on a wheel assembly pallet according to an aspect of the present disclosure;

[0041] FIG 9c is a schematic illustration of a wheel and a cladding located on a wheel assembly pallet according to an aspect of the present disclosure;

[0042] FIG 9d is a cross-sectional view of a wheel and a cladding located on a wheel assembly pallet according to an aspect of the present disclosure;

[0043] FIG 9e is an exploded view of a wheel assembly pallet, cladding and wheel according to an aspect of the present disclosure;

[0044] FIG 10a is a schematic illustration of a cladding isolator feature according to an aspect of the present disclosure;

[0045] FIG 10b is a schematic illustration of a cladding isolator feature according to another aspect of the present disclosure;

[0046] FIG 10c is a schematic illustration of a cladding isolator feature according to still another aspect of the present disclosure;

[0047] FIG 10d is a schematic illustration of a cladding isolator feature according to a further aspect of the present disclosure;

[0048] FIG 10e is a schematic illustration of a cladding isolator feature according to yet another aspect of the present disclosure;

[0049] FIG 11a is a schematic illustration of a prior art wheel assembly; and

[0050] FIG 11b is a schematic illustration of a wheel assembly in accordance with an aspect of the present disclosure.

#### **DETAILED DESCRIPTION OF THE INVENTION**

[0051] For purposes of description herein, the terms "upper", "lower", "right", "left", "rear", "front", "vertical", "horizontal", "inner" and "outer" and derivatives thereof are intended merely for purposes of illustration and are not intended to be limiting. It is to be understood that the aspects of the disclosure may assume various alternative orientations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are exemplary embodiments of the inventive concepts defined in the appended claims. The specific dimensions and other physical characteristics relating to the aspects disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

**[0052]** The present disclosure relates to a wheel assembly that provides improved aerodynamics and aesthetics. According to an aspect, the wheel assembly includes a backbone wheel and a cladding. According to an additional aspect, the cladding may be formed of a plastic structure, which has an outer surface that has been subjected to a metal plating process or other decorating procedures and materials, such as painting, hydrographic or molded in color. It will be appreciated that the cladding could be formed of other suitable materials, including metal or carbon fiber. According to another aspect, the cladding may be designed to cover only a portion of (less than the entirety of) the outboard wheel surface. In other words, the cladding can be designed such that when it is attached to the wheel, a significant portion of the wheel outboard face remains exposed. The metal plating may be accomplished through a chrome plating process. However, other metal plating processes, including those employing other metals may be utilized. Additionally, the metal plated surface of the cladding may have a variety of different colors. Different colors can be employed to provide a distinction (i.e., contrast) between the cladding surface and the exposed portion of the wheel surface. According to a further aspect, the metal plated surface could be selectively colored such that it has multiple colors, tones or shades.

**[0053]** According to an aspect, various different constructions of wheel assemblies can be utilized and various differently configured partial claddings could be employed that cover only a part of the wheel exterior or outboard surface. The aspects described below in connection with the drawings are merely exemplary and not intended to be limiting.

**[0054]** FIGs 1a through 1d illustrate an exemplary wheel assembly **10** according to an aspect of the present disclosure. The wheel assembly **10** includes a backbone wheel **12** and a cladding **14**. According to an aspect, the cladding **14** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **12**. The wheel **12** can include a central hub portion **16**, including a plurality of wheel lug openings **18**, which allow for

attachment of the wheel **12** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. As shown, a plurality of wheel spokes **20** may extend outwardly from the hub portion **16** to a wheel rim **22**. The wheel rim **22** may extend entirely around the periphery of the wheel **12** such that a plurality of turbine openings **24** may be defined between adjacent spokes **20** and a portion of the wheel rim **22**. The wheel rim **22** can also include an upwardly extending flange portion (not shown). The wheel can also be configured for aerodynamic benefits, such as is disclosed in Applicant's co-pending U.S. Patent Application Serial No. 14/212,914, entitled "Aerodynamically Efficient Spoke Design for a Vehicle Wheel", which is concurrently filed herewith and which is hereby incorporated by reference as though set forth fully herein.

[0055] According to an aspect, the cladding **14** (FIG 1d) may be a single unitary structure that can be configured to overlie the outboard face of the wheel **12**, but only cover a portion of the outboard face. Put another way, portions of the front or outboard face of the wheel **12** can remain exposed after the cladding **14** is attached thereto. According to another aspect and as shown in FIGs 1a through 1d, the cladding **14** can include a uniform outer rim portion **30**. According to a further aspect, the outer rim portion **30** can overlie the entirety of the wheel rim **22**. However, the cladding **14** can be configured to only cover portions of the wheel outer rim **22**, as discussed below. As shown, the cladding **14** may include a pair of side spoke portions **32** that overlay and cover the side surfaces **26** of the wheel spokes **20**. Additionally, the cladding **14** may fully define a plurality of cover turbine openings **34** that surround and overlay the surfaces that define the wheel turbine openings **24**, including the wheel spoke side surfaces and the wheel rim **22**. According to a still further aspect, the hub portion **16** of the wheel **12** may be exposed. In other words, as shown, the cladding **14** does not include a central hub portion. As also shown, the outboard surfaces **28** of the wheel spokes **20** may remain exposed after the cladding **14** is secured to the wheel **12**.

[0056] According to another aspect, the cladding **14** may be plated or otherwise treated such that it has a color that is different than the color of the surface of the wheel **12**. The wheel surface can also be treated, as discussed above. This can provide an aesthetically pleasing contrast between the wheel surface and the clad surface. It will be appreciated that the amount of color difference can vary depending upon the degree of contrast that is sought. It will also be appreciated that the cladding **14** and the exposed outboard surface of the wheel **12** may have the same color, but vary in tone or shade. According to a further aspect, the cladding **14** may be plated or otherwise treated such that it includes accents or portions that are colored differently from one another. Put another way, the exterior of the cladding **14** itself could be plated or otherwise treated with a variety of different colors, color combinations and/or patterns. Such coloring of a cladding is known with an exemplary process being commercially available from Lacks Enterprises, Inc. and its Spinnelle<sup>®</sup> product.

[0057] According to another aspect, the cladding **14** may be permanently attached to the wheel **12** through the use of an adhesive. The adhesive could be an RTV adhesive. Alternatively, the adhesive could be foam adhesive. Other suitable adhesives could also be employed.

[0058] FIGs 2a through 2d illustrate another exemplary wheel assembly **50** according to an aspect of the disclosure. The wheel assembly **50** includes a backbone wheel **52** and a cladding **54**. According to an aspect, the cladding **54** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **52**. The wheel **52** can include a hub portion **56**, including a plurality of wheel lug openings **58**, which allow for attachment of the wheel **52** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. As shown, a plurality of wheel spokes **60** may extend outwardly from the hub portion **56** to a wheel rim **62**. The wheel rim **62** can extend entirely around the periphery of the wheel **52**. According to an aspect, a plurality of turbine openings **64** may be defined between

adjacent wheel spokes **60** and a corresponding portion of the wheel rim **62**. The wheel rim **62** can also include an upwardly extending flange portion (not shown). According to another aspect, a spoke turbine opening **68** may be formed in each spoke **60**. More or less spoke turbine openings **68** may be employed as desired.

[0059] According to this aspect, the cladding **54** (FIG 2d) may be a single unitary structure that is configured to overlie the outboard face of the wheel **52**, but only covers a portion thereof. Again, according to this aspect, portions of the outboard face of the wheel **52** can remain exposed after attachment of the cladding **54** to the wheel **52**. As shown in FIGs 2a through 2d, the cladding **54** may include a full hub portion **70** that overlies the hub portion **56** of the wheel **52**. Additionally, the cladding **54** may include a plurality of spoke portions **72** that overlie each of the wheel spokes **60**. As shown, the cladding spoke portions **72** can partially overlie the side surfaces **66** of the wheel spokes **60** which surfaces define the wheel turbine openings **64** such that the lower portion of each of the wheel spoke side surfaces **66** remain exposed. According to another aspect, the cladding spoke portions **72** can completely cover the surfaces that define the wheel turbine openings **64**, including the side surfaces thereof, such that none of the surfaces that define the wheel turbine opening surfaces remain exposed after the cladding **54** is attached to the wheel **52**. According to a further aspect, the cladding **54** may include a rim portion **74** that is discontinuous. In other words, the rim portion **74** of the cladding **54** does not fully cover the wheel rim **62** such that part of the wheel rim **62** remains exposed after the cladding is attached to the wheel. Additionally, the cladding **54** may be configured such that it does not cover any upwardly extending flange portion. This combination can provide some aesthetically pleasing contrast between the cladding surface and the exposed wheel surface. Again, the cladding **54** may be attached to the wheel **52** by an adhesive such as an RTV adhesive or foam adhesive, as discussed above.

Also, the wheel **52** and the cladding **54** can have different colors to yield unique aesthetics, as discussed above.

**[0060]** FIGs 3a through 3e illustrate still another exemplary wheel assembly **80** according to an aspect of the disclosure. The wheel assembly **80** can include a backbone wheel **82** and a cladding **84**. According to an aspect, the cladding **84** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **82**. The wheel **82** may include a hub portion **86**, including a plurality of wheel lug openings **88**, which allow for attachment of the wheel **82** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. A plurality of wheel spokes **90** may extend outwardly from the hub portion **86** to a wheel rim **92**. The wheel rim **92** can extend entirely around the periphery of the wheel **82**. According to an aspect, a plurality of turbine openings **94** may be defined between adjacent spokes **90** and a portion of the wheel rim **92**.

**[0061]** According to one aspect, the cladding **84** (FIG 3d) may be a single unitary structure that is configured to overlie the front or outboard face of the wheel **82**, but only covers a portion thereof. Again, according to this aspect, portions of the front face of the wheel **82** can remain exposed after attachment of the cladding **84** to the wheel **82**. As shown in FIGs 3a through 3e, the cladding **84** may include a plurality of separate portions that together form the cladding **84**. As shown in FIG 3d, the cladding **84** can include a plurality of turbine portions **96** that can be nested within a respective one of the wheel turbine portions **94**. The cladding turbine portions **96** can also include lug openings **98** integrally formed therewith that also may nest within a respective one of the wheel lug openings **88**. Additionally, the cladding **84** can include a plurality of spoke portions **100** that overlie a middle portion **102** the outboard surface of the wheel spokes **90** such that the peripheries of the wheel spokes **90** remain exposed. As shown, the wheel spokes **90** may also include recesses **104** into which the clad spoke portions **100** may be nested and secured. With this

configuration, portions of the wheel spokes **90** may be exposed and visible after attachment of the cladding **84**. Similarly, portions of the wheel rim **92** also may remain exposed between the clad turbine portions **96** after attachment of the cladding **84** to the wheel **82**. The clad portions may be secured to the wheel by an adhesive, as discussed above. Additionally, the wheel and the cladding may be constructed, treated or formed such that they have different colors, as discussed above.

**[0062]** FIGs 4a through 4g illustrate various aspects of an exemplary wheel assembly **120** according to an aspect of the disclosure. The wheel assembly **120** includes a backbone wheel **122** and a cladding **124**. According to an aspect, the cladding **124** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **122**. The wheel **122** can include a hub portion **126**, including a plurality of wheel lug openings **128** that allow for attachment of the wheel to a vehicle for rotation therewith about an axis of rotation defined by the hub center. According to an aspect, a plurality of wheel spokes **130** may extend outwardly from the hub portion **126** to a wheel rim **132**. The wheel rim **132** may extend entirely around the periphery of the wheel **122** such that a plurality of turbine openings **134** can be defined between adjacent wheel spokes **130** and a corresponding portion of the wheel rim **132**.

**[0063]** According to an aspect, the cladding **124** (FIG 4d) may be a single unitary structure that is configured to overlie the outboard face of the wheel **122**, but only covers a portion of the outboard face. Put another way, portions of the outboard face of the wheel **122** can remain exposed after attachment of the cladding **124** to the wheel **122**. According to another aspect and as shown in FIGs 4a through 4d, the cladding **124** may include a hub portion **140**, which covers the entirety of the wheel hub portion **126**. As shown, the cladding **124** may also include a plurality of side petal portions **142** that nest within a respective one of the turbine openings **134** and cover the surfaces that define the turbine openings **134**. As

shown, the petal portions **142** can fill in some of the wheel turbine openings **134** thereby making them smaller and may also cover the lower portions of the wheel spoke side surfaces **138**. Alternatively, the petal portions **142** could be configured to cover the entirety of the wheel spoke side surfaces **138**. According to an aspect, the entireties of the wheel spokes **130** may remain exposed along with the wheel spoke openings **136**. According to another aspect, the wheel outer rim **132** may also remain uncovered and thus exposed. Again, the cladding **124** may be permanently attached to the wheel outboard surface by an adhesive such as an RTV adhesive or foam adhesive, as discussed above.

[0064] FIG 5 illustrates still another exemplary wheel assembly **150** according to an aspect of the disclosure. The wheel assembly **150** includes a backbone wheel **152** and a cladding **154**. According to an aspect, the cladding **154** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **152**. The wheel **152** can include a hub portion **156**, including a plurality of wheel lug openings **158**, which allow for attachment of the wheel **152** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. As shown, a plurality of wheel spokes **160** may extend outwardly from the hub portion **156** to a wheel rim **162**. The wheel rim **162** can extend entirely around the periphery of the wheel **152**. According to an aspect, a plurality of turbine openings **164** may be defined between adjacent wheel spokes **160** and a corresponding portion of the wheel rim **162**. The wheel rim **162** can also include an upwardly extending flange portion (not shown).

[0065] According to this aspect, the cladding **154** may be a single unitary structure that is configured to overlie the outboard face of the wheel **152**, but only covers a portion thereof. Again, according to this aspect, portions of the outboard face of the wheel **152** can remain exposed after attachment of the cladding **154** to the wheel **152**. As shown, the cladding **154** may include an inner periphery **170** that terminates adjacent an inner end of the

wheel spokes **160** and the wheel hub portion **156**. By this configuration, the cladding **154** need not include any cladding hub portion and the wheel hub portion **156** can remain exposed after the cladding **154** is attached to the wheel **152**. Additionally, the cladding **154** may include a plurality of cladding turbine portions **172** that overlie the wheel turbine opening spokes **160** such that they are made efficiently smaller. According to another aspect, the cladding **154** need not include any spoke portions such that considerable portions of the wheel spoke portions **160** remain exposed after attachment of the cladding **154** to the wheel **152**. According to a further aspect, the cladding **154** is configured such that it does not include any rim portion between the plurality of turbine openings **172**. In other words, part of the wheel rim **162** remains exposed after the cladding **154** is attached to the wheel **152**. Additionally, the cladding **154** may be configured such that it does not cover any upwardly extending flange portion. This combination can provide some aesthetically pleasing contrast between the cladding surface and the exposed wheel surface. Again, as discussed above, the cladding **154** may be attached to the wheel **152** by an adhesive such as an RTV adhesive or foam adhesive. As also discussed above, the wheel **152** and the cladding **154** can have different colored outboard surfaces for aesthetic purposes.

[0066] FIG 6 illustrates another exemplary wheel assembly **200** according to an aspect of the disclosure. The wheel assembly **200** includes a backbone wheel **202** and a cladding **204**. According to an aspect, the cladding **204** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **202**. The wheel **202** can include a hub portion **206**, including a plurality of wheel lug openings **208**, which allow for attachment of the wheel **202** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. As shown, a plurality of wheel spokes **210** may extend outwardly from the hub portion **206** to a wheel rim **212**. The wheel rim **212** can extend entirely around the periphery of the wheel. According to an aspect, a plurality of turbine openings **214** may

be defined between adjacent wheel spokes **210** and a corresponding portion of the wheel rim **212**. The wheel rim **212** can also include an upwardly extending flange portion (not shown).

[0067] According to this aspect, the cladding **204** may be a single unitary structure that is configured to overlie the outboard face of the wheel **202**, but only covers a portion thereof. Again, according to this aspect, portions of the outboard face of the wheel **202** can remain exposed after the cladding **204** is attached to the wheel **202**. As shown, the cladding **204** may include a full hub portion **220** that overlies the hub portion **206** of the wheel **202**. Additionally, the cladding **204** may include a plurality of spoke portions **222** that overlie a respective one of the wheel spokes **210**. According to a further aspect, the spoke portions **222** may extend downwardly into the wheel turbine openings **214** such that side portions **216** of the wheel spokes **210** may be covered by the cladding spoke portions **222**. The cladding spoke portions **222** can cover some, all or none of the wheel spoke side portions **216**. According to a further aspect, the cladding **204** may be configured to leave the majority of the wheel rim portion **212** exposed such that it remains exposed after the cladding **204** is attached to the wheel **202**. Additionally, the cladding **204** may be configured such that it does not cover any upwardly extending flange portion. This combination can provide some aesthetically pleasing contrast between the cladding surface and the exposed wheel surface, which can be formed of different colors, as discussed above. Again, as discussed above, the cladding **204** may be attached to the wheel **202** by an adhesive such as an RTV adhesive or foam adhesive.

[0068] FIG 7 illustrates another exemplary wheel assembly **250** according to an aspect of the disclosure. The wheel assembly **250** includes a backbone wheel **252** and a cladding **254**. According to an aspect, the cladding **254** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **252**. The wheel **252** can include a hub portion **256**, including a plurality of wheel lug openings **258**, which allow for

attachment of the wheel **252** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. As shown, a plurality of wheel spokes **260** may extend outwardly from the hub portion **256** to a wheel rim **262**. The wheel rim **262** can extend entirely around the periphery of the wheel. According to an aspect, a plurality of turbine openings **264** may be defined between adjacent wheel spokes **260** and a corresponding portion of the wheel rim **262**. The wheel rim **262** can also include an upwardly extending flange portion (not shown).

[0069] According to this aspect, the cladding **254** may be a single unitary structure that is configured to overlie the outboard face of the wheel **252**, but only covers a portion thereof. Again, according to this aspect, portions of the outboard face of the wheel **252** can remain exposed after attachment of the cladding **254** to the wheel **252**. As shown, the cladding **254** may include a full hub portion **270** that overlies the hub portion **256** of the wheel **252**. Additionally, the cladding **254** may include a plurality of spoke portions **272** that overlie the wheel spokes **260**. According to a further aspect, the spoke portions **272** may extend downwardly into the wheel turbine openings **264** such that side portions **266** of the wheel spokes **260** are covered by the clad spoke portions **272**. The clad spoke portions **272** can cover some, all or none of the wheel spoke side portions **266**. According to a further aspect, the cladding **254** can be configured to leave the majority of the rim portion **262** exposed after the cladding **254** is attached to the wheel **252**. According to a further aspect, the cladding **254** can include clad spoke flanges **274** disposed at an outer end of the clad spokes **272**, which are configured to overlie a portion of the wheel rim **262** on either side of the wheel spokes **260**. Additionally, the cladding **254** may be configured such that it does not cover any upwardly extending flange portion. This combination can provide some aesthetically pleasing contrast between the cladding surface and the exposed wheel surface, which as discussed above, may be formed of a different color. Again, as discussed above, the

cladding **254** may be attached to the wheel **252** by an adhesive such as an RTV adhesive or foam adhesive.

