



- (51) **International Patent Classification:**
B29D 30/06 (2006.01) *B29D 30/08* (2006.01)
- (21) **International Application Number:**
PCT/US2015/067038
- (22) **International Filing Date:**
21 December 2015 (21.12.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
62/095,450 22 December 2014 (22.12.2014) US
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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, 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, ST, 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).

Published:

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

(54) **Title:** TIRE MOLD AND VENT INSERT HAVING CORRESPONDING SURFACES

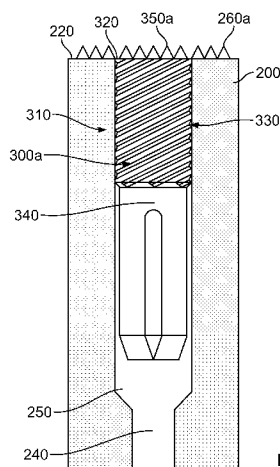


FIG. 3B

(57) **Abstract:** A system for venting a tire mold includes a tire mold having an interior region and an exterior region. The interior region is defined by a surface having a non-smooth portion that defines a pattern. The interior and exterior regions of the tire mold are in fluid connection with each other via at least one conduit extending from the exterior region to the non-smooth portion of the surface defining the interior region. The system further includes a vent insert at least partially disposed inside the at least one conduit. The vent insert has a non-smooth face that corresponds to the pattern defined by the non-smooth surface of the surface of the interior region.



TIRE MOLD AND VENT INSERT HAVING CORRESPONDING SURFACES

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. Provisional Patent Application No. 62/095,450, filed on December 22, 2014, the disclosure of which is incorporated by reference herein in its entirety.

FIELD OF THE INVENTION

[0002] The present disclosure relates to venting structures for tire molds. More particularly, the present disclosure relates to a venting structure for a non-smooth portion of a sidewall-forming region of a tire mold.

BACKGROUND

[0003] During the curing cycle of a tire manufacturing process, air may become trapped between a green tire and a mold cavity when a tire molding press is closed. This trapped air can cause “lightness” in the cured tire. One known method for evacuating this trapped air is through the use of vents. Vents are added in the mold and bead rings to bleed the air during the curing process. The vents may be directly drilled through the mold or bead rings, or a hole may be drilled through the mold or bead ring and a preformed insert is placed in the hole, thereby forming a vent.

[0004] During air evacuation, the elastomeric tire material may flow into the vents, creating projections on the surface of the tire known as sprues. Vent inserts

may be employed to alter the air flow around the vents and prevent sprues from forming.

SUMMARY

[0005] In one embodiment, a tire mold includes an interior surface having a non-smooth portion defined by at least one mold surface element selected from the group consisting of a raised surface and a recessed surface. The tire mold further includes a conduit extending from an opening in the non-smooth portion to an exterior of the tire mold. The tire mold also includes a vent insert located at least partially inside of the conduit. The vent insert has a face that is substantially flush with the tire mold interior surface. The face includes at least one face surface element selected from the group consisting of a raised surface and a recessed surface. The at least one face surface element corresponds to the at least one mold surface element.

[0006] In another embodiment, a system for venting a tire mold includes a tire mold having an interior region and an exterior region. The interior region is defined by a surface having a non-smooth portion that defines a pattern. The interior and exterior regions of the tire mold are in fluid connection with each other via at least one conduit extending from the exterior region to the non-smooth portion of the surface defining the interior region. The system further includes a vent insert at least partially disposed inside the at least one conduit. The vent insert has a non-smooth face that corresponds to the pattern defined by the non-smooth surface of the surface of the interior region.

[0007] In yet another embodiment, a tire mold includes an interior region and an exterior region. The interior and exterior regions of the tire mold are connected via at least one conduit extending from the exterior region to the interior region. The interior region is defined by an interior surface including a sidewall forming portion having multiple elevations. The at least one conduit has an opening in the sidewall forming portion of the interior surface. The tire mold further includes at least one vent insert having a face. At least a portion of the at least one vent insert is located inside the at least one conduit. The face has multiple elevations corresponding to the multiple elevations of the sidewall forming portion of the interior surface of the tire mold.

BRIEF DESCRIPTION OF DRAWINGS

[0008] In the accompanying drawings, structures are illustrated that, together with the detailed description provided below, describe exemplary embodiments of the claimed invention. Like elements are identified with the same reference numerals. It should be understood that elements shown as a single component may be replaced with multiple components, and elements shown as multiple components may be replaced with a single component. The drawings are not to scale and the proportion of certain elements may be exaggerated for the purpose of illustration.

[0009] **Figure 1** is a side view of an exemplary tire;

[0010] **Figure 2** is a partial cross-section of a tire mold;

[0011] **Figure 3A** is a front view of a portion of a tire mold and one embodiment of a vent insert;

[0012] **Figure 3B** is a partial cross-section of the tire mold and vent insert of **Figure 3A**;

[0013] **Figure 4A** is a front view of a portion of a tire mold and an alternative embodiment of a vent insert;

[0014] **Figure 4B** is a partial cross-section of the tire mold and vent insert of **Figure 4A**;

[0015] **Figure 5A** is a front view of a portion of a tire mold and another alternative embodiment of a vent insert;

[0016] **Figure 5B** is a partial cross-section of the tire mold and vent insert of **Figure 5A**;

[0017] **Figure 6A** is a front view of a portion of a tire mold and yet another alternative embodiment of a vent insert;

[0018] **Figure 6B** is a partial cross-section of the tire mold and vent insert of **Figure 6A**;

[0019] **Figure 7A** is a front view of a portion of a tire mold and still another alternative embodiment of a vent insert; and

[0020] **Figure 7B** is a partial cross-section of the tire mold and vent insert of **Figure 7A**.

DETAILED DESCRIPTION

[0021] Directions are stated herein with reference to the tire mold. For example “interior,” “inside,” or “inner” refers to a direction or area towards the center cavity of a tire mold. The terms “exterior,” “outside,” or “outer” refer to a direction or area generally outside of the tire mold.