[0070] FIG 8 illustrates another exemplary wheel assembly **300** according to an aspect of the disclosure. The wheel assembly **300** includes a backbone wheel **302** and a cladding **304**. According to an aspect, the cladding **304** may be a metal plated structure that can be permanently secured to an outboard surface of the wheel **302**. The wheel **302** can include a hub portion **306**, including a plurality of wheel lug openings **308**, which allow for attachment of the wheel **302** to a vehicle for rotation therewith about an axis of rotation defined by the hub center. As shown, a plurality of wheel spokes **310** may extend outwardly from the hub portion **306** to a wheel rim **312**. The wheel rim **312** can extend entirely around the periphery of the wheel **302**. According to an aspect, a plurality of turbine openings **314** may be defined between adjacent wheel spokes **310** and a corresponding portion of the wheel rim **312**. The wheel rim **312** can also include an upwardly extending flange portion (not shown). According to another aspect, a spoke opening **318** may be formed in each spoke **310**.

[0071] According to this aspect, the cladding **304** may be a single unitary structure that is configured to overlie the outboard face of the wheel **302**, but only covers a portion thereof. Again, according to this aspect, portions of the outboard face of the wheel **302** can remain exposed after attachment of the cladding **304** to the wheel **302**. As shown, the cladding **304** may include a full hub portion **320** that overlies the hub portion **306** of the wheel **302**. Additionally, the cladding **304** may include spoke portions **322** that overlie a respective one of the wheel spokes **310**. According to an aspect, the cladding spoke portions **322** can partially overlie wheel spoke side surfaces **316** partially or completely. Alternatively, the wheel spoke side surfaces **316** may remain exposed after attachment of the cladding **304** to the wheel outboard face. According to a further aspect, the cladding **304** may be configured such that the wheel rim portion **312** remains exposed (wholly or partially) after

attachment of the cladding **304** to the wheel **302**. According to another aspect, the cladding **304** can also include **324** spoke openings that overlie the surfaces that form the wheel spoke openings **318** such that the wheel spoke openings **318** remain exposed in the final wheel assembly **300**. Additionally, the cladding **304** may be configured such that it does not cover any upwardly extending flange portion. This combination can provide some aesthetically pleasing contrast between the cladding surface and the exposed wheel surface. As discussed above, the wheel **302** and the cladding **304** may be formed or otherwise treated to have different colors on the outboard surfaces for aesthetic purposes. Again, the cladding **304** may be attached to the wheel **302** by an adhesive such as an RTV adhesive or foam adhesive.

[0072] It will be appreciated that the above examples are merely illustrative and an infinite number of other wheel assembly combinations and configurations may be employed.

[0073] FIGs 9a through 9e illustrate an exemplary assembly process for a wheel assembly in accordance with an aspect of the disclosure. FIG 9a schematically illustrates a pallet **400** that can be used in the assembly process for a wheel assembly according to an aspect of the present disclosure. As shown, the pallet **400** can include a plurality of locating structures **402**, **404** that may be configured to assist in locating the wheel and the cladding, respectively. According to an aspect, the locating structures **402**, **404** can extend upwards to engage features of the wheel and the cladding to assist with the location function of elements of the wheel assembly. According to another aspect, the locating structures **402**, **404** may be constructed of a generally pliable material that allows for their deflection and application of a subsequent resistive force to accommodate variations in surface tolerances as the wheel and the cladding are positioned thereon. The location, positioning and number of locating structures can obviously vary depending upon the configuration of the wheel and the cladding that together form the wheel assembly. According to another aspect, the pallet **400** may also be formed with other structures that contact the wheel spokes or wheel turbine openings to

assist in locating the wheel with respect to the cladding and the pallet. The pallet **400** may also be formed with pockets that allow for the accommodation of any tolerances that may exist in the wheel surfaces.

[0074] As shown in FIG 9b, according to an aspect, a cladding **410** can be placed face down on the pallet **400** such that the outboard face of the cladding rests on the upper surface of the pallet **400**. According to an aspect, the wheel locating structures **402** can be disposed between adjacent spokes **406** of the cladding **410**. According to another aspect, the clad locating structures **404** can engage a cladding spoke to window **408** to locate the cladding **410** with respect to the pallet **400**. According to an aspect, the clad locating structures **404** may be generally wedge shaped. However, they could take on a variety of different shapes depending upon the configuration of the cladding **410**. According to an aspect, the clad locating structures **404** can assist in centering and locating the cladding with respect to a reference datum. According to an aspect, one reference datum of concern is the rotational center of the wheel/cladding assembly. According to another aspect, the clad locating structures **404** can assist in centering (concentricity) the cladding **410** on the wheel **412** and assist in setting the angular orientation of the cladding **410** to the wheel **412**.

[0075] FIGs 9c and 9d illustrate a wheel **412** disposed face down on the cladding **410**, which is disposed face down on the pallet **400**. According to an aspect, the wheel locating structures **402** can include a first side portion **414**, a second side portion **416**, and a pocket portion **418** disposed therebetween. This arrangement of the side portions **414**, **416** and the pocket portion **418** can allow flexibility in the wheel locating structures **402** whereby the side portions **414**, **416** can move inwards into the pocket portion **418** as the wheel is placed on the pallet **400** to account for any tolerances that may exist in the wheel or cladding structures. The wheel locating structures can take on a variety of different configurations. According to an aspect, the side portions **414**, **416** of the wheel locating structures **402** can be configured to

contact or engage the wheel spoke **420** or wheel turbine opening **422** to locate the wheel properly on the pallet **400**. The wheel **412** may then be positioned face down on the pallet **400**. With this orientation, the wheel **412** may be placed face down such that the wheel outer surface contacts the cladding inner surface. According to an aspect, the wheel may engage the wheel locating features **402**, as shown, to properly align the wheel **412** with respect to the cladding **410**.

[0076] FIG 9e is an exploded view of the components of the wheel assembly and their assembly orientation in accordance with an aspect of the disclosure.

[0077] FIGs 10a through 10e illustrate the features of the wheel assembly that can assist in isolating the wheel cladding from the wheel according to an aspect of the disclosure. The isolation of the clad from the wheel can prevent contact therebetween and serve to prevent corrosion and/or noise issues that can occur from abrasion due to any relative motion between the clad and the wheel.

[0078] As shown in FIG 10a, an isolator feature, such as a gimp or gasket **500** may be disposed between the wheel and the cladding. According to another aspect, the isolator feature **500** could be attached initially to either the cladding or the wheel. As exemplarily shown, the isolator feature **500** could be attached to the underside of a clad side spoke **502**. According to an aspect, the isolator feature **500** may be generally cylindrical in shape and extend from an edge **504** of the clad side spoke **502** in a direction toward the clad turbine opening **506**. As also shown, an isolator feature may be disposed on each clad side spoke **502**. Obviously, more or less isolator features may be employed and they could be disposed in different places. Tape or other adhesive could then be utilized on the isolator features to assist in securing it to the other structure (wheel or cladding) to which the isolator feature is not attached. Alternatively, an adhesive that is separate from the isolator feature **500** could also be employed in other areas to secure the cladding to the wheel. The adhesive could be an

RTV or foam adhesive. Alternatively, a double sided pressure sensitive adhesive could also be employed. Other suitable adhesives may also be employed. According to aspect, the isolator feature **500** can also assist in centering the cladding on the wheel as well as aligning the cladding to the wheel angularly. The disclosed feature can also help establish a gap distance between the cladding and the wheel to minimize contact therebetween.

[0079] FIG 10b illustrates another aspect of an isolator feature configured as a pad. According to an aspect, the pad **510** could be constructed of a UHMW polyethylene, plastic or foam. The pad could also be formed of other suitable materials. As shown, pads **510** could be disposed on each of the clad side spokes **512** as well as the clad rim portion **514**. According to an aspect, the pads **510** could be disposed generally in the middle of the clad side spokes **512** and the clad rim portion **514**. Obviously, more or less pads could be employed with the location of their placement also varying. It will be appreciated that the pad **510** could be constructed of other suitable shapes. According to an aspect, the pad **510** may be secured to the cladding (or wheel) with a tape or a pressure sensitive adhesive. The cladding can then be attached to the wheel using a separate adhesive. According to an aspect, the isolator feature **510** can help center the cladding on the wheel as well as align the cladding to the wheel angularly. The isolator feature **510** can also establish a gap/distance between the cladding and the wheel to minimize contact therebetween.

[0080] FIG 10c illustrates still another aspect of the disclosure where the isolator feature consists of a plurality of standoff ribs **520**. As shown, the plurality of standoff ribs **520** may be disposed on each of the cladding side spokes **522** and the cladding rim portion **524**. The standoff ribs **520** can be molded into the cladding. According to an aspect, the ribs can allow the cladding to be attached to the wheel using adhesive over the ribs **520** so as to isolate the cladding from any clear coat on the wheel, which can minimize any corrosion. It will be appreciated that the number of ribs employed may vary as can their location on the

cladding. It will also be appreciated that the ribs can be formed on the cladding (or wheel) in a variety of different ways. According to an aspect, the standoff ribs **520** can help center the cladding on the wheel and assist in aligning the cladding to the wheel angularly. The standoff ribs **520** can also establish a gap/distance between the cladding and the wheel. The ribs **520** may have a variety of other suitable configurations.

[0081] FIG 10d illustrates yet another aspect of the disclosure where the isolator feature consists of a plurality of stand-off dimples **530**. As shown, the plurality of stand-off dimples **530** may be molded or formed into the cladding (or wheel). According to this aspect, after the cladding is formed, an adhesive can be disposed over the dimples **530** and then the cladding can be attached to the wheel. It will be appreciated that the dimples **530** could be formed in a variety of other suitable ways. As shown, the plurality of dimples **530** may be disposed on each of the cladding side spokes **532** and the cladding rim portion **534**. According to an aspect, the adhesive over the dimples can serve to isolate the cladding from the clear coat on the wheel. It will be appreciated that the number of dimples employed may vary as can their location on the cladding. According to an aspect, the dimples **530** can help center the cladding on the wheel and assist in aligning the cladding to the wheel angularly. The dimples **530** can also establish a gap/distance between the cladding and the wheel to minimize or prevent contact therebetween.

[0082] FIG 10e illustrates a further aspect of the disclosure where the isolator feature consists of a pre-cured elastomeric adhesive **540** attached to the cladding or the wheel. As shown, the pre-cured elastomeric adhesive **540** may be disposed on each of the cladding side spokes **542** and the cladding rim portion **544**. The location of the isolator feature can obviously vary. Additionally, more or less isolator features may be employed. According to an aspect, once the pre-cured elastomeric adhesive **540** is attached, a separate adhesive may then be used to adhere the cladding to the wheel. According to an aspect, the pre-cured

elastomeric adhesive **540** can help center the cladding on the wheel and assist in aligning the cladding to the wheel angularly. The pre-cured elastomeric adhesive **540** can also establish a gap/distance between the cladding and the wheel.

[0083] The above described isolators are merely exemplary and a variety of other ways of isolating the cladding from the wheel may be employed. Additionally, the isolators could be used in combination as desired.

[0084] In accordance with an aspect, an assembly process for securing the cladding to the wheel is also provided. According to the method, the assembly process and fixturing is unique. The key features relate to centering of the clad to the backbone wheel features as well as mechanisms to set a consistent gap from wheel to cladding, accounting for wheel and/or cladding surface geometry variations, while maintaining the ability to isolate the wheel from the clad to prevent corrosion and potential noise issues during on-vehicle operation. This can also address some of the packaging issues related to the utilization of claddings in small spaces available on passenger car wheels.

[0085] FIG 11a illustrates a wheel assembly attached to a vehicle. As shown, the wheel assembly **600** includes a wheel **602** having a rim portion **604** and an outboard face **606**. As also shown, a cover or cladding **608** is attached to the outboard face **606** of the wheel **602**. A tire **610** is disposed on the rim portion **604** of the wheel **602**. The outboard edge **612** of the tire defines an envelope (Te) or profile of the tire. As shown, inwardly of the envelope (Te) is a known clearance zone (Cz) that can be intruded upon by structures exterior to the vehicle. The wheel cannot intrude into the clearance zone or it will be unacceptable for OEM use. However, as illustrated in FIG 11a, depending upon the size of the vehicle, the prior art cladding **608** can extend into the clearance zone (Cz), which is disadvantageous. This is due, in large part, to the fact that the cladding **608** covers all exterior surfaces of the wheel outboard face **606**.

[0086] FIG 11b illustrates a wheel assembly attached to a vehicle according to an aspect of the disclosure. As shown, the wheel assembly 650 includes a wheel 652 having a rim portion 654 and an outboard face 656. As also shown, a cover or cladding 658 is attached to the outboard face 656 of the wheel 652. A tire 660 is disposed on the rim portion 654 of the wheel 652. The outboard edge 662 of the tire defines an envelope (Te) or profile of the tire. As shown, a clearance zone (Cz) is again defined inwardly of the envelope (Te). As shown, the cladding 658 in accordance with an aspect of the present disclosure does not extend into the clearance zone (Cz). As such, there is no interference between the cladding 658 and the clearance zone (Cz). According to an aspect, the cladding 654 can rest or nest within the wheel turbine openings such that their outer surface does not intrude into the clearance zone (Cz). The cladding 654 can thus provide desired aesthetics with a smaller profile, which can be desirable for small vehicles. A cladding with this configuration can also provide aerodynamic benefits.

[0087] The specification and illustrations of the embodiments described herein are intended to provide a general understanding of the structure of the various embodiments. The specification and illustrations are not intended to serve as an exhaustive and comprehensive description of all of the elements and features of apparatus and systems that use the structures or methods described herein. Many other embodiments may be apparent to those of skill in the art upon reviewing the disclosure. Other embodiments may be used and derived from the disclosure, such that a structural substitution, logical substitution, or another change may be made without departing from the scope of the disclosure. Accordingly, the disclosure is to be regarded as illustrative rather than restrictive.

[0088] Certain features are, for clarity, described herein in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features that are, for brevity, described in the context of a single embodiment, may

also be provided separately or in any sub combination. Further, reference to values stated in ranges includes each and every value within that range.

**[0089]** Benefits, other advantages, and solutions to problems have been described above with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any feature(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential feature of any or all the claims.

**[0090]** The above-disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover any and all such modifications, enhancements, and other embodiments that fall within the scope of the present invention. Thus, to the maximum extent allowed by law, the scope of the present invention is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

**[0091]** Although only a few exemplary embodiments have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of the embodiments of the present disclosure. Accordingly, all such modifications are intended to be included within the scope of the embodiments of the present disclosure as defined in the following claims. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents, but also equivalent structures.

## CLAIMS

What is claimed is:

1. A unitary wheel cover for permanent attachment to a wheel, comprising:
  - a central hub portion;
  - a plurality of spoke portions integrally formed with and extending outwardly from the central hub portion, each of the plurality of spoke portions having an inner end located adjacent the central hub portion and an outer end disposed away from the inner end;
  - wherein the outer ends of the plurality of spoke portions are spaced apart from one another such that the outer periphery of the wheel cover is discontinuous whereby the wheel cover overlies an entirety of an outer periphery of an underlying wheel.
2. The wheel cover of claim 1, further comprising:
  - a metal layer disposed on at least an outer surface of the wheel cover.
3. The wheel cover of claim 2, wherein the metal layer includes a chrome material.
4. The wheel cover of claim 3, further comprising:
  - a decorative accent disposed overtop of the chrome layer.
5. The wheel cover of claim 4, wherein the decorative accent includes at least one of the following: paint, hydro graphics or molded in color.
6. A wheel assembly, comprising:
  - a wheel portion having an outboard surface including:
    - a wheel central hub portion;
    - a plurality of wheel spoke portions extending outwardly from the wheel central hub portion, the plurality of wheel spoke portions having inner ends located adjacent the wheel central hub portion and outer ends disposed away from the inner ends;
    - a plurality of wheel turbine openings disposed between adjacent ones of the plurality of wheel spoke portions;

a wheel outer periphery located adjacent the outer ends of the plurality of wheel spokes;

the wheel central hub portion, the plurality of wheel spoke portions and the wheel outer periphery cooperate to define a wheel outboard surface;

a cover portion that is configured to overlie a portion of the wheel outboard surface, the cover portion having an inboard surface that is configured to face the wheel outboard surface and including structure configured to overlie one or more of the wheel central hub portion, the plurality of wheel spoke portions, the plurality of turbine openings and the wheel outer periphery;

an adhesive for permanently securing the inboard surface of the cover portion to the outboard surface of the wheel portion;

whereby, when the cover portion is secured to the wheel, substantial portions of the plurality of wheel spokes, the wheel central hub, or wheel outer periphery are visible.

7. The assembly of claim 6, wherein the adhesive is foam adhesive.

8. The assembly of claim 6, wherein the wheel outboard surface and an outer surface of the clad are configured with different colors.

9. The assembly of claim 8, wherein the cover portion consists of the following:  
a cover outer periphery that overlies the entirety of the wheel outer periphery; and  
a plurality of cover turbine opening portions that overlie side surfaces of the plurality of wheel spoke portions;

whereby the wheel central hub portion and an outboard surface of each of the plurality of wheel spoke portions remains exposed after attachment of the cover portion to the wheel outboard surface.

10. The assembly of claim 6, further comprising:

a plurality of openings formed in each of the plurality of wheel spokes.

11. The assembly of claim 10, wherein the cover portion consists of the following:

- a cover central hub portion that overlies the wheel central hub portion;
- a plurality of cover spoke portions that overlie an outboard surface of each of the plurality of wheel spoke portions;
- a plurality of cover spoke opening side surfaces that each define cover wheel spoke openings;

whereby side surfaces of each of the plurality of wheel turbine openings and portions of the wheel outer periphery adjacent each of the plurality of wheel turbine openings remain exposed after attachment of the cover portion to the wheel outboard surface.

12. The assembly of claim 11, further comprising:

- a spoke flange portion formed on either side of each of the plurality of cover spoke portions, each spoke flange portion being disposed over a portion of the wheel outer periphery.

13. The assembly of claim 6, wherein the cover portion consists of the following:

- a plurality of cover turbine opening portions that are configured to nest within each of the plurality of wheel turbine openings to overlie a plurality of wheel spoke side surfaces that define each of the plurality of wheel turbine openings; and

- a plurality of cover spoke portions that are disposed over a portion of each of the plurality of wheel spoke portions;

whereby the wheel central hub portion, portions of each of the plurality of wheel spoke portions and portions of the wheel outer periphery remain exposed after attachment of the cover to the wheel outboard surface.

14. The assembly of claim 6, further comprising:

- a plurality of wheel spoke openings formed in each of the plurality of wheel spokes.

15. The assembly of claim 14, wherein the cover portion consists of the following:

a cover central hub portion; and

a plurality of cover turbine opening portions that are configured to nest within each of the plurality of wheel turbine openings to overlie a lower portion of each of a plurality of wheel spoke side surfaces that define each of the wheel turbine openings;

whereby an outboard surface of each of the plurality of wheel spokes, an upper portion of each of the plurality of wheel side surfaces that define each of the wheel turbine openings, and the wheel outer periphery remain exposed after attachment of the cover to the wheel outboard surface.

16. The assembly of claim 6, wherein the cover portion consists of the following:

a plurality of partial cover spoke portions that overlie at least a portion of an outboard surface of each of the plurality of wheel spoke portions; and

a plurality of cover turbine opening portions that are configured to nest within each of the plurality of wheel turbine openings so as to overlie each of a plurality of cover spoke side surfaces that define the plurality of wheel turbine openings;

whereby the wheel central hub portion, portions of each of the plurality of wheel spoke portions, and portions of the wheel outer periphery remain exposed after attachment of the cover to the wheel outboard surface.

17. The assembly of claim 6, wherein the cover portion consists of the following:

a plurality of cover spoke portions that are configured to overlie the plurality of wheel spoke portions; and

a cover central hub portion that overlies the wheel central hub portion;

whereby portions of the wheel outer periphery remain exposed after attachment of the cover to the outboard surface of the wheel.