[0022] **Figure 1** illustrates a side view of an exemplary tire **100**. The tire includes a sidewall **110** that includes both smooth portions and non-smooth portions. Non-smooth portions include serrations **120**, which may also be referred to as notches, hatching, or cross-hatching. Serrations in a tire are defined by a series of projections, a series of recesses, or a series of alternating projections and recesses. Serrations may be defined by straight lines, curved lines, or a combination of straight and curved lines. The lines may cross each other or maintain separation.

[0023] Non-smooth portions also include grooves **130** or other recesses in the sidewall **110**, as well as ribs **140** or other projections in the sidewall **110**. Some non-smooth portions may form indicia, such as lettering **150**. Other indicia include numbers and other symbols, such as logos. The indicia may be formed by recesses, projections, or a combination of recesses and projections. Alternatively, the indicia may be a smooth portion of a sidewall that is outlined by surrounding serrations.

[0024] Each of the above-described non-smooth portions forms a pattern. As used herein, “pattern” includes repeating series of elements, such as a repeating series of serrations, and also includes a single element. For example, a single, circumferential rib may be described as a pattern.

[0025] **Figure 2** illustrates a partial cross-section of an exemplary tire mold **200** that may be used to form the tire **100** of **Figure 1** or other tires. In the illustrated embodiment, the tire mold **200** includes an interior portion **210** defined by an interior surface **220**, and an exterior surface **230**. The interior surface **220**

may take any shape suitable for forming tires. The tire mold **200** further includes a plurality of through holes (such as the illustrated through hole **240**) extending from the interior surface **220** to the exterior surface **230**. In one known embodiment, the through holes have a diameter of about 0.092 inches (0.23 centimeters). In other embodiments, the through holes may have diameters ranging from 0.050 inches (0.13 centimeters) to 0.25 inches (0.64 centimeters).

[0026] In the illustrated embodiment, each through hole **240** includes a counter-bore **250** extending outwardly from the interior surface **220**. Together, the through hole **240** and the counter-bore **250** form a conduit for venting air from the interior **210** of the tire mold **200** to the exterior of the tire mold **200**. The conduit may take any form, but here is depicted as cylindrical. An opening permits fluid communication between the interior **210** of the tire mold **200** and exterior. Other venting structures known in the art may be used without departing from the scope of the present disclosure.

[0027] The counter-bore **250** forms an opening in the interior surface **220** and receives a vent insert **300**. The vent insert **300** may be employed to alter air flow around the openings of the conduit and prevent sprues from forming. Because the interior surface **220** includes curves and contours, each vent insert **300** may include a face that is similarly curved or contoured.

[0028] In one embodiment, the counter bore **250** and the vent insert **300** are substantially cylindrical. The vent insert **300** includes both a large diameter portion and a small diameter portion. In one embodiment, the large diameter is 0.125 inches (0.318 centimeters) and the small diameter is 0.062 inches (0.16

centimeters). In other embodiments, the large diameter ranges from 0.060 inches (0.15 centimeters) to 0.25 inches (0.64 centimeters) and the small diameter ranges from 0.030 inches (0.075 centimeters) to 0.125 inches (0.318 centimeters). In an alternative embodiment (not shown), the vent insert has a single diameter. In other alternative embodiments, the conduits and inserts have non-cylindrical shapes.

[0029] The diameter and length of the counter-bore **250** is dimensioned to accommodate the vent insert **300**. In one embodiment, the diameter of the counter-bore **250** is 0.003 inches (0.008 centimeters) smaller than the largest diameter of the insert **300** to provide a light press fit of the insert **300**. In alternative embodiments, the diameter of the counter-bore **250** is equal to or larger than the largest diameter of the insert **300**. In such embodiments, the insert **300** can be held in place by one or more pins, adhesive, or other attachment means. In one known embodiment, each counter-bore **250** has a diameter of about 0.122 inches (0.310 centimeters). In other embodiments, the counter-bores may have diameters ranging from 0.060 inches (0.15 centimeters) to 0.25 inches (0.64 centimeters). In an alternative embodiment (not shown), the mold **200** does not include a counter-bore, and instead the entire through hole is sized to accommodate the vent insert.

[0030] **Figures 3A** and **3B** illustrate a partial front view and a partial cross-section, respectively, of a portion of the tire mold **200** and one embodiment of the vent insert **300a**. The vent insert **300a** includes a large diameter portion **310** with a face **320** that is substantially flush with the interior surface **220** of the tire mold

200. In an alternative embodiment (not shown), the face of the vent insert extends into the interior region of the tire mold. In another alternative embodiment (not shown), the vent insert is recessed such that the face of the vent insert is inside the conduit.

[0031] The vent insert **300a** has a plurality of spiral channels **330** on the large diameter portion **310**. Spiral channels **330** run continuously from the face **320** of the vent insert **300a** along a portion of a length of the vent insert **300a**. Each spiral channel **330** defines an intake opening along the face **320** of the vent insert **300a**, as can be seen in **Figure 3A**. In other embodiments, the spiral channels may be replaced with straight channels. Any number of channels may be employed. Additionally, other types of vent inserts may be used without departing from the scope of the present disclosure, including but not limited to spring vents, drill vents, micro vents, or sinter vents.

[0032] The vent insert **300a** is a sprueless-type vent insert that allows gas from the interior **210** of the tire mold **200** to vent to an exterior of tire mold **200**, reducing or preventing the formation of tire sprues. When tire material is injected into the tire mold **200**, the air inside the tire mold **200** is displaced. The displaced air is forced into the intake openings through the channels **330** of the vent insert **300a** in the counter bore **250**. The air then travels along the large diameter portion **310** and the small diameter portion **340** of the vent insert **300a** and out the through hole **240** until reaching the exterior of the tire mold **200**. The shape and size of the intake openings, reducing or preventing the formation of tire sprues

when tire material comes into contact with the interior surface **220** and the face **320**.

[0033] In the illustrated embodiment, the vent insert **300a** includes a plurality of raised surfaces, or projections **350a** from the face **320** that extend into the interior **210** of the tire mold **200**. The face **320** and the projections **350a** form multiple elevations. The projections **350a** extend from a peak, to a lower elevation. In the illustrated embodiment, the lower elevation is the same elevation as the face **320** of the vent insert **350a**. In an alternative embodiment (not shown), the lower elevation is higher than the elevation of the face. In another alternative embodiment (not shown), the lower elevation is lower than the elevation of the face, such that the face has both projections and recesses.

[0034] The projections **350a** correspond to projections **260a** of the interior surface **220** in a non-smooth portion of a tread forming surface of a tire mold **200**. Together, the projections **260a** and **350a** define serrations in a tire sidewall. The serrations may be part of any pattern in a sidewall, and may also form an outline of letters, numbers, symbols, or logos.

[0035] The projections **350a** of the vent insert **300a** and the projections **260a** of the tire mold **200** have triangular cross sections. In alternative embodiments (not shown), the projections are rectangular, trapezoidal, round, or have any geometric cross-section.

[0036] **Figures 4A** and **4B** illustrate a partial front view and a partial cross-section, respectively, of a portion of the tire mold **200** and an alternative embodiment of the vent insert **300b**. The vent insert **300b** is substantially the

same as the vent insert **300a** described above with respect to **Figures 3A** and **3B** (including the alternative embodiments discussed therein) except for the differences described below. Like reference numerals are used for like elements.

[0037] In the illustrated embodiment, the vent insert **300b** includes a raised surface, or projection **350b** from the face **320** that extends into the interior **210** of the tire mold **200**. The face **320** and the projection **350b** form multiple elevations. The projection **350b** corresponds to a projection **260b** of the interior surface **220** in a non-smooth portion of a tread forming surface of a tire mold **200**. Together, the projections **260b** and **350b** define a recess in a tire sidewall. The recess that is formed may be part of any pattern in a sidewall, and may form a groove, letters, numbers, symbols, or logos.

[0038] The projection **350b** of the vent insert **300b** and the projection **260b** of the tire mold **200** both have trapezoidal cross sections. In alternative embodiments (not shown), the projections are rectangular, triangular, or have any geometric cross-section.

[0039] **Figures 5A** and **5B** illustrate a partial front view and a partial cross-section, respectively, of a portion of the tire mold **200** and another alternative embodiment of the vent insert **300c**. The vent insert **300c** is substantially the same as the vent inserts **300a** and **300b** described above with respect to **Figures 3A–4B** (including the alternative embodiments discussed therein) except for the differences described below. Like reference numerals are used for like elements.

[0040] In the illustrated embodiment, the vent insert **300c** includes a raised surface, or projection **350c** from the face **320** that extends into the interior **210** of

the tire mold **200**. The face **320** and the projection **350c** form multiple elevations. The projection **350c** corresponds to a projection **260c** of the interior surface **220** in a non-smooth portion of a tread forming surface of a tire mold **200**. Together, the projection **260c** and **350c** define a recess in a tire sidewall. The recess that is formed may be part of any pattern in a sidewall, and may form a groove, letters, numbers, symbols, or logos.

[0041] The projection **350c** of the vent insert **300c** and the projection **260c** of the tire mold **200** each have a round cross section, defined by a single radius. In an alternative embodiment (not shown), the projections are curved but are defined by multiple radii. In another alternative embodiment (not shown), the projections are defined by a geometric curve, such as a parabola, an ellipse, or a hyperbola.

[0042] **Figures 6A** and **6B** illustrate a partial front view and a partial cross-section, respectively, of a portion of the tire mold **200** and yet another alternative embodiment of the vent insert **300d**. The vent insert **300d** is substantially the same as the vent inserts **300a**, **300b**, and **300c** described above with respect to **Figures 3A–5B** (including the alternative embodiments discussed therein) except for the differences described below. Like reference numerals are used for like elements.

[0043] In the illustrated embodiment, the vent insert **300d** includes a recessed surface **350d** in the face **320**. The face **320** and the recess **350d** form multiple elevations. The recess **350d** corresponds to a recess **260d** of the interior surface **220** in a non-smooth portion of a tread forming surface of a tire mold **200**. Together, the recesses **260d** and **350d** define a projection in a tire sidewall. The

projection that is formed may be part of any pattern in a sidewall, and may form a rib, letters, numbers, symbols, or logos.

[0044] The recess **350d** of the vent insert **300d** and the recess **260d** of the tire mold **200** have trapezoidal cross sections. In alternative embodiments, the recesses are rectangular, triangular, or have any geometric cross-section.

[0045] **Figures 7A** and **7B** illustrate a partial front view and a partial cross-section, respectively, of a portion of the tire mold **200** and still another alternative embodiment of the vent insert **300e**. The vent insert **300e** is substantially the same as the vent inserts **300a**, **300b**, **300c**, and **300d** described above with respect to **Figures 3A–6B** (including the alternative embodiments discussed therein) except for the differences described below. Like reference numerals are used for like elements.

[0046] In the illustrated embodiment, the vent insert **300e** includes a recess **350e** in the face **320**. The face **320** and the recess **350e** form multiple elevations. The recess **350e** corresponds to a recess **260e** of the interior surface **220** in a non-smooth portion of a tread forming surface of a tire mold **200**. Together, the recess **260e** of the interior surface **220** of the tire mold and the recess **350e** of the face **320** of the vent insert **300e** define a projection in a tire sidewall. The formed projection may be part of any pattern in a sidewall, and may form a rib, letters, numbers, symbols, or logos.