18. The assembly of claim 17, further comprising:

a plurality of wheel spoke openings formed in each of the plurality of wheel spoke portions.

19. The assembly of claim 6, further comprising:

a plurality of isolator features formed on the inboard surface of the cover portion to space the cover portion inboard surface from the wheel outboard surface.

20. The assembly of claim 19, wherein the plurality of isolator features consist of one or more of the following: a plurality of gaskets, a plurality of foam pads, a plurality of ribs, a plurality of dimples, or a plurality of elastomeric adhesive structures.

21. A wheel assembly, comprising:

a wheel portion having an outboard surface including:

a wheel central hub portion,

a plurality of wheel spoke portions extending outwardly from the wheel central hub portion, the plurality of wheel spoke portions having inner ends located adjacent the wheel central hub portion and outer ends disposed away from the inner ends;

a plurality of wheel turbine openings disposed between adjacent ones of the plurality of wheel spoke portions;

a wheel outer periphery that engages each of the outer ends of the plurality of wheel spokes;

the wheel central hub portion, the plurality of wheel spoke portions, and the wheel outer periphery cooperate to define a wheel outboard surface;

a cover portion that is configured to overlie the wheel portion, the cover portion having an inboard surface that is configured to face the wheel outboard surface and including:

a cover central hub portion;

at least one of a plurality of cover spoke portions that overlie at least a portion of the plurality of wheel spoke portions or a plurality of cover turbine openings that overlie surfaces that define each of the plurality of wheel turbine openings; and

an adhesive disposed on the inboard surface of the cover portion and the outboard surface of the wheel to permanently secure the cover portion to the wheel portion.

22. The assembly of claim 21, wherein the adhesive is foam adhesive.

23. The assembly of claim 21, wherein the cover portion is configured such that it does not overlie an entirety of the wheel outboard surface.

24. The assembly of claim 21, further comprising:

a metal layer disposed on at least an outer surface of the wheel cover.

25. The wheel cover of claim 24, wherein the metal layer includes a chrome material.

26. The wheel cover of claim 25, further comprising:

a decorative accent disposed overtop of the chrome layer.

27. The wheel cover of claim 26, wherein the decorative accent includes at least one of the following: paint, hydro graphics or molded in color.

28. A method of forming a wheel assembly consisting of a wheel portion and a cover portion, comprising:

providing a wheel assembly pallet having a plurality of pliable locating structures formed on a base surface;

disposing a cover portion on the base surface such that an outboard surface of the cover portion engages the base surface;

engaging the cover portion with a plurality of cover locating structures in order to properly align the cover portion for assembly of the wheel portion;

disposing the wheel portion face down on the cover portion such that an outboard surface of the wheel portion overlies a cover inboard surface;

placing the wheel portion on the cover portion such that each of a plurality of wheel turbine openings engage a respective wheel portion locating structure, wherein each of the wheel portion locating structure includes a pair of side portions disposed on either side of a pocket portion and whereby the pair of side portions are configured to flex inwardly to accommodate placement of the wheel portion with respect to the cover portion.

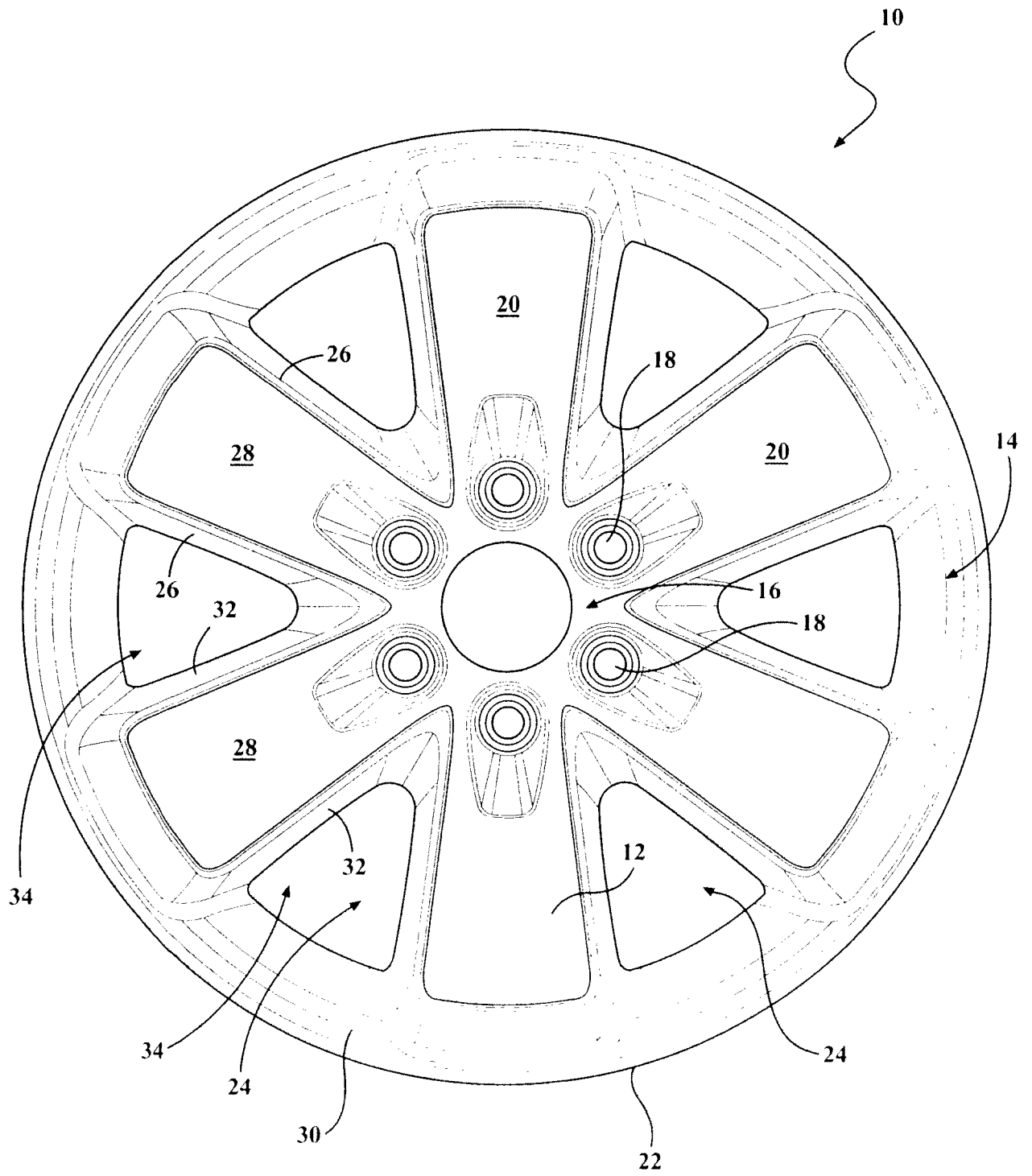
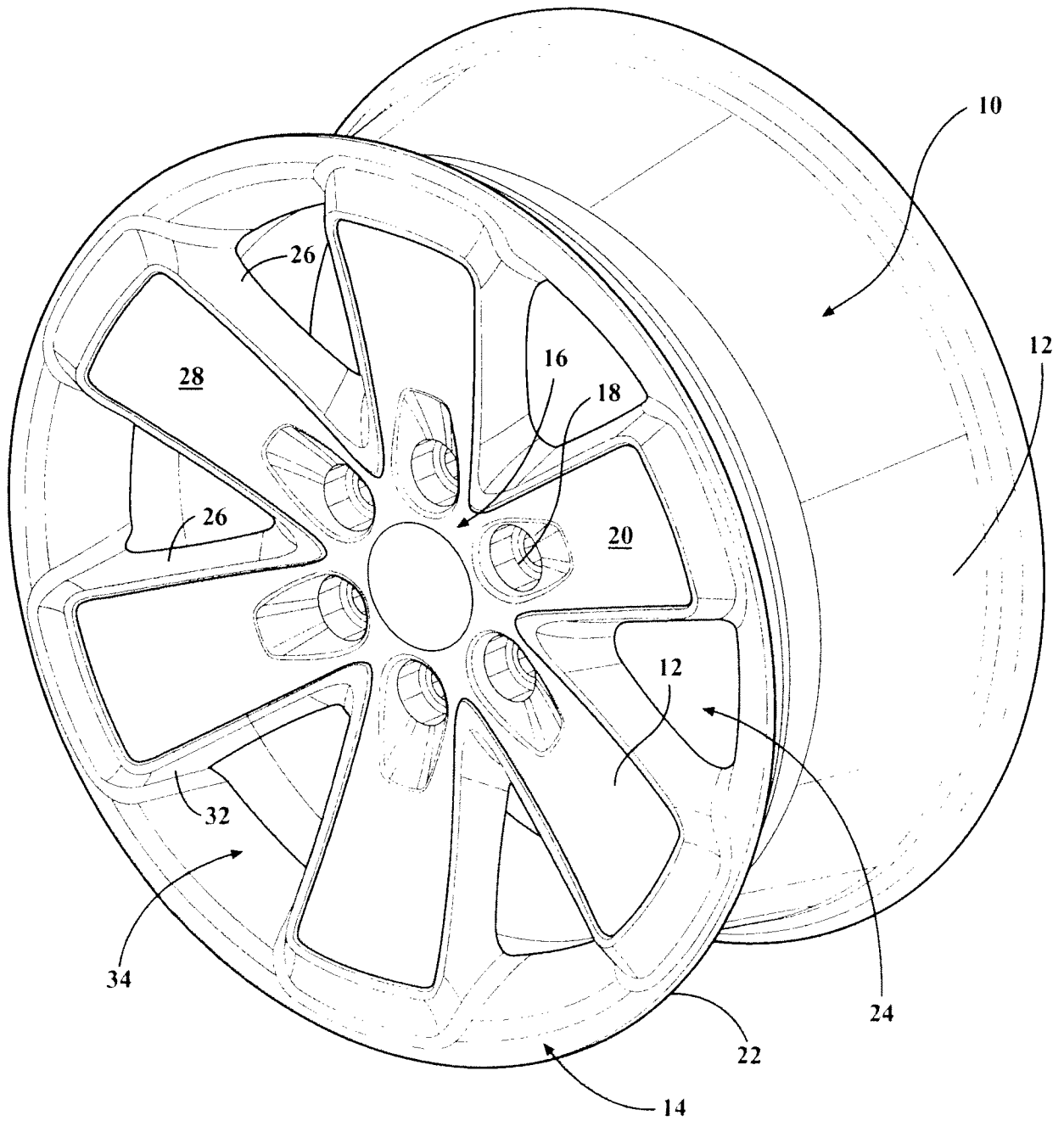
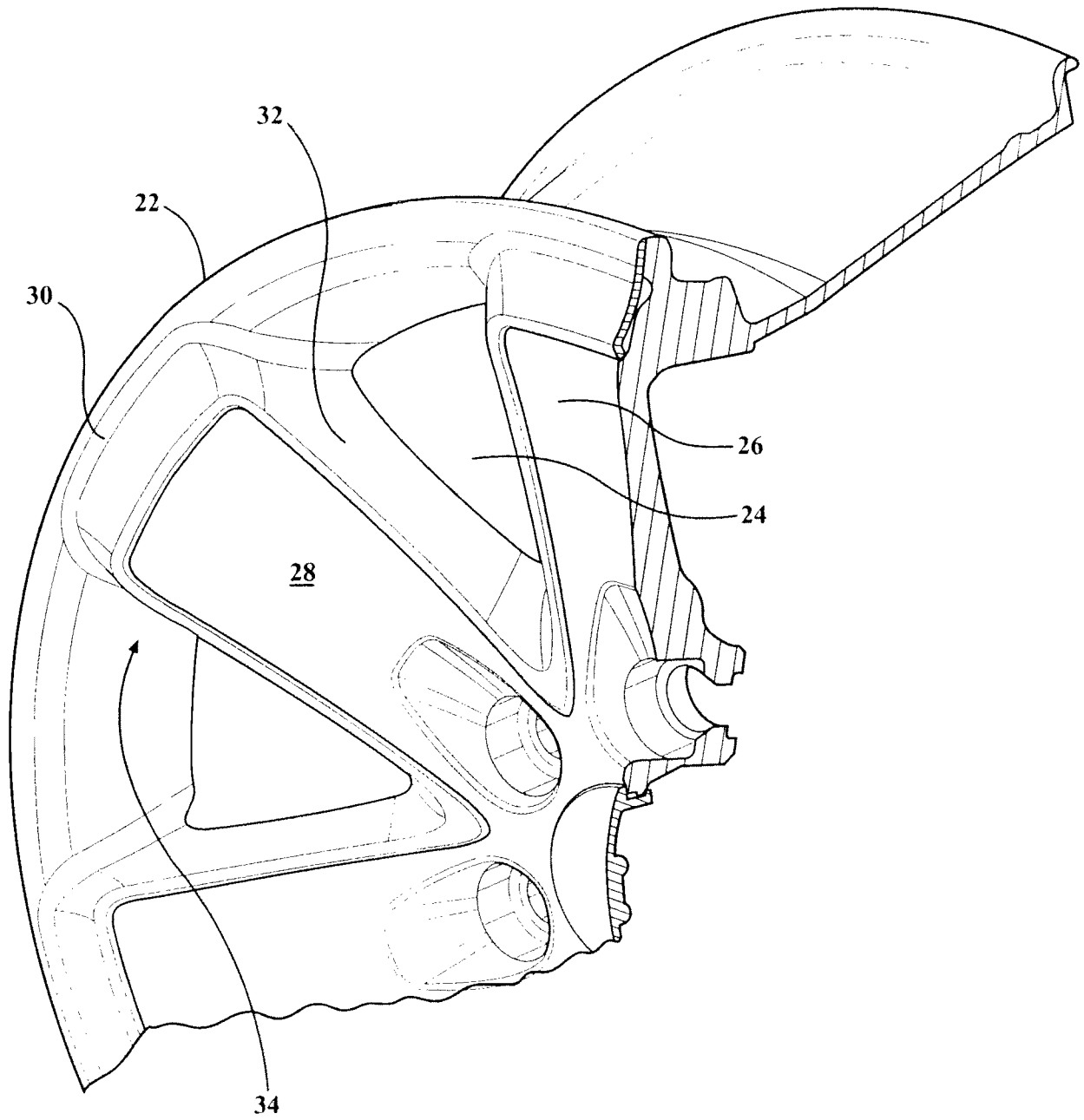