[0047] The recess **350e** of the vent insert **300e** and the recess **260e** of the tire mold **200** each have a round cross section, defined by a single radius. In an alternative embodiment (not shown), the recesses are curved but are defined by

multiple radii. In another alternative embodiment (not shown), each recess is defined by a geometric curve, such as a parabola, an ellipse, or a hyperbola.

[0048] It should be understood that the embodiments illustrated in **Figures 3A–7B** are merely exemplary, and that other projections and recesses may be employed. For example, a vent insert may include a combination of both recesses and projections.

[0049] While only vent inserts for non-smooth portions of a sidewall forming surface are shown, it should be understood that additional conduits and vent inserts may be employed in smooth portions of a sidewall forming surface. Such a vent insert would not include projections or recesses.

[0050] Additionally, while the vent inserts are generally described as being used in a sidewall-forming portion of a tire mold, they may also be employed in a bead-forming portion or a shoulder forming portion of a tire mold. They may also be employed in the tread portion of a tire mold.

[0051] In one embodiment, the tire mold **200** and vent inserts **300** are formed of the same material. Exemplary material includes steel, aluminum, and other metal. In an alternative embodiment, the tire mold is made of metal and the vent inserts **300** are made of thermoplastic. Thermoplastic may be easier to cut, mold, or otherwise shape to include the desired projections and recesses. In another alternative embodiment, vent inserts that are used in smooth portions of a sidewall-forming surface are constructed of metal, while vent inserts that are used in non-smooth portions of a sidewall forming surface are constructed of thermoplastic.

[0052] To the extent that the term “includes” or “including” is used in the specification or the claims, it is intended to be inclusive in a manner similar to the term “comprising” as that term is interpreted when employed as a transitional word in a claim. Furthermore, to the extent that the term “or” is employed (e.g., A or B) it is intended to mean “A or B or both.” When the applicants intend to indicate “only A or B but not both” then the term “only A or B but not both” will be employed. Thus, use of the term “or” herein is the inclusive, and not the exclusive use. See, Bryan A. Garner, *A Dictionary of Modern Legal Usage* 624 (2d. Ed. 1995). Also, to the extent that the terms “in” or “into” are used in the specification or the claims, it is intended to additionally mean “on” or “onto.” Furthermore, to the extent the term “connect” is used in the specification or claims, it is intended to mean not only “directly connected to,” but also “indirectly connected to” such as connected through another component or components.

While the present application has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the application, in its broader aspects, is not limited to the specific details, the representative apparatus and method, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the applicant’s general inventive concept.

CLAIMS

What is claimed is:

1. A tire mold comprising:
 - a tire mold interior surface having a non-smooth portion defined by at least one mold surface element selected from the group consisting of a raised surface and a recessed surface;
 - a conduit extending from an opening in the non-smooth portion of the tire mold interior surface to an exterior of the tire mold; and
 - a vent insert located at least partially inside of the conduit, the vent insert having a face that is substantially flush with the tire mold interior surface,
 - wherein the face includes at least one face surface element selected from the group consisting of a raised surface and a recessed surface, and
 - wherein the at least one face surface element corresponds to the at least one mold surface element.
2. The tire mold of claim 1, wherein the tire mold interior surface further includes a smooth portion.
3. The tire mold of claim 2, further comprising:
 - a second conduit extending from a second opening in the smooth portion of the tire mold interior surface to an exterior of the tire mold; and

a second vent insert located at least partially inside of the second conduit, wherein the second vent insert has a face that is substantially flush with the tire mold interior surface.

4. The tire mold of claim 1, wherein the vent insert has a plurality of vent insert channels extending along a vent insert side surface, and wherein each vent insert channel has an intake opening at the face.
5. The tire mold of claim 1, wherein the at least one mold surface element and the at least one face surface element together define a serrated surface.
6. The tire mold of claim 1, wherein the at least one mold surface element and the at least one face surface element together define an indicium.
7. The tire mold of claim 1, wherein the at least one mold surface element and the at least one face surface element together define one of a groove and a rib.
8. The tire mold of claim 1, wherein the non-smooth portion of the tire mold interior surface includes a recess, and wherein the at least one face surface element is a corresponding recess.
9. A method of venting a tire mold, the method comprising:
 - providing a tire mold having an interior region and an exterior region,
 - wherein the interior region is defined by a surface having a non-smooth portion,

wherein the non-smooth surface defines a pattern,

wherein the interior and exterior regions of the tire mold are in fluid connection with each other via at least one conduit extending from the exterior region to the non-smooth portion of the surface defining the interior region; and

inserting a vent insert at least partially inside the at least one conduit, the vent insert having a non-smooth face that corresponds to the pattern defined by the non-smooth surface of the surface of the interior region.

10. The method of claim 9, wherein the inserting the vent insert includes inserting the vent insert such that the non-smooth face of the vent insert is flush with the non-smooth portion of the surface of the interior region.
11. The method of claim 9, wherein the vent insert has a plurality of channels extending along a vent insert side surface, wherein each channel has an intake opening at the non-smooth face.
12. The method of claim 9, wherein the pattern is selected from the group consisting of: at least one serration, at least one rib, at least one groove, at least one letter, at least one number, at least one symbol, and at least one logo.
13. The method of claim 9, wherein the surface of the interior region is contoured, and the non-smooth face of the vent insert has a corresponding contour.

14. The method of claim 9, wherein the non-smooth portion of the surface of the interior region corresponds to a bead portion of a tire.
15. The method of claim 9, wherein the vent insert is constructed of thermoplastic.

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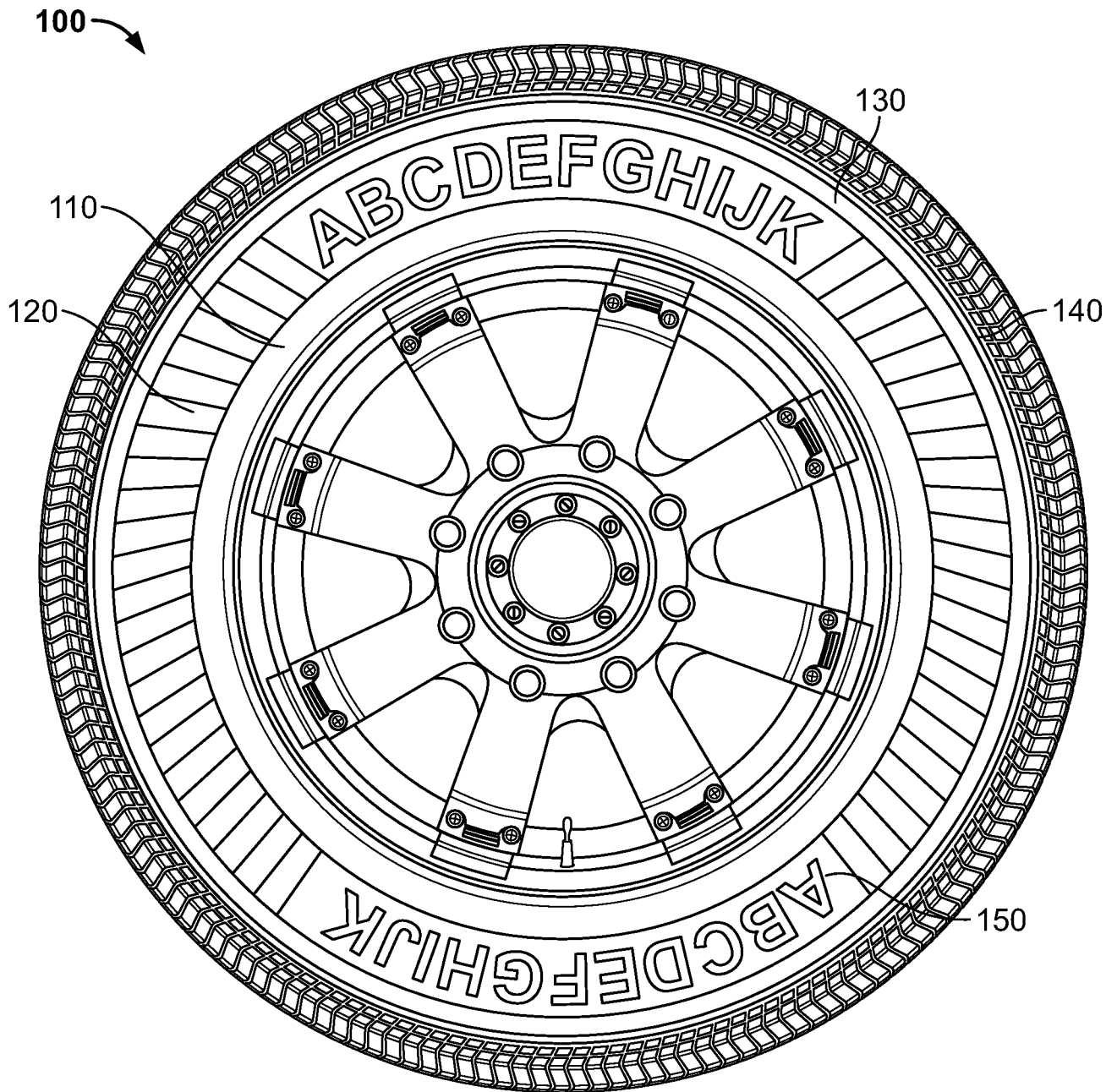


FIG. 1

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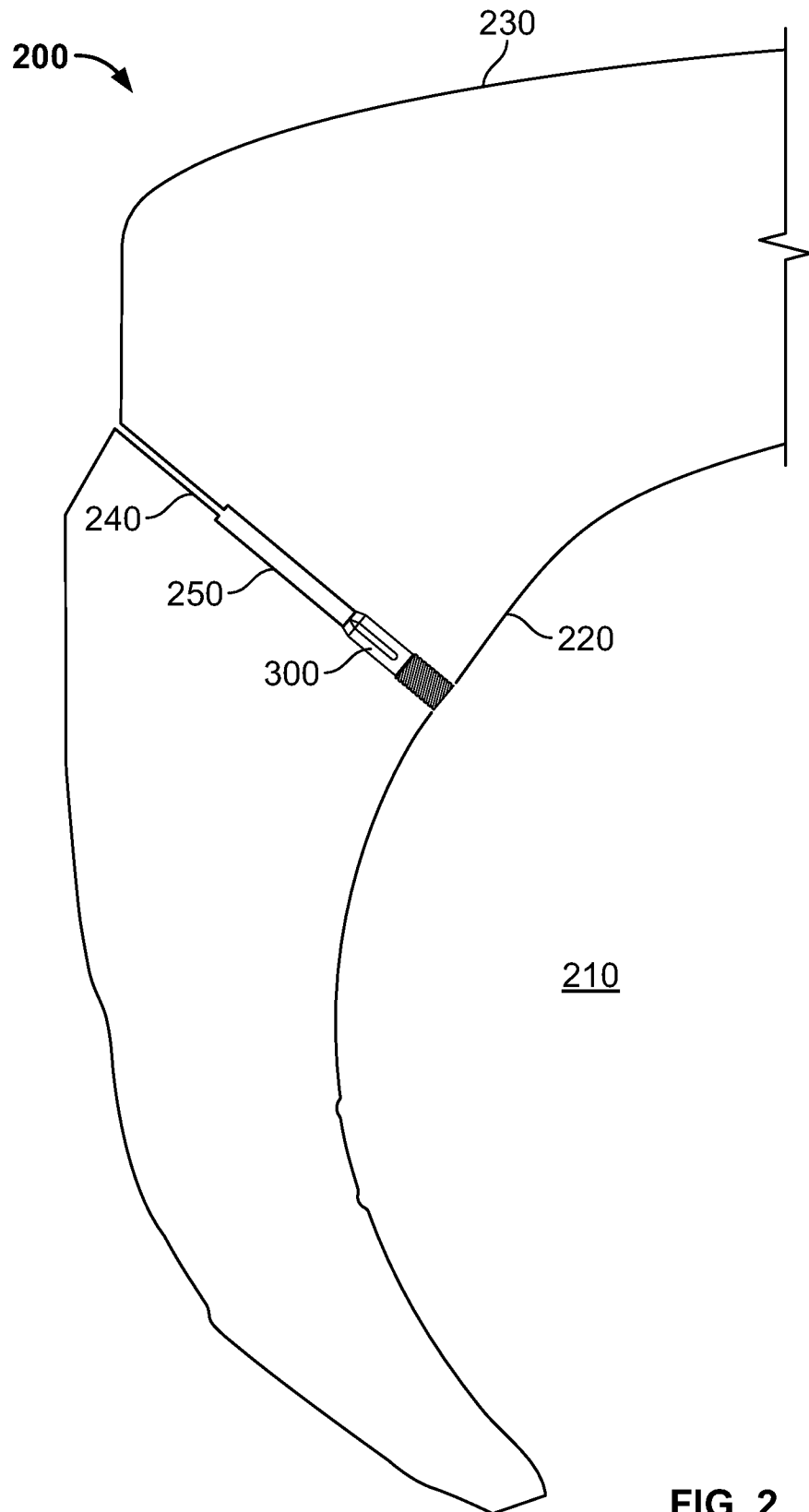