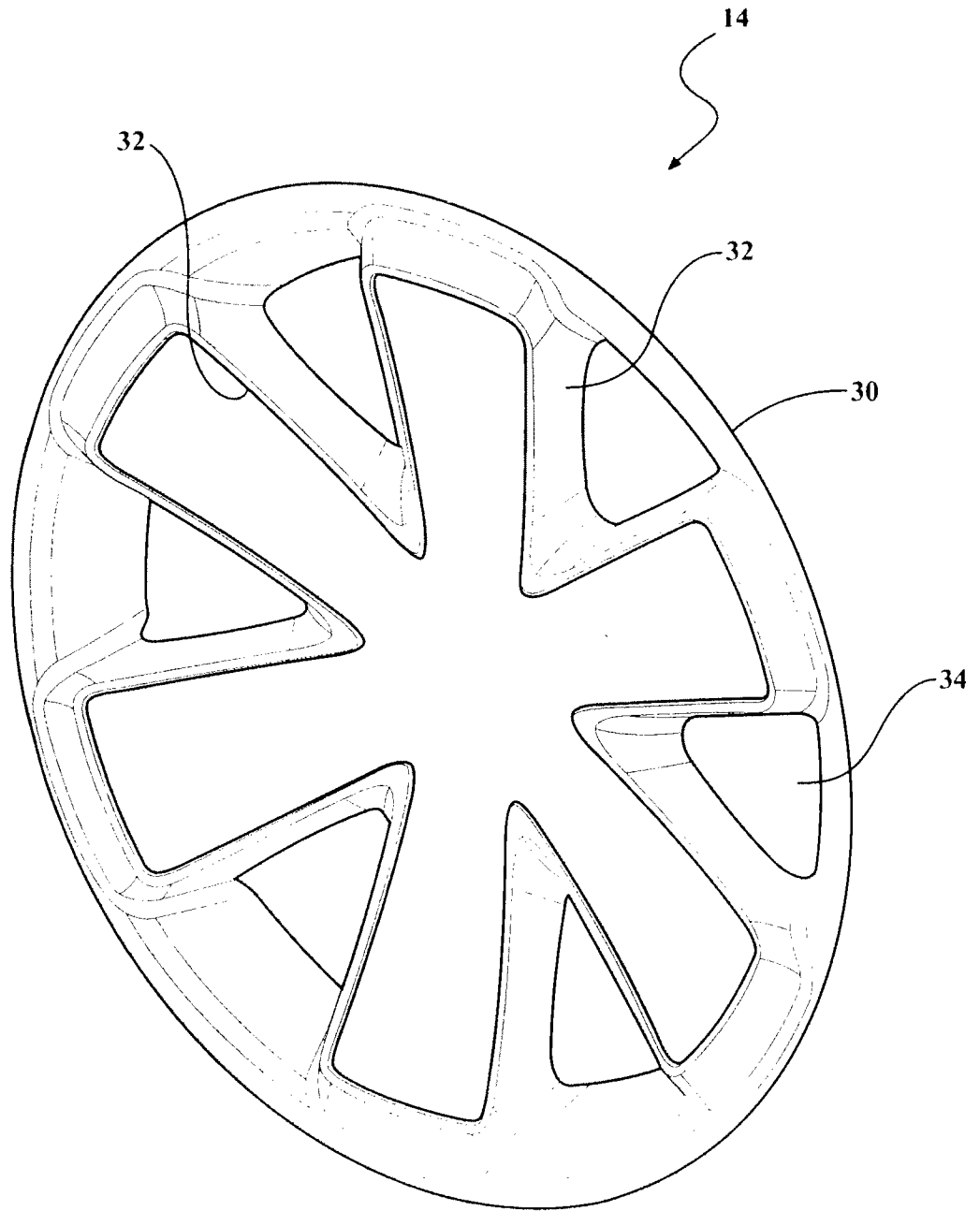
FIG. 1A



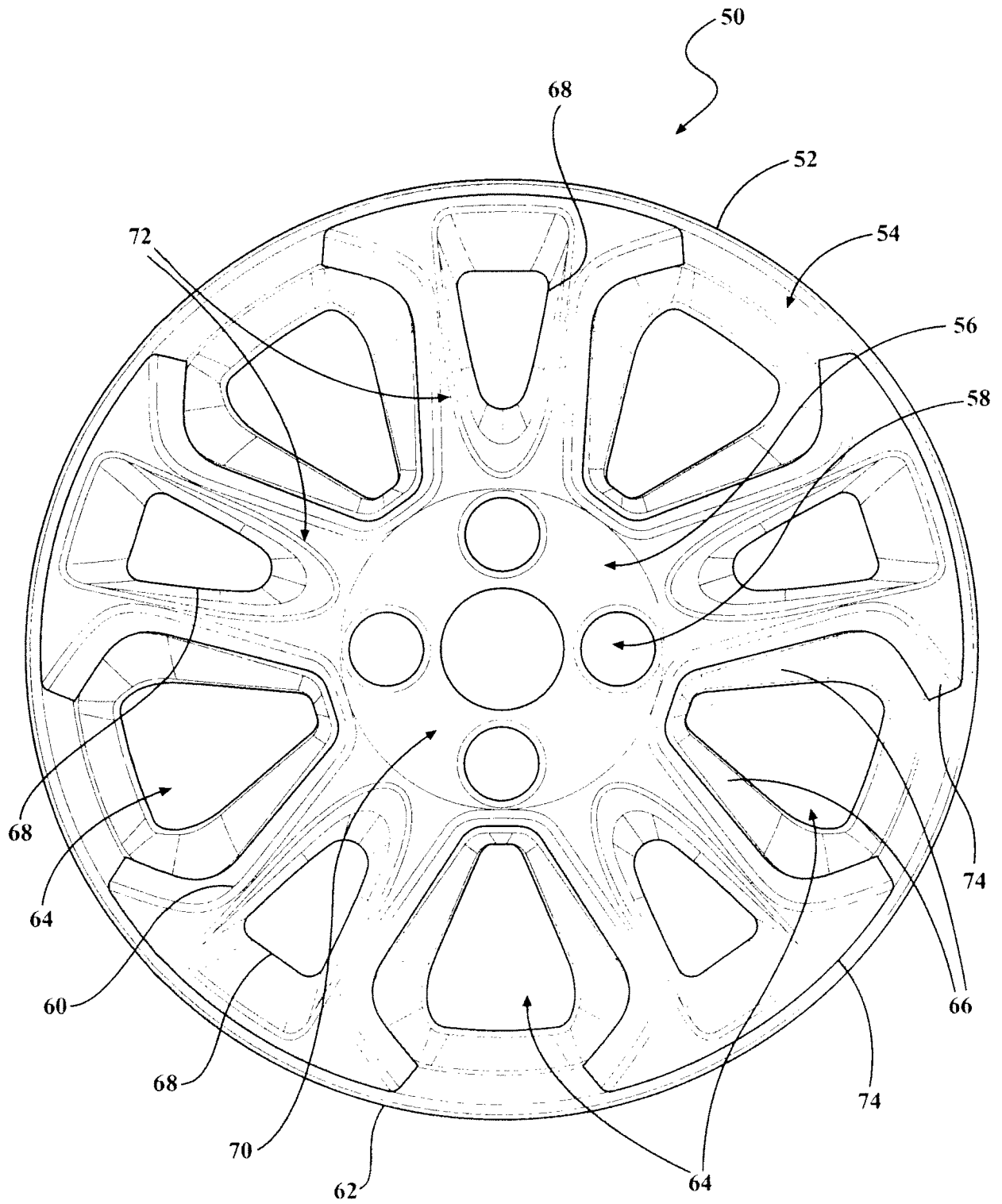
**FIG. 1B**



**FIG. 1C**



**FIG. 1D**

**FIG. 2A**

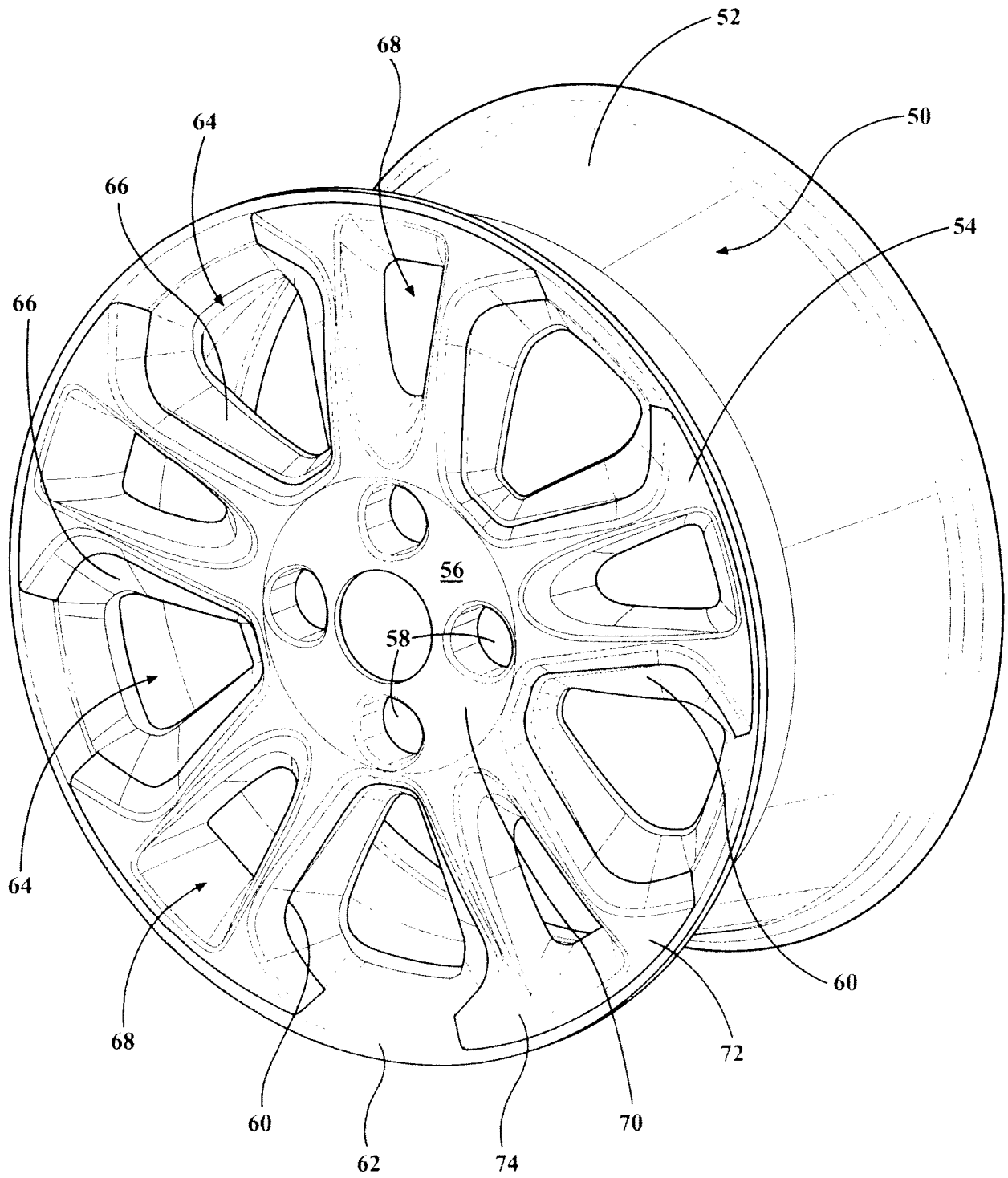
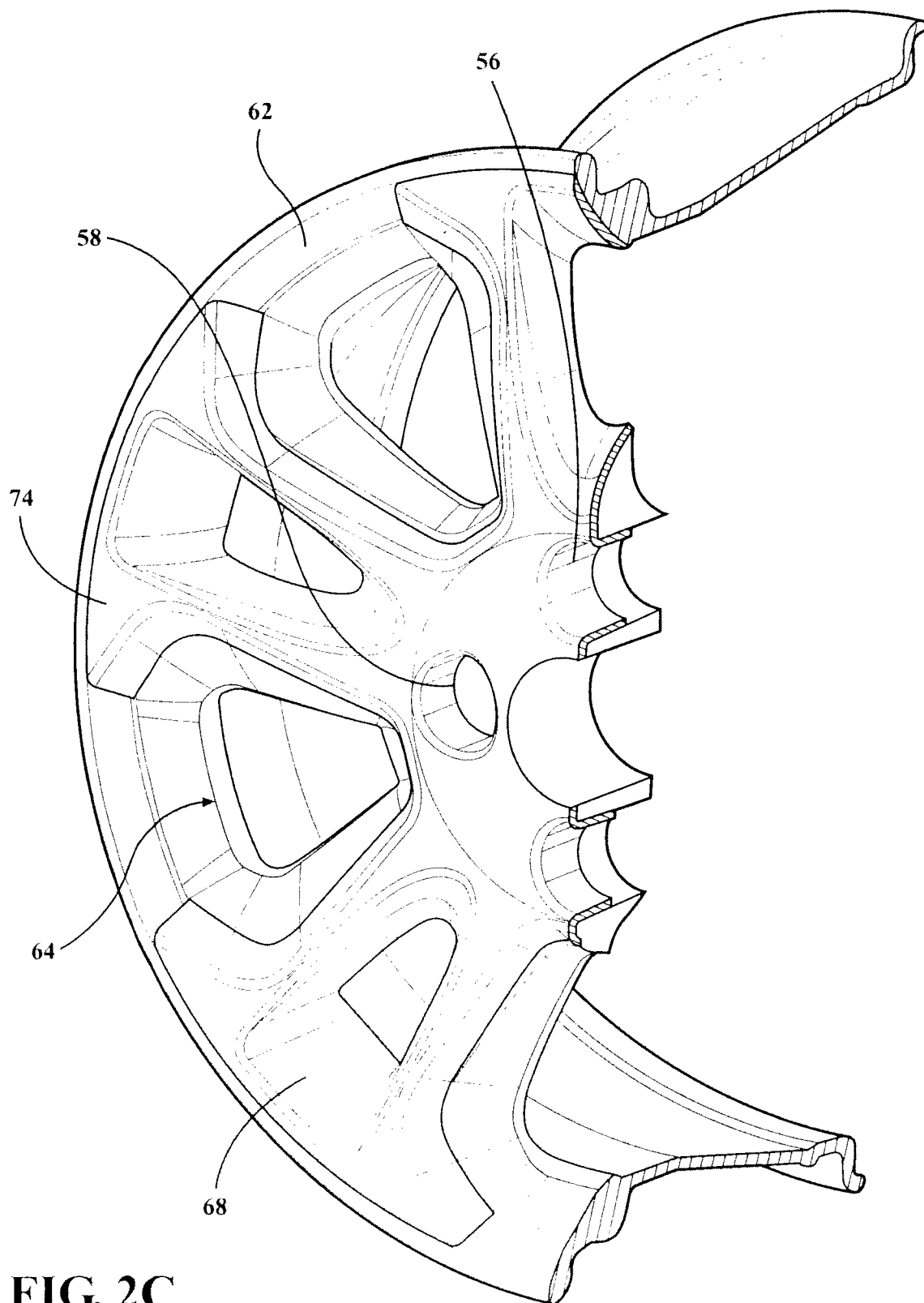
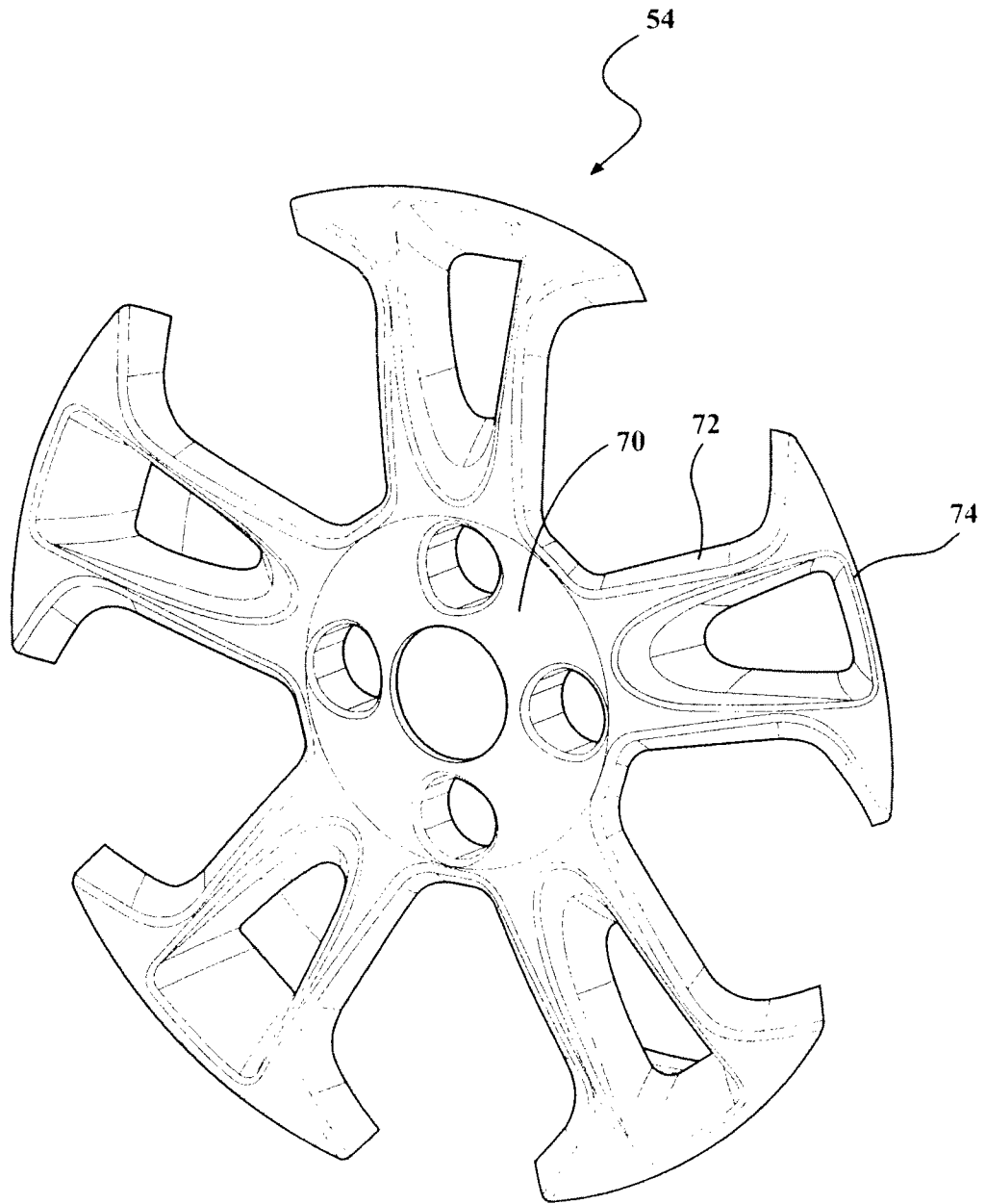


FIG. 2B



**FIG. 2D**

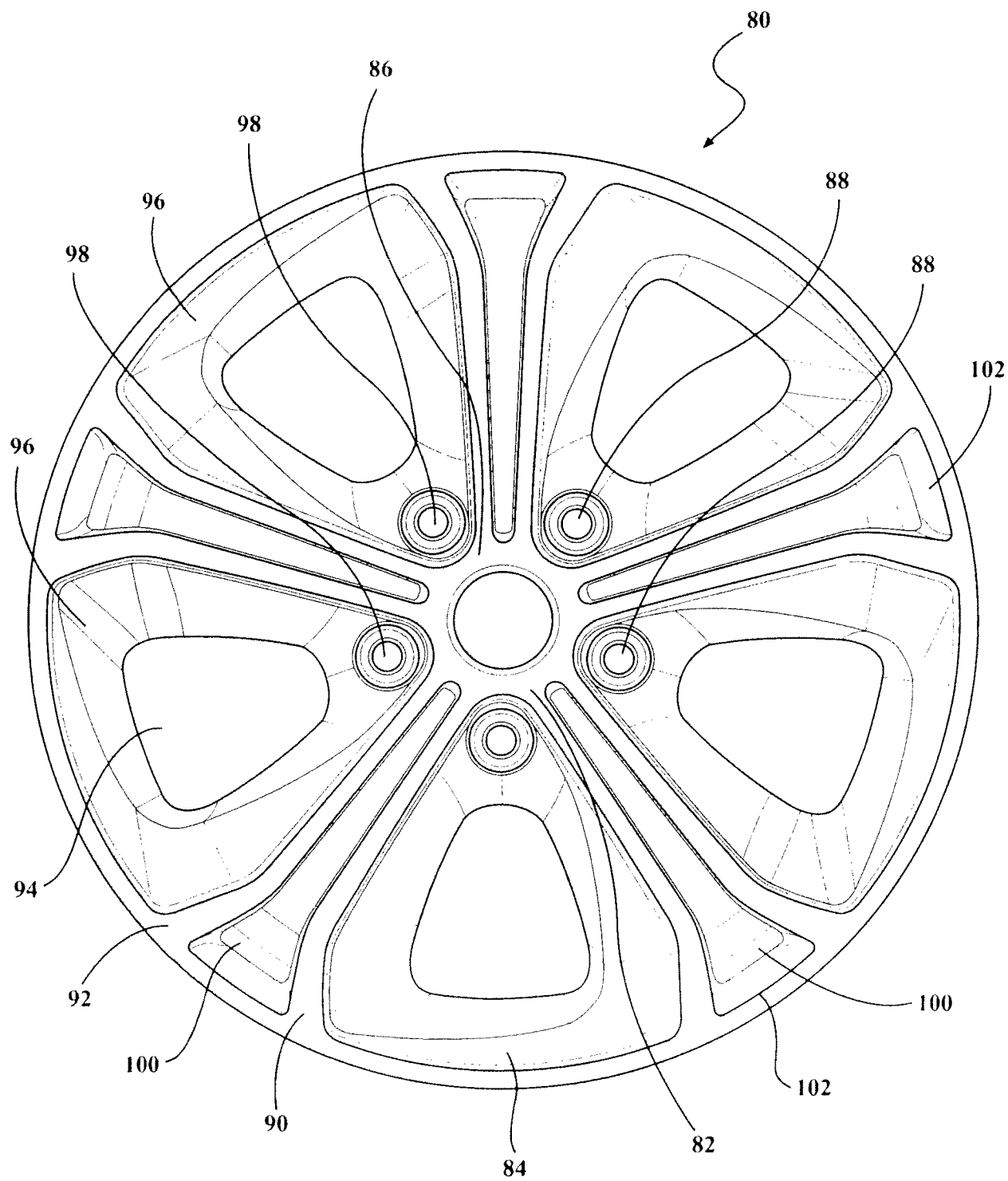


FIG. 3A



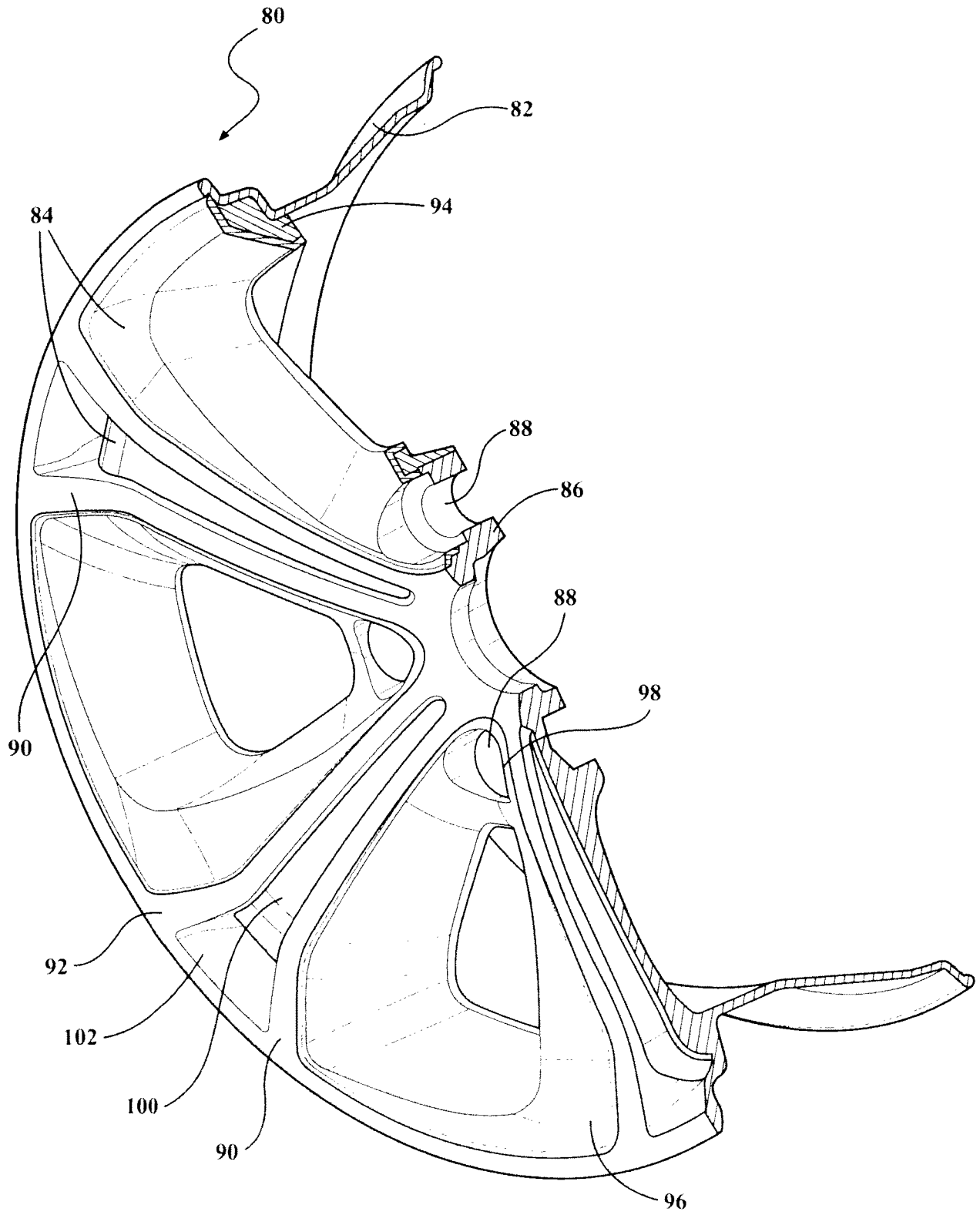
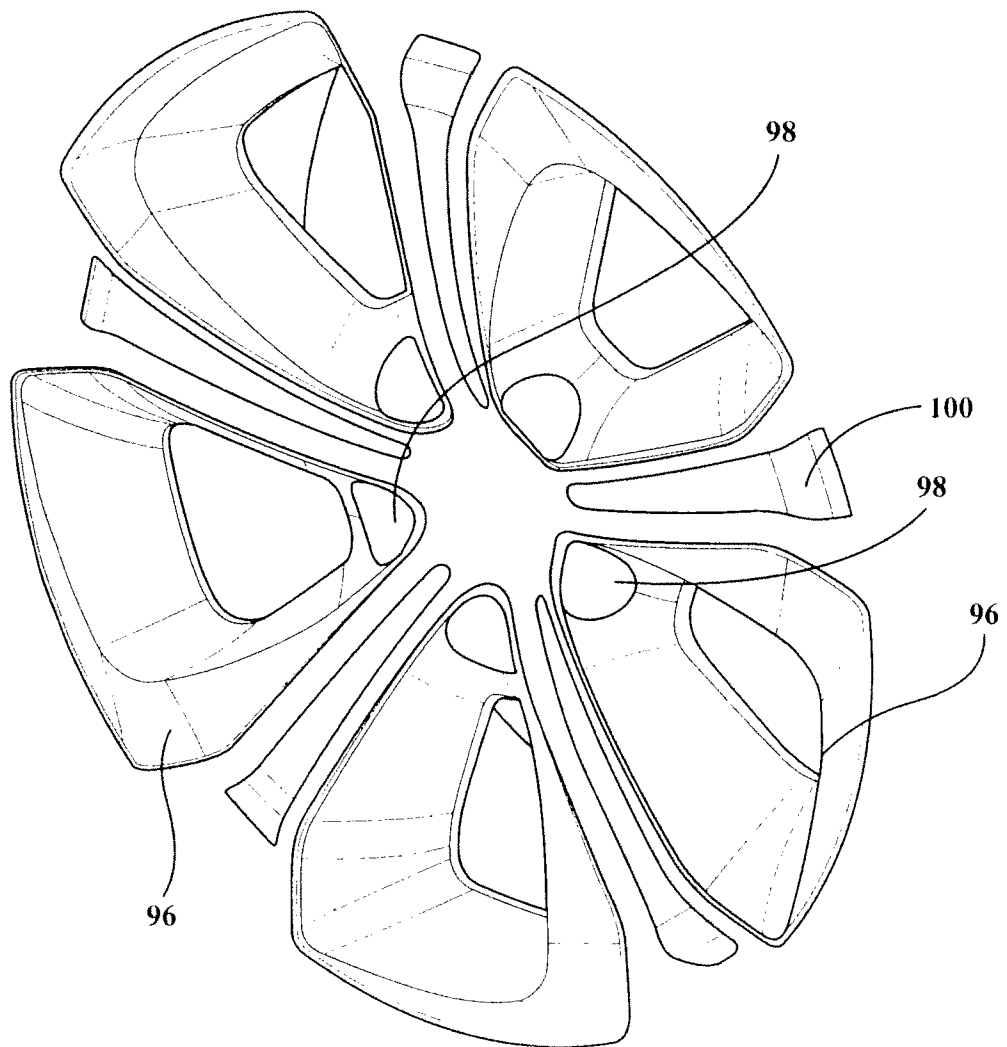
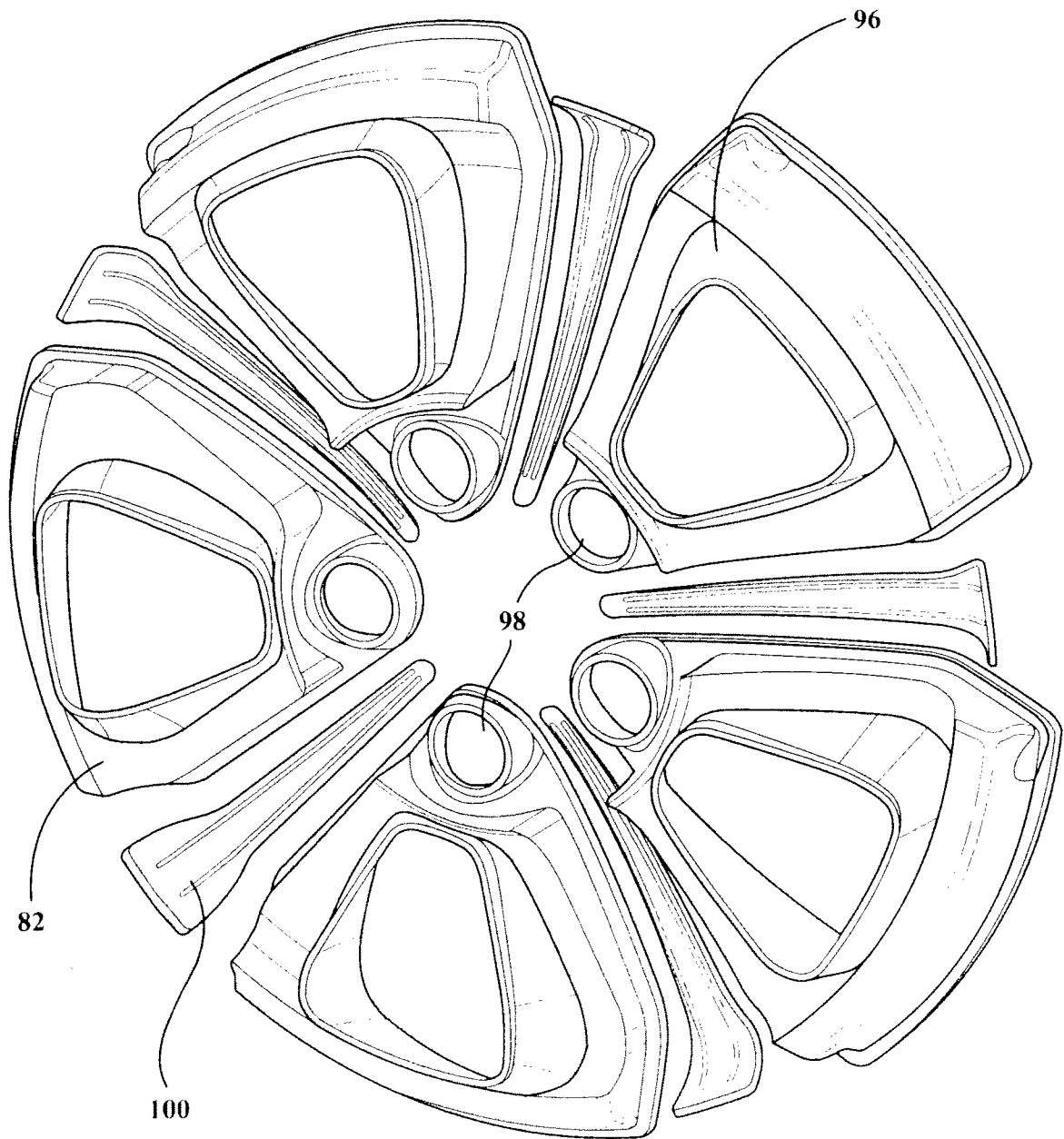
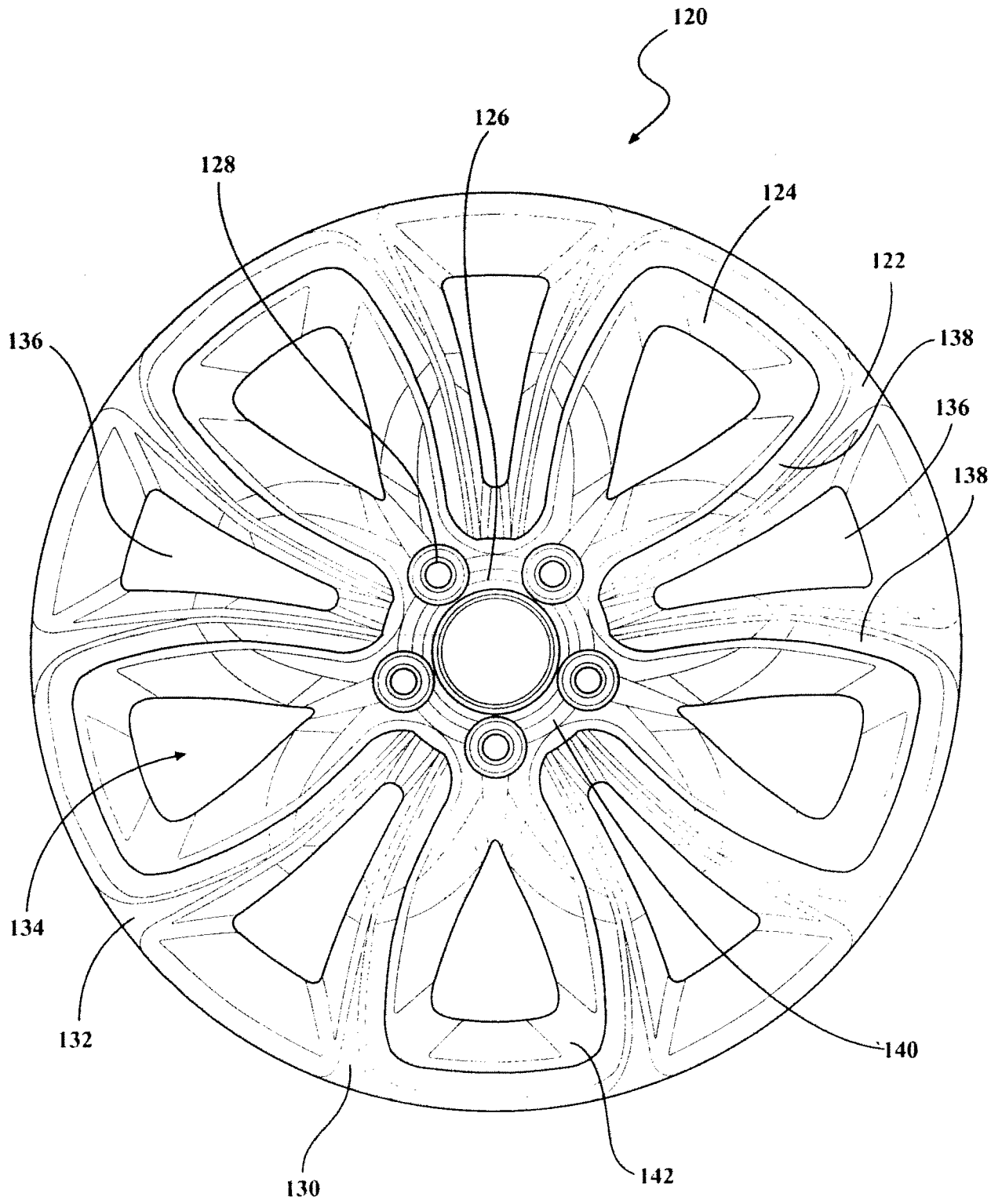