FIG. 2

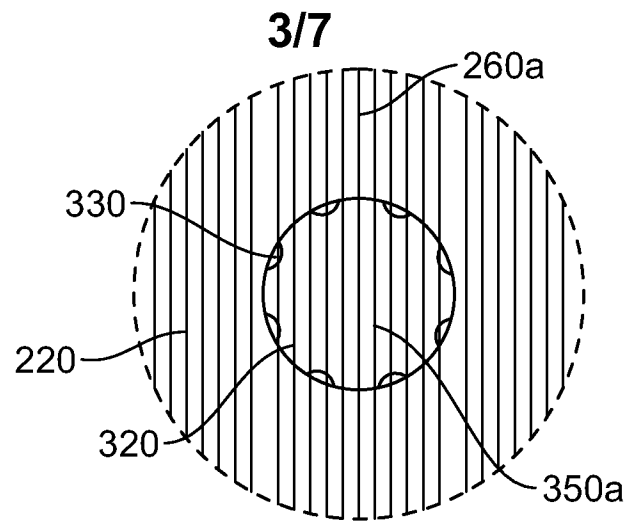


FIG. 3A

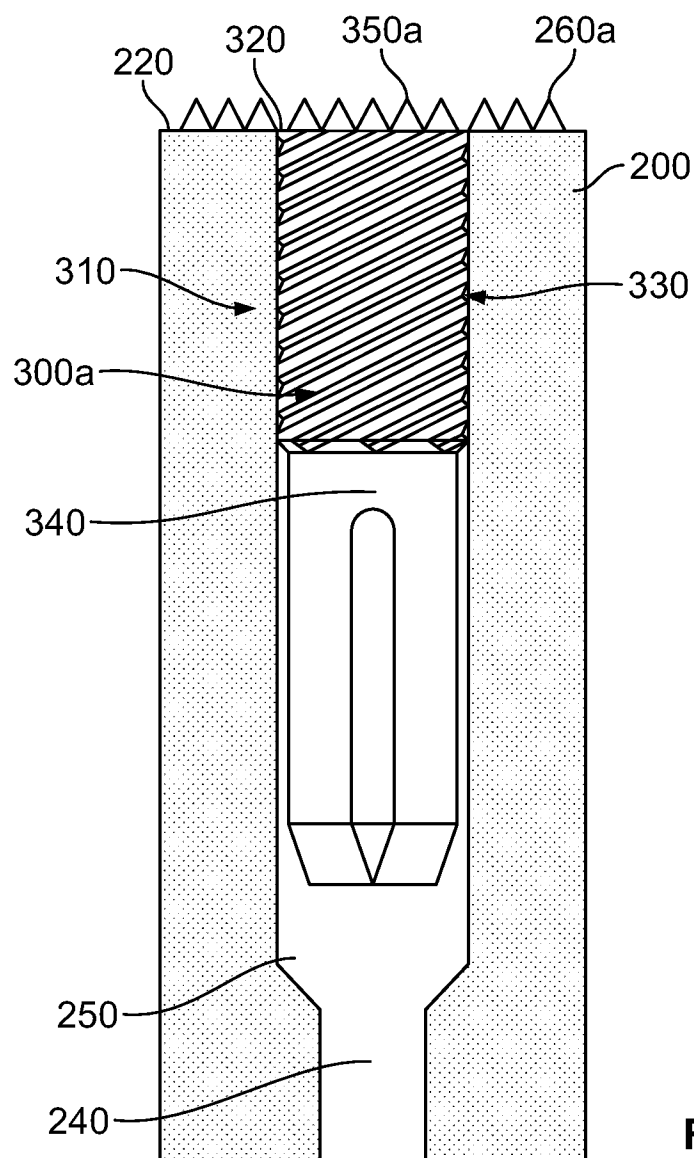


FIG. 3B

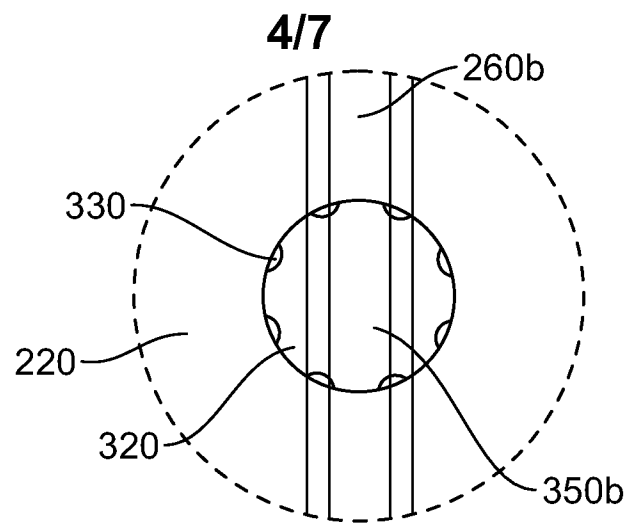