FIG. 3C

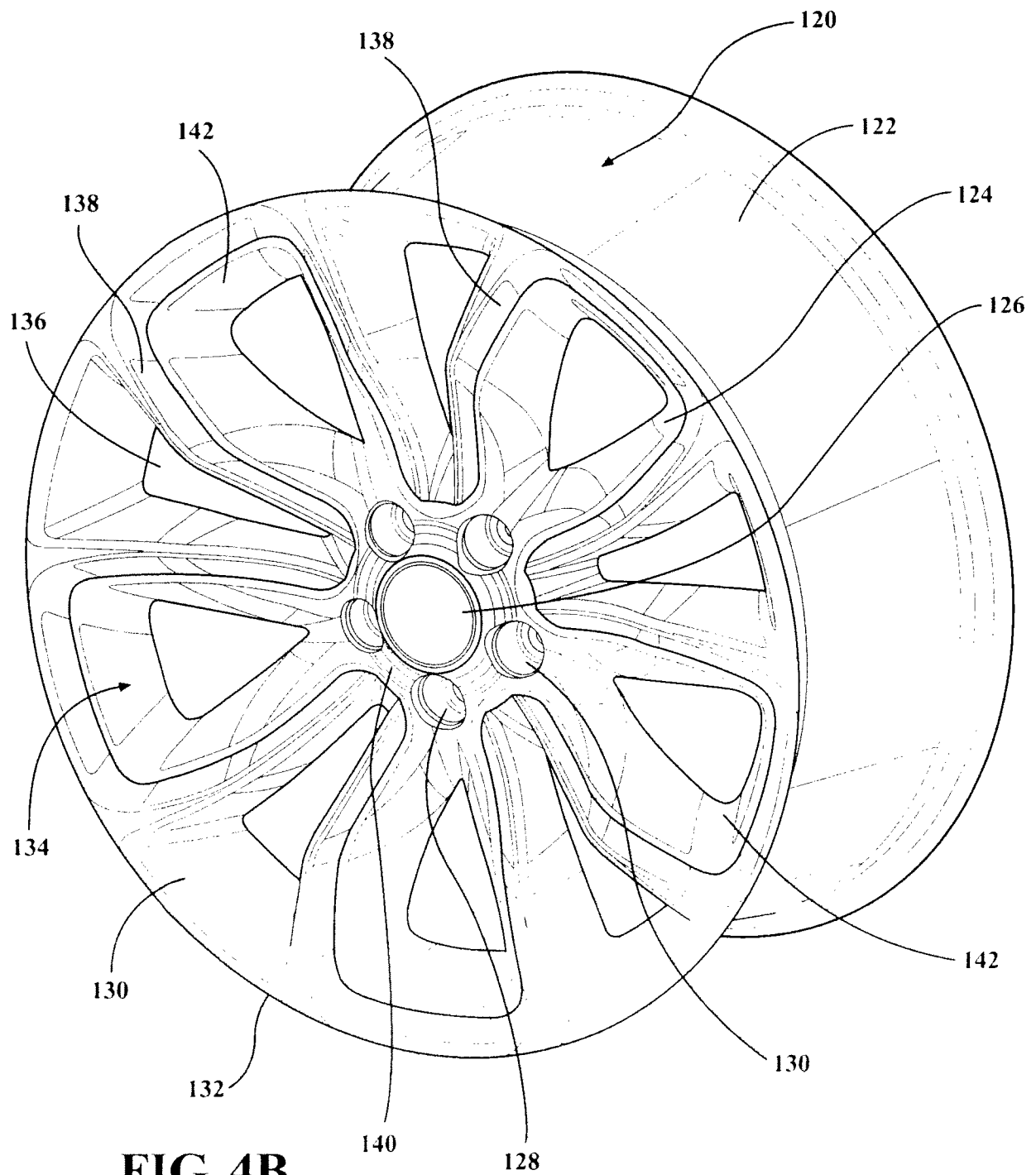
**FIG. 3D**



**FIG. 3E**



**FIG. 4A**

**FIG. 4B**

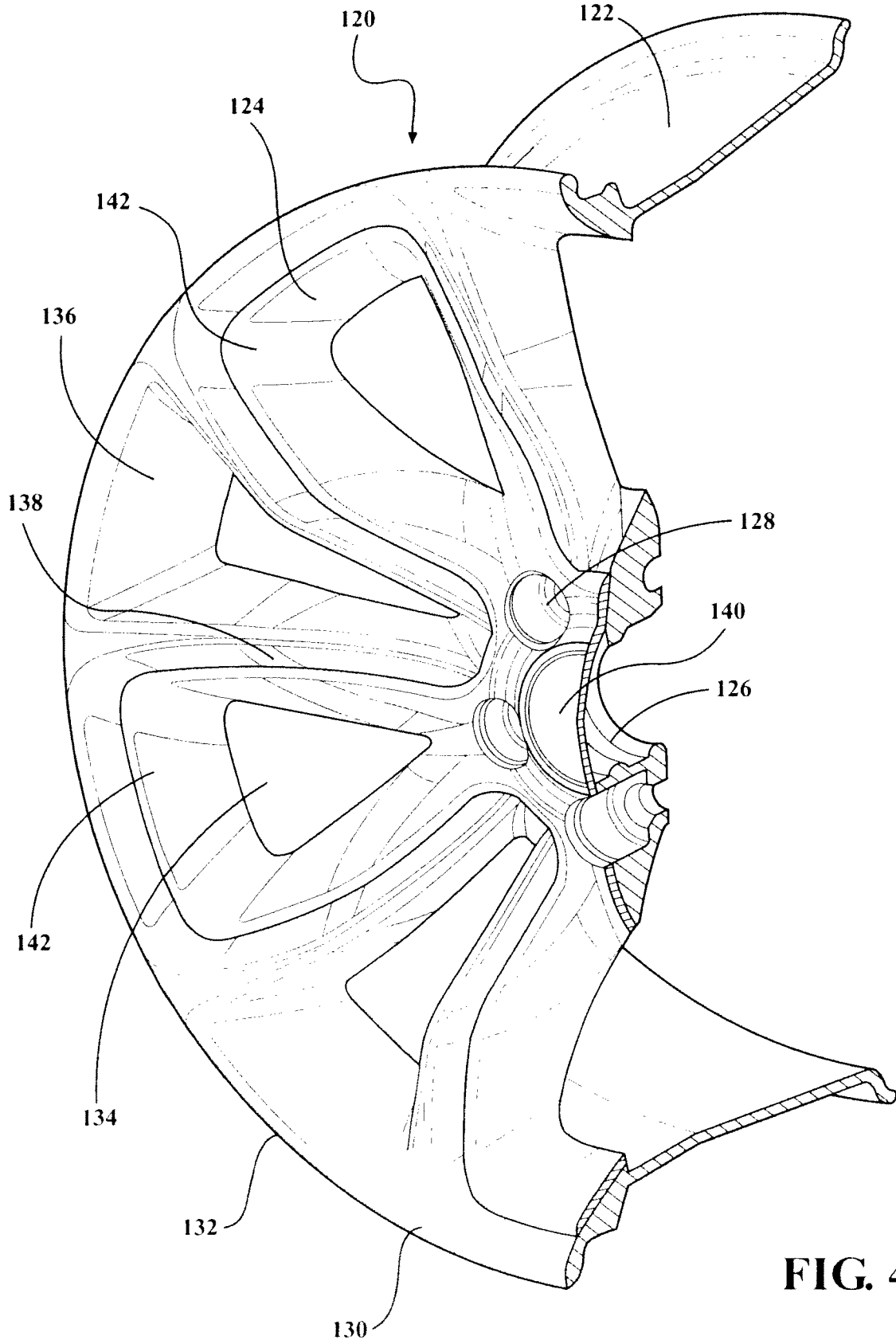
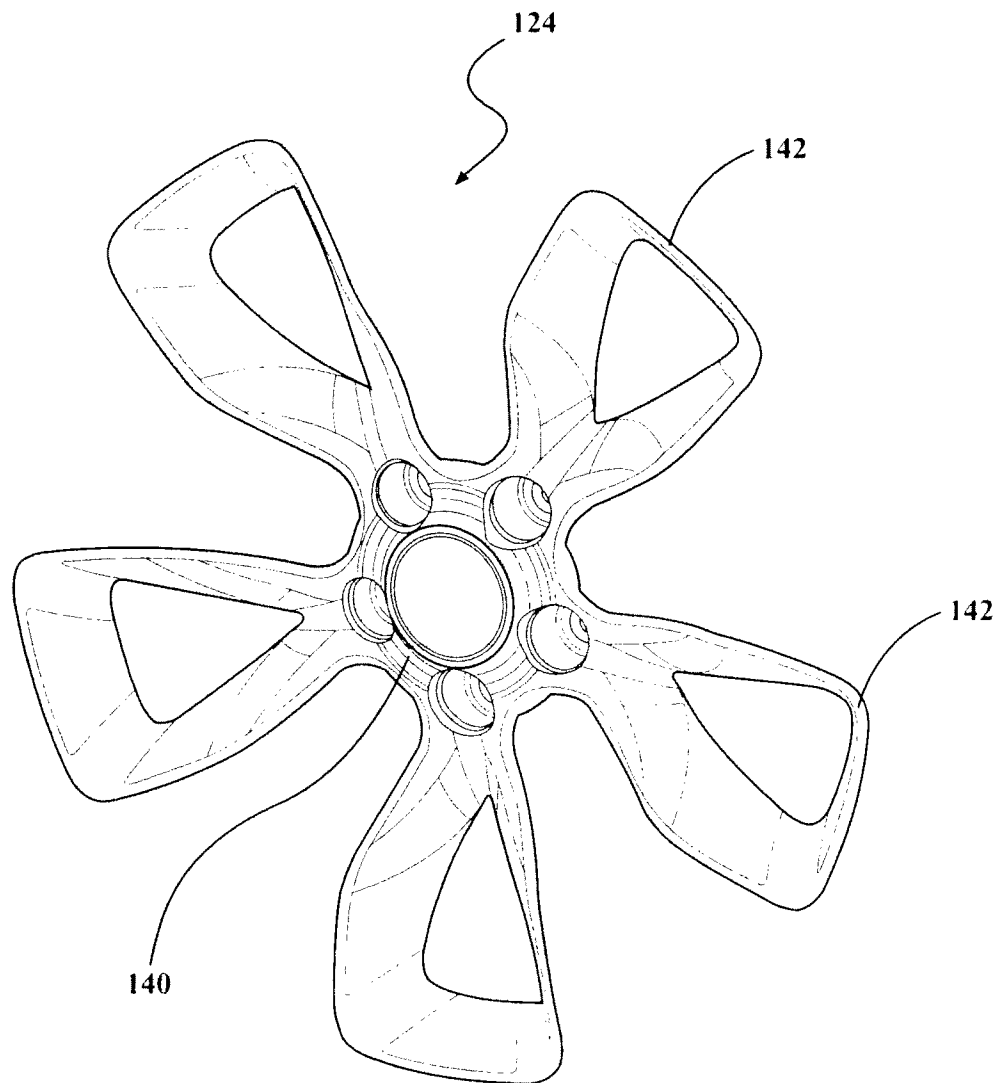


FIG. 4C

**FIG. 4D**

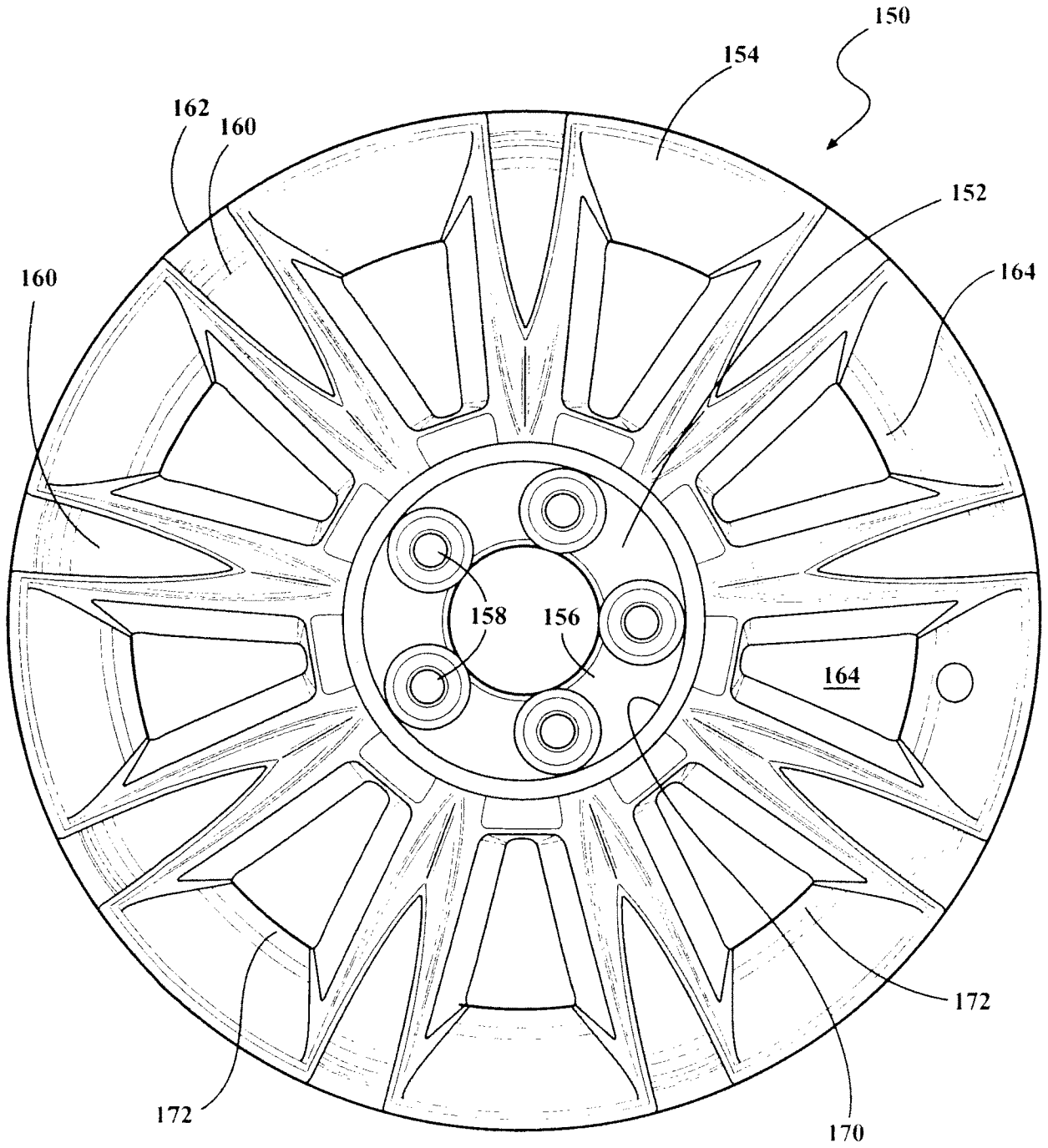
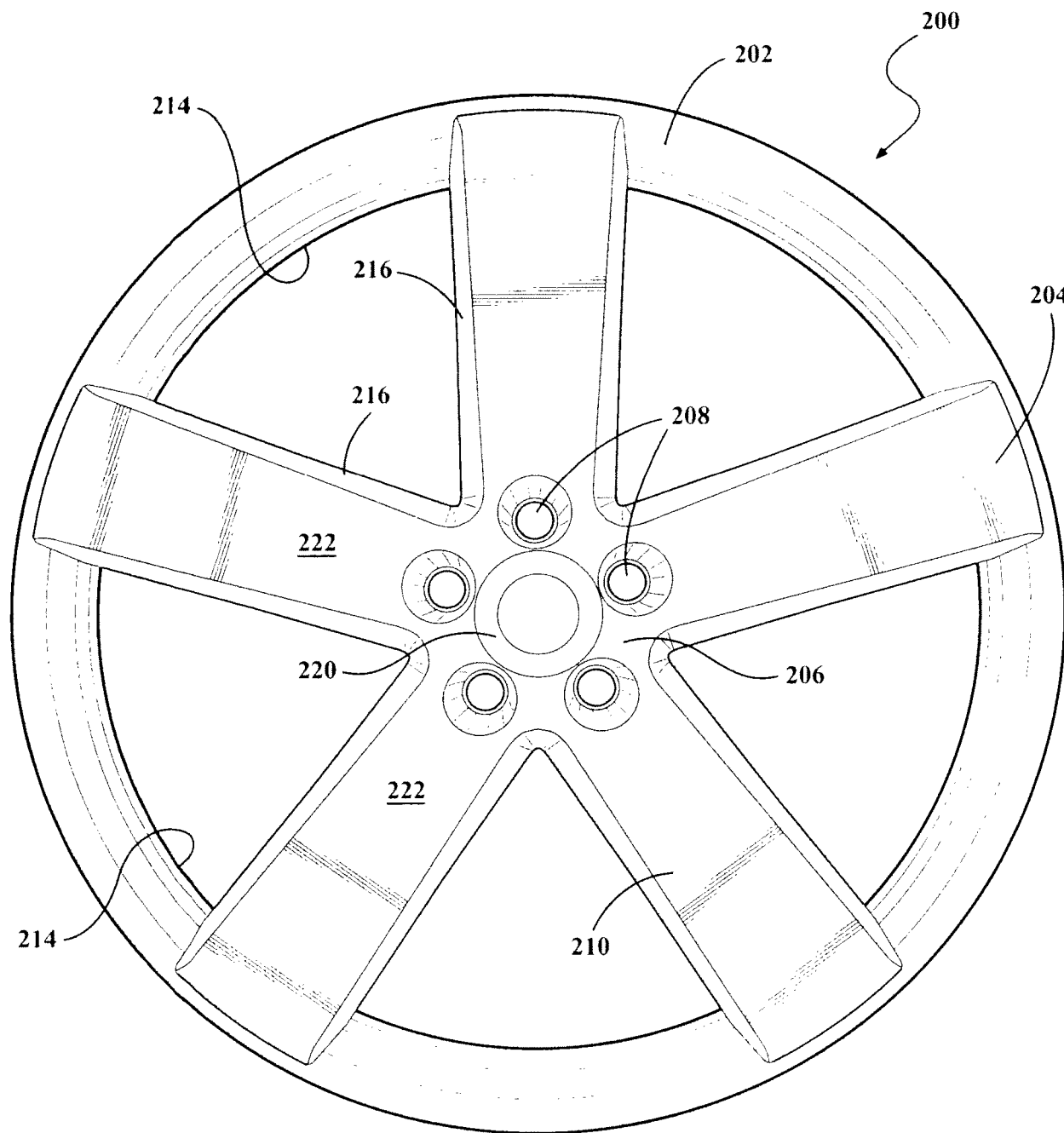


FIG. 5



**FIG. 6**

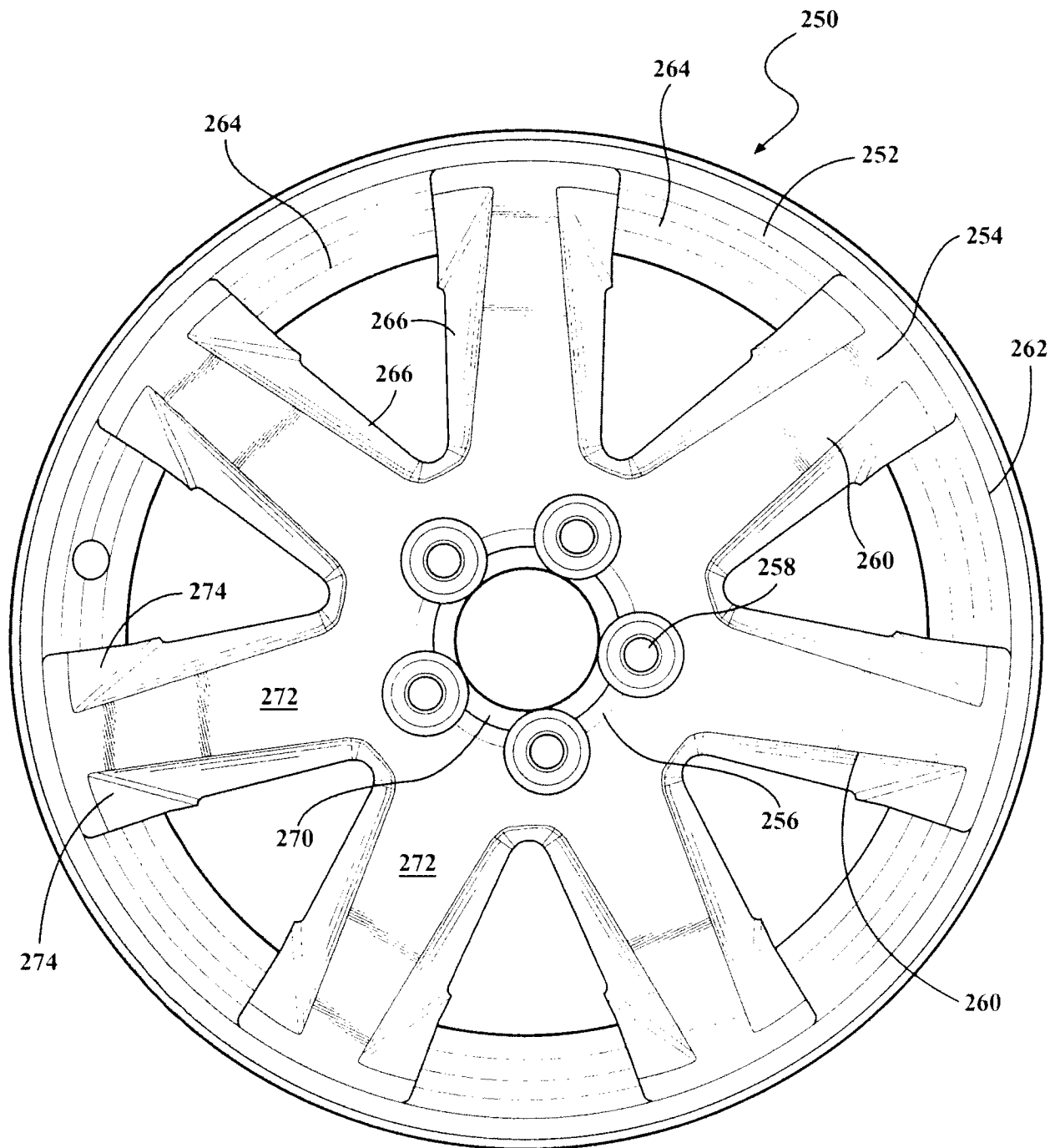
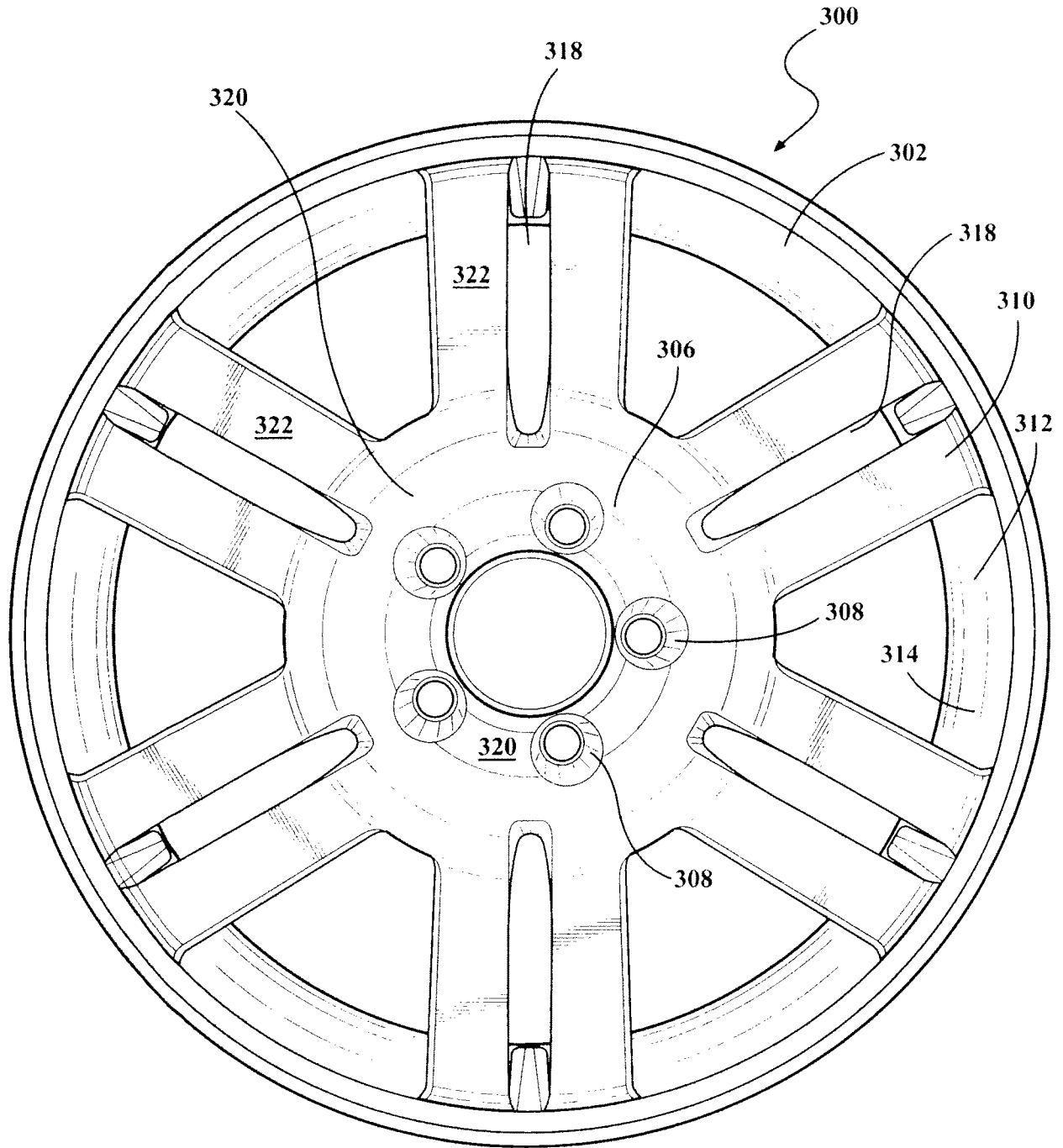
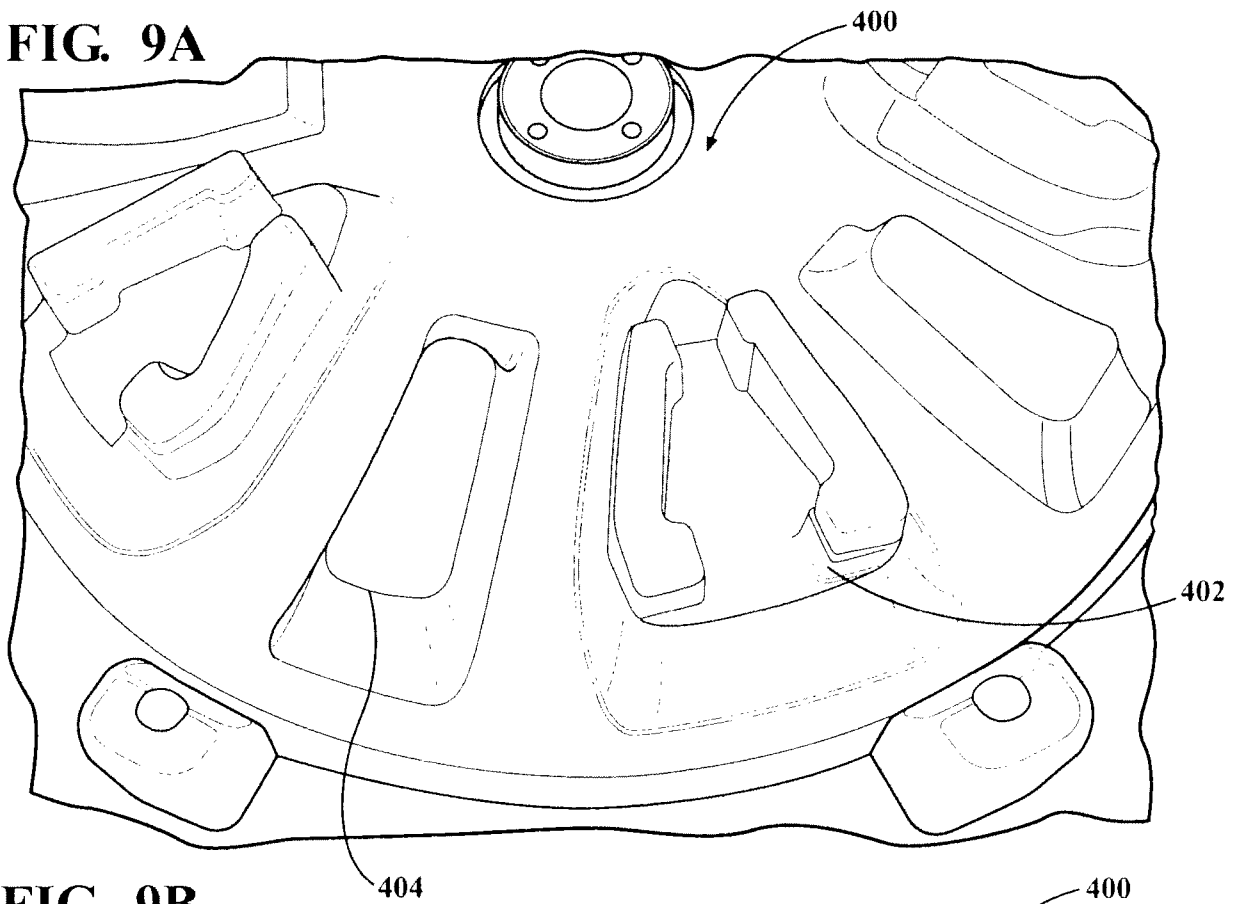


FIG. 7

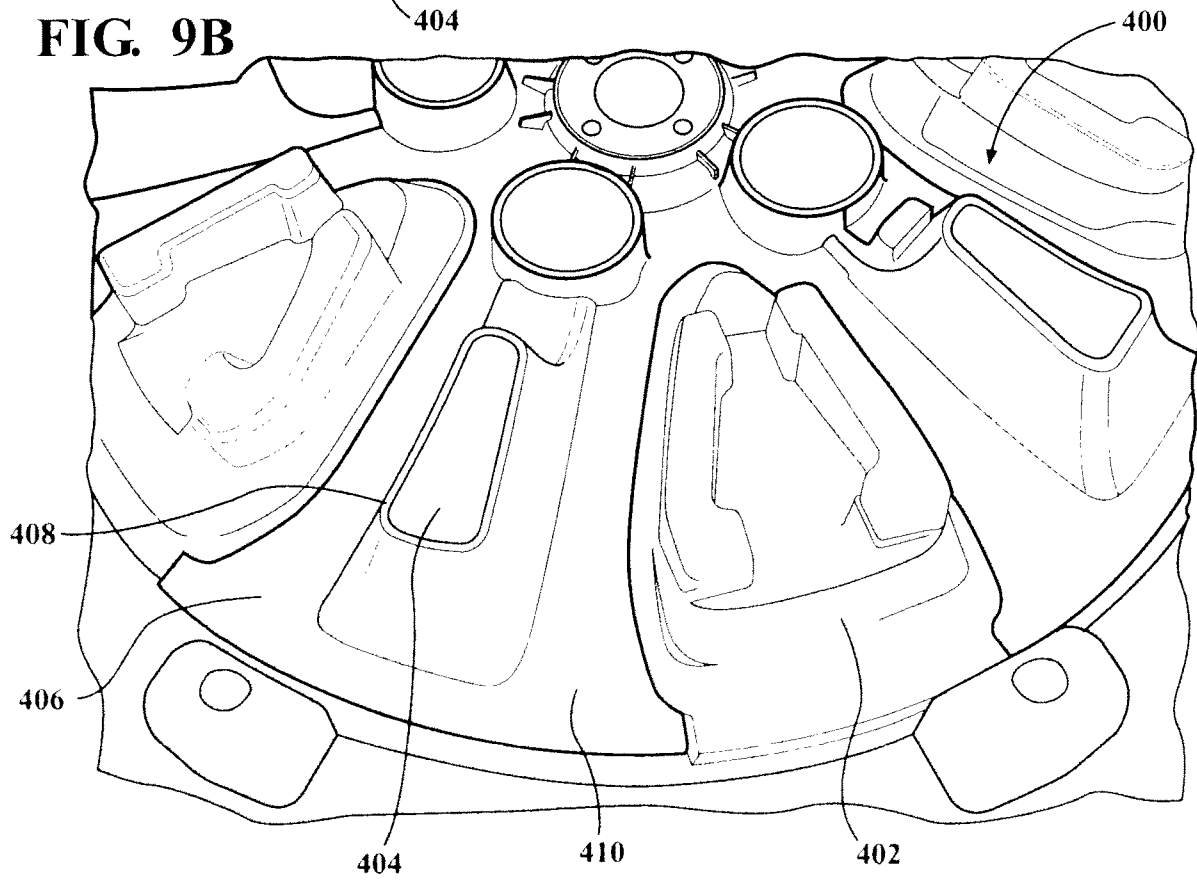


**FIG. 8**

**FIG. 9A**



**FIG. 9B**



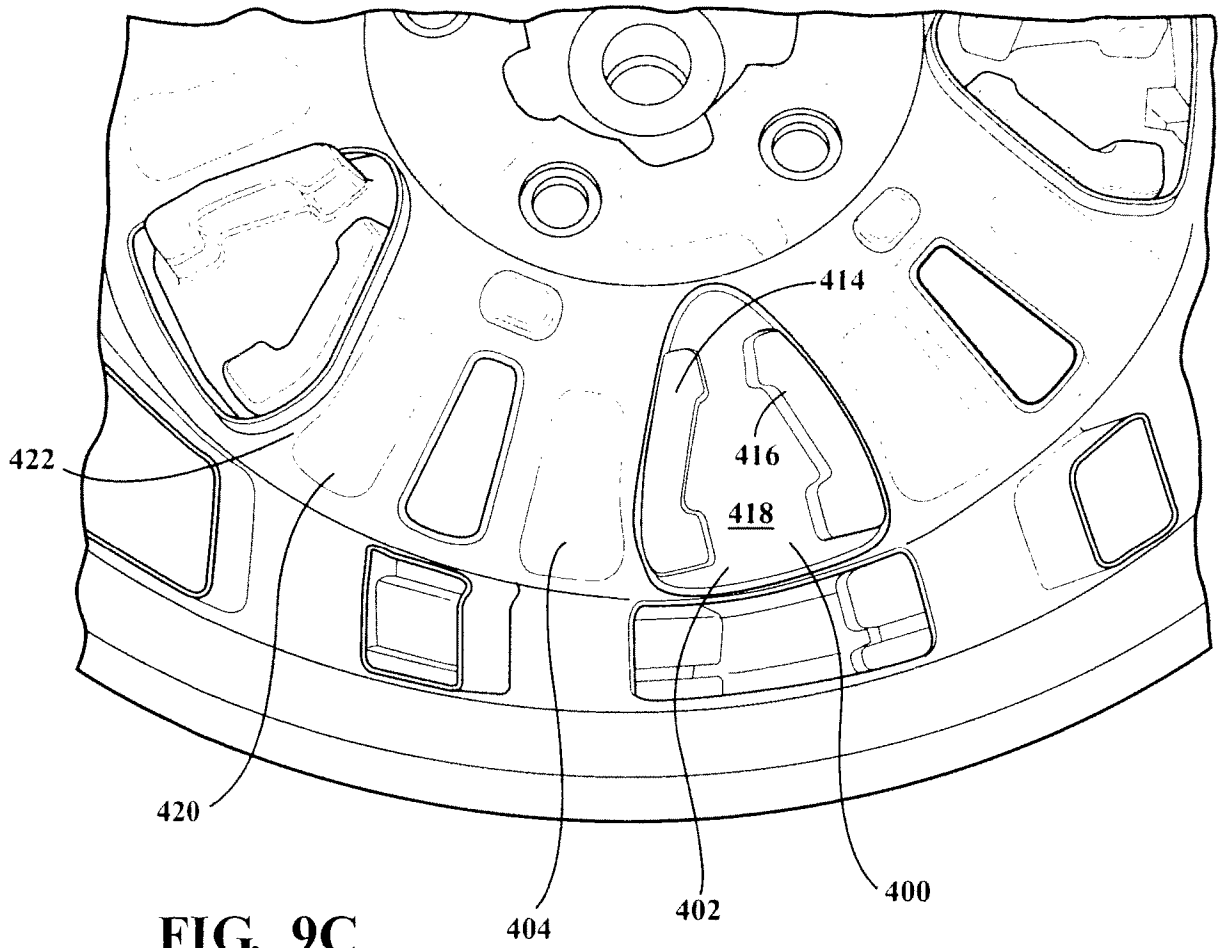


FIG. 9C

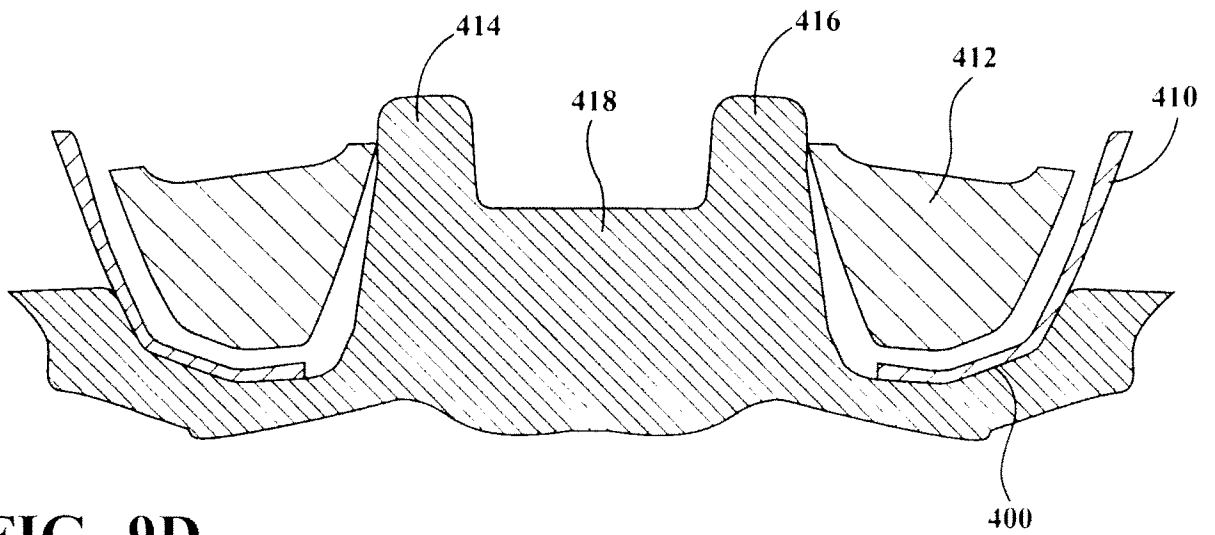


FIG. 9D

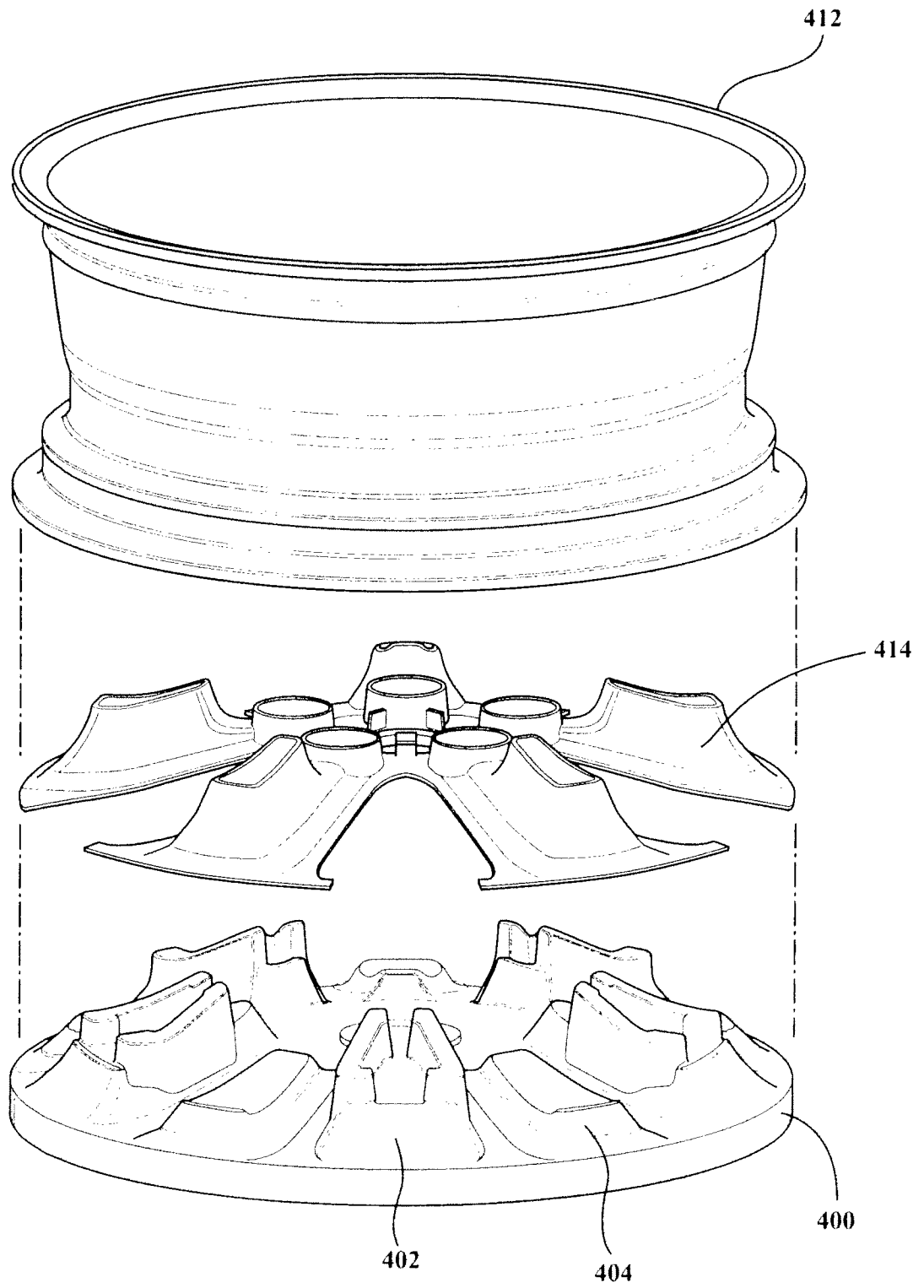
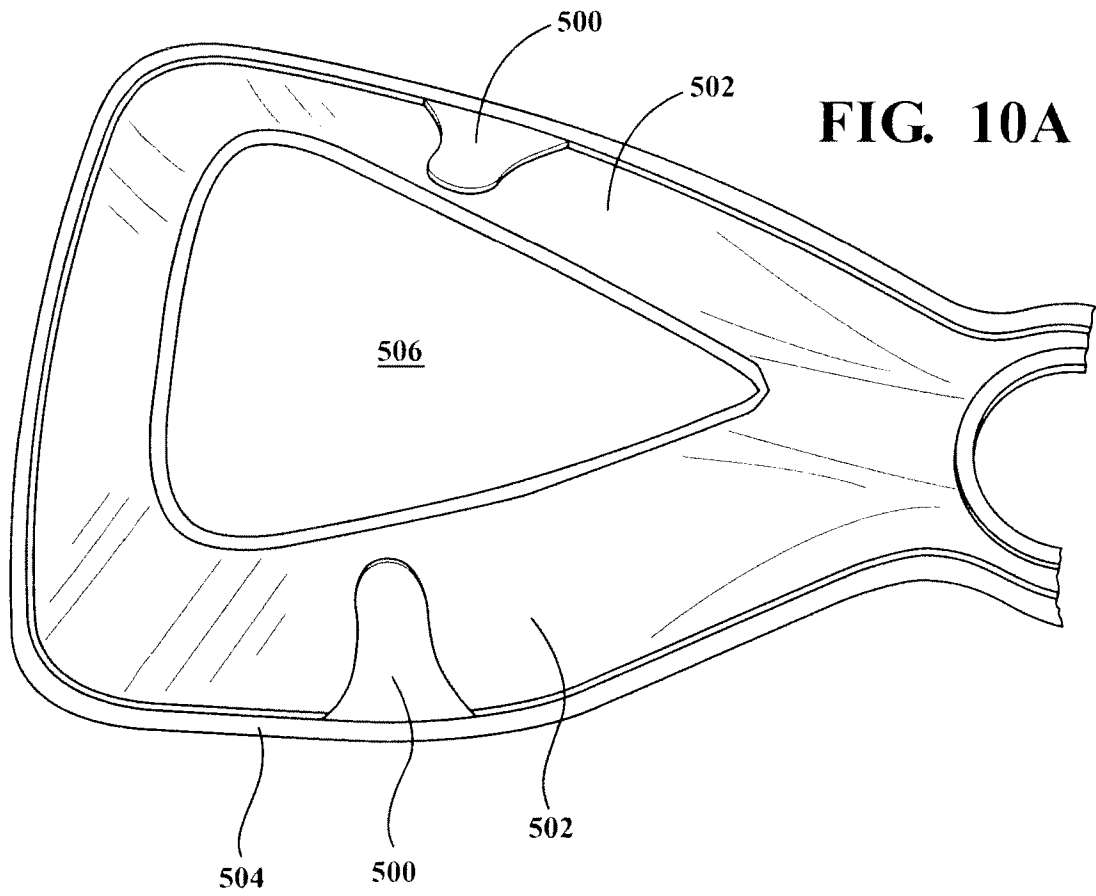
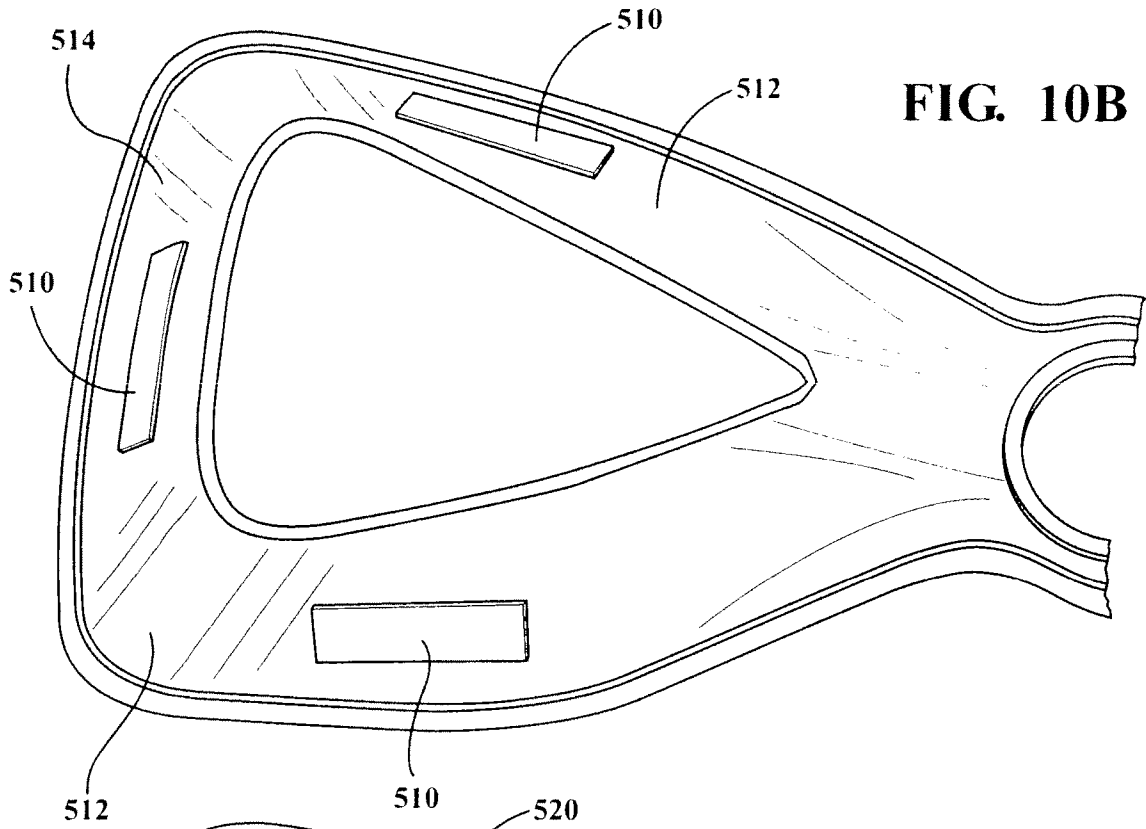
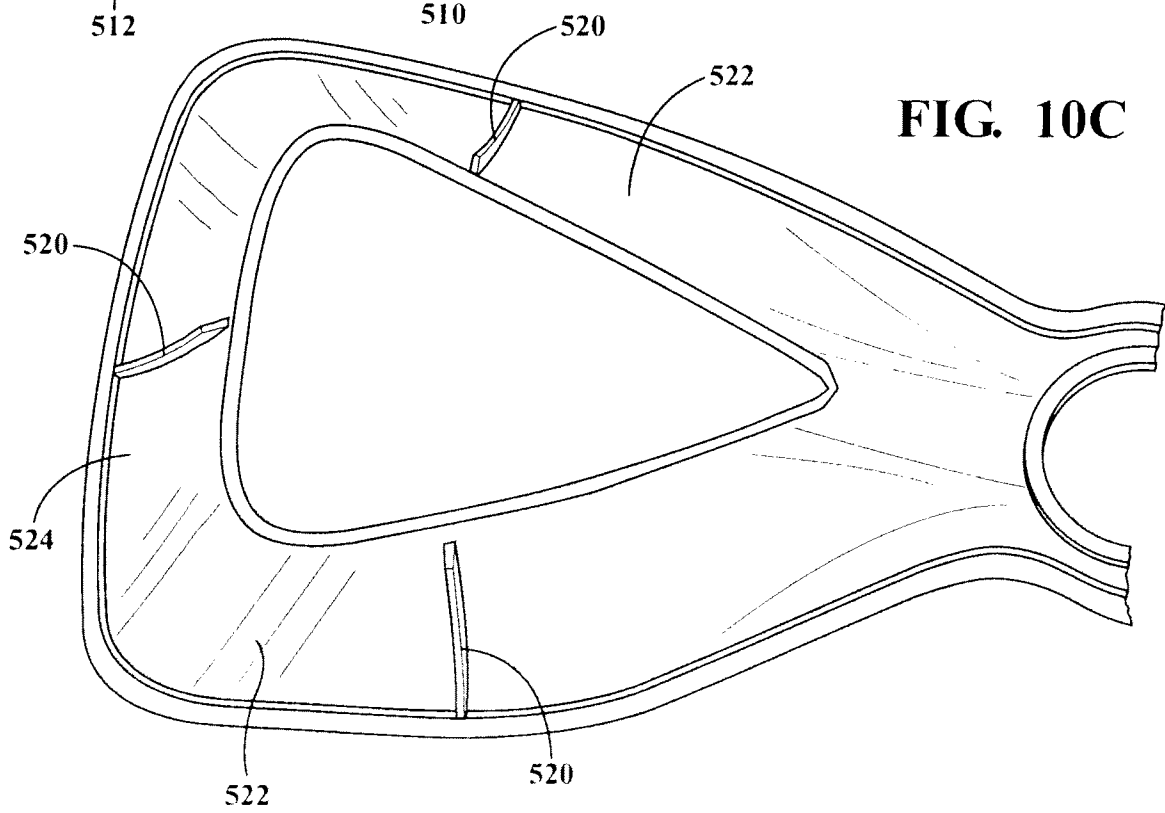


FIG. 9E





**FIG. 10B**



**FIG. 10C**

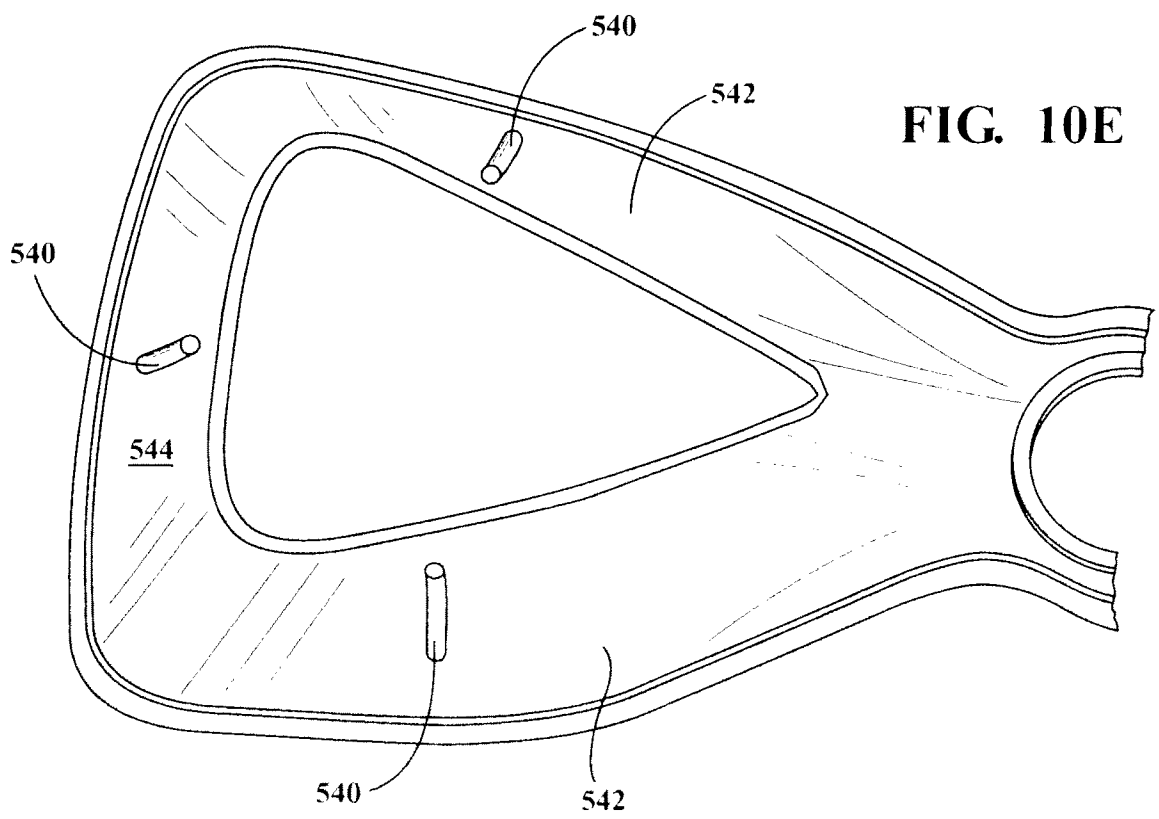
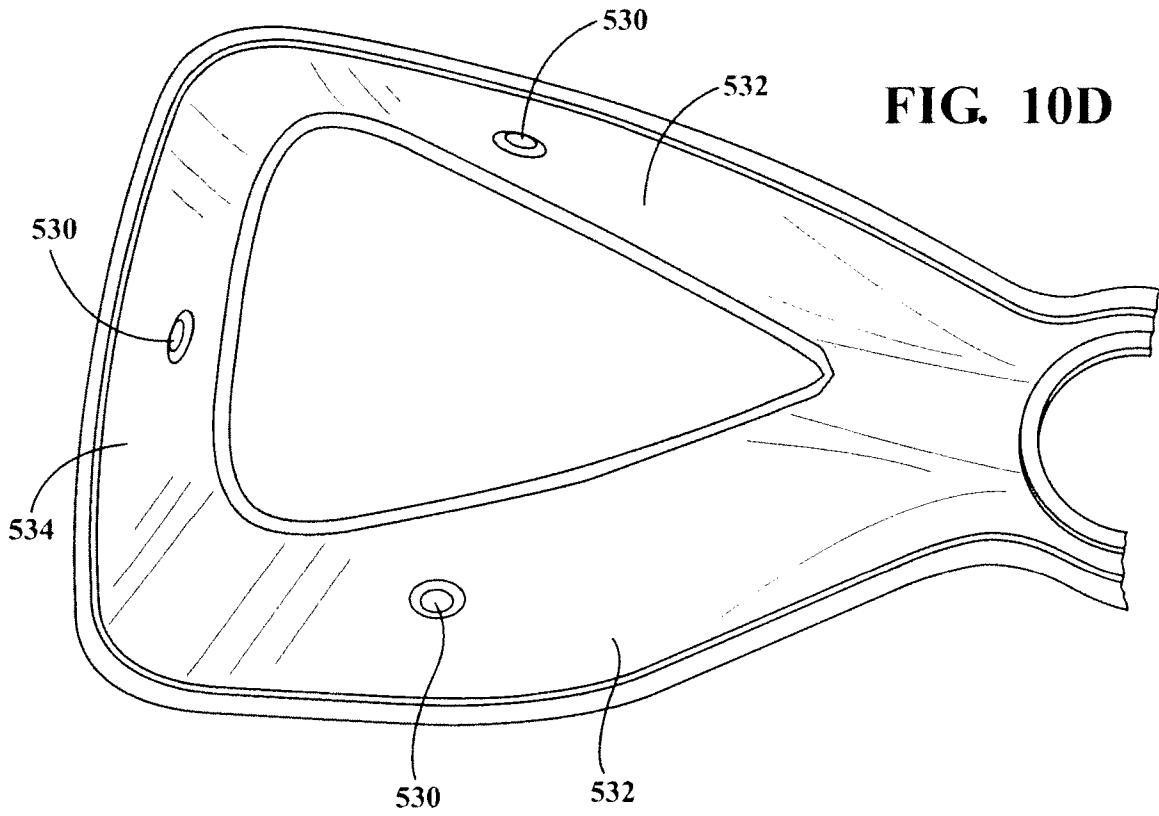


FIG. 11A

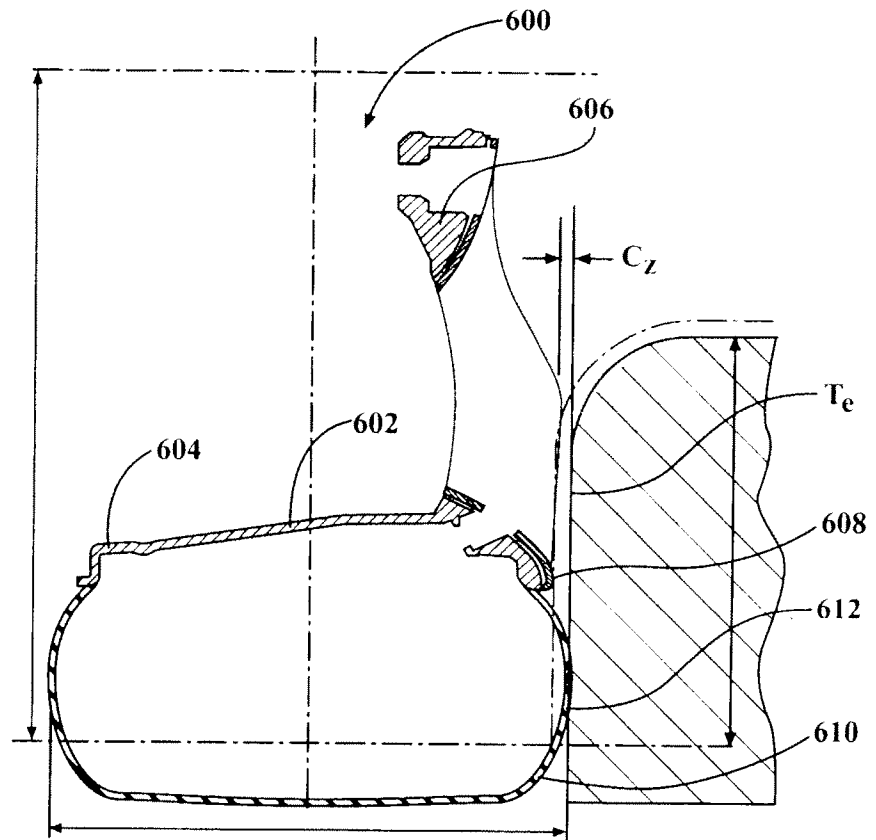
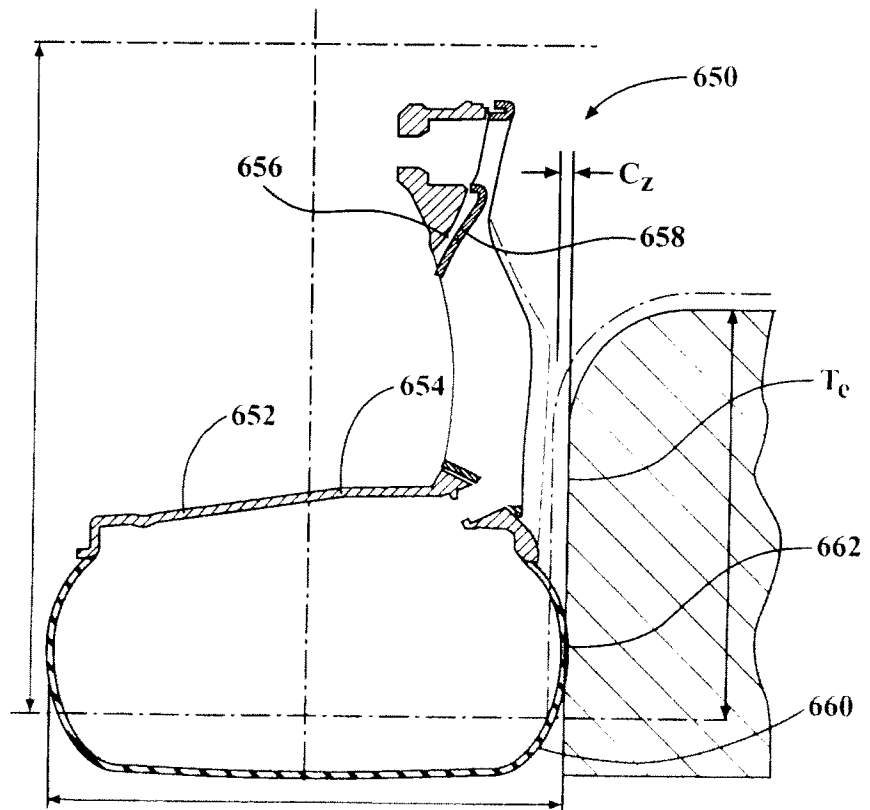


FIG. 11B



INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/030356

A. CLASSIFICATION OF SUBJECT MATTER  
 INV. B60B7/08 B60B7/06 B60B7/18  
 ADD.  
 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)  
 B60B

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)  
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/020514 A1 (CHASE LEE A [US] ET AL) 13 September 2001 (2001-09-13)	1-5
L	paragraph [0047]; figure 2	1-5
X	US 5 845 973 A (CHASE LEE A [US]) 8 December 1998 (1998-12-08)	1-5
L	figure 2	1-5
X	US 2002/153763 A1 (VAN HOUTEN GARRY [US] ET AL) 24 October 2002 (2002-10-24)	6-27
	paragraph [0045] - paragraph [0048]; figure 2	
X	US 2003/047987 A1 (ENOMOTO TSUTOMU [JP] ET AL) 13 March 2003 (2003-03-13)	6,8-27
Y	paragraphs [0032], [0041] - paragraph [0044]; figures 2-5	7,19,20, 22
	----- -/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search  22 July 2014	Date of mailing of the international search report  04/08/2014
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Cipriano, Pedro
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/030356

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 458 401 A (BACCMAN BJORN [US]) 17 October 1995 (1995-10-17) the whole document	7,19,20, 22
X	----- DE 10 2007 042609 A1 (GM GLOBAL TECH OPERATIONS INC [US]) 12 March 2009 (2009-03-12) the whole document	6,21
X	----- US 2 857 208 A (ALBERT LYON GEORGE) 21 October 1958 (1958-10-21) column 9, line 32 - line 42; figure 11 column 6, line 51 - column 7, line 52	28
X	----- WO 2009/109019 A1 (ARVINMERITOR DO BRASIL SIST S [BR]; SILVA DE CARVALHO MARCELO [BR]; RO) 11 September 2009 (2009-09-11) page 6, line 17 - line 28; figures 8,9	28

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/030356

## 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:

see additional sheet

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 an 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.:

### 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.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-28

a permanently attached wheel cover that completely covers the underlying wheel

1.1. claims: 6-27

a permanently attached by adhesive wheel cover that covers the underlying wheel only partially

1.2. claim: 28

a method for attaching a cover portion to a wheel comprising flexible side portions

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/030356

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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