FIG. 4A

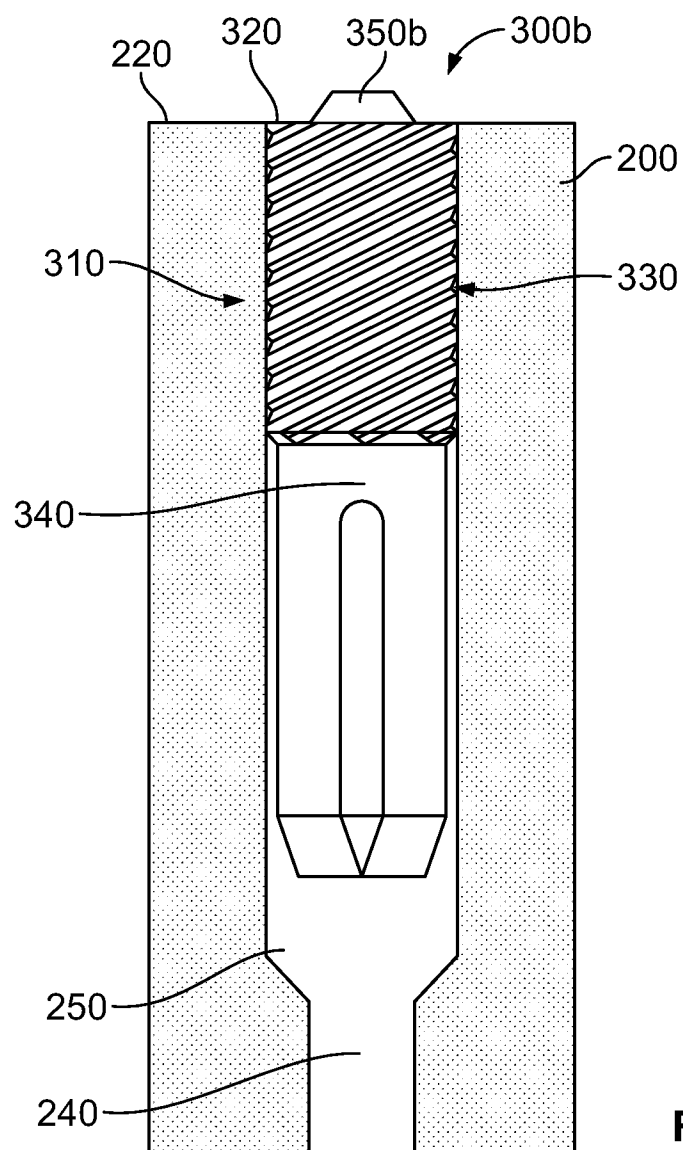


FIG. 4B

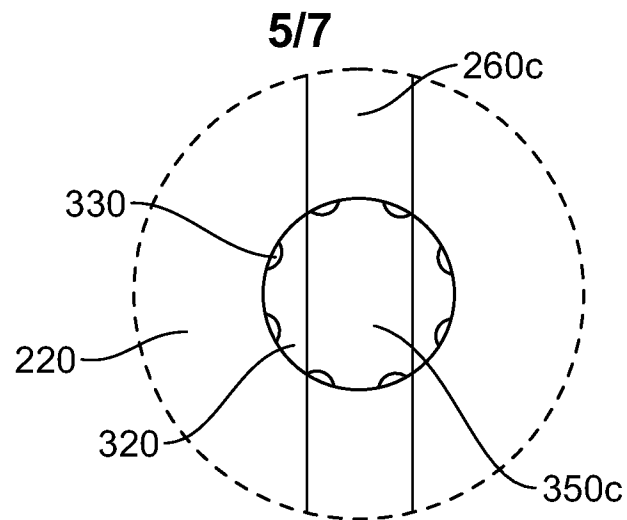


FIG. 5A

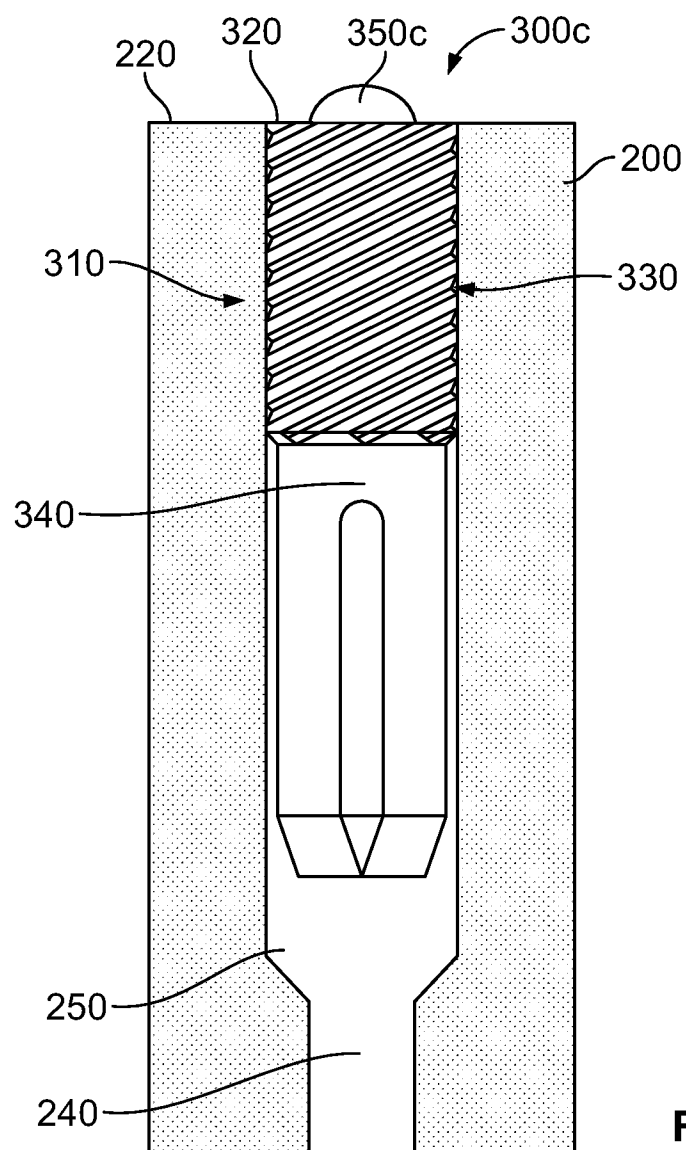


FIG. 5B

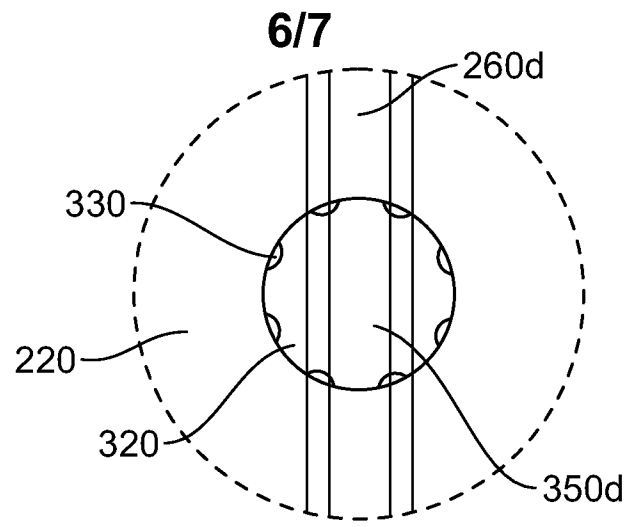


FIG. 6A

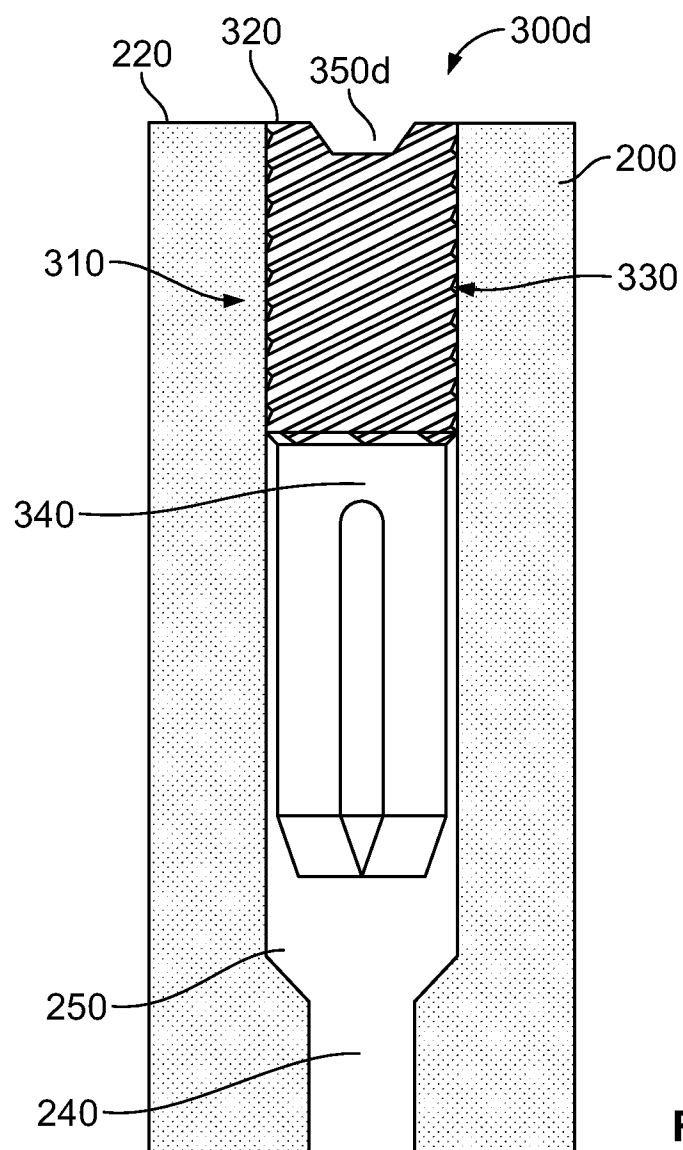


FIG. 6B

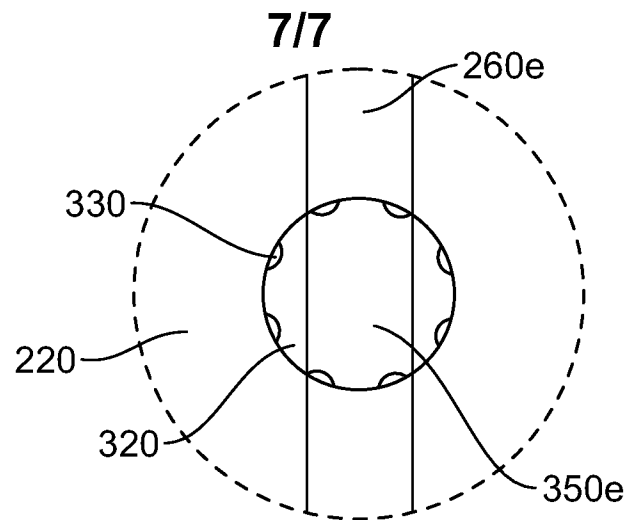


FIG. 7A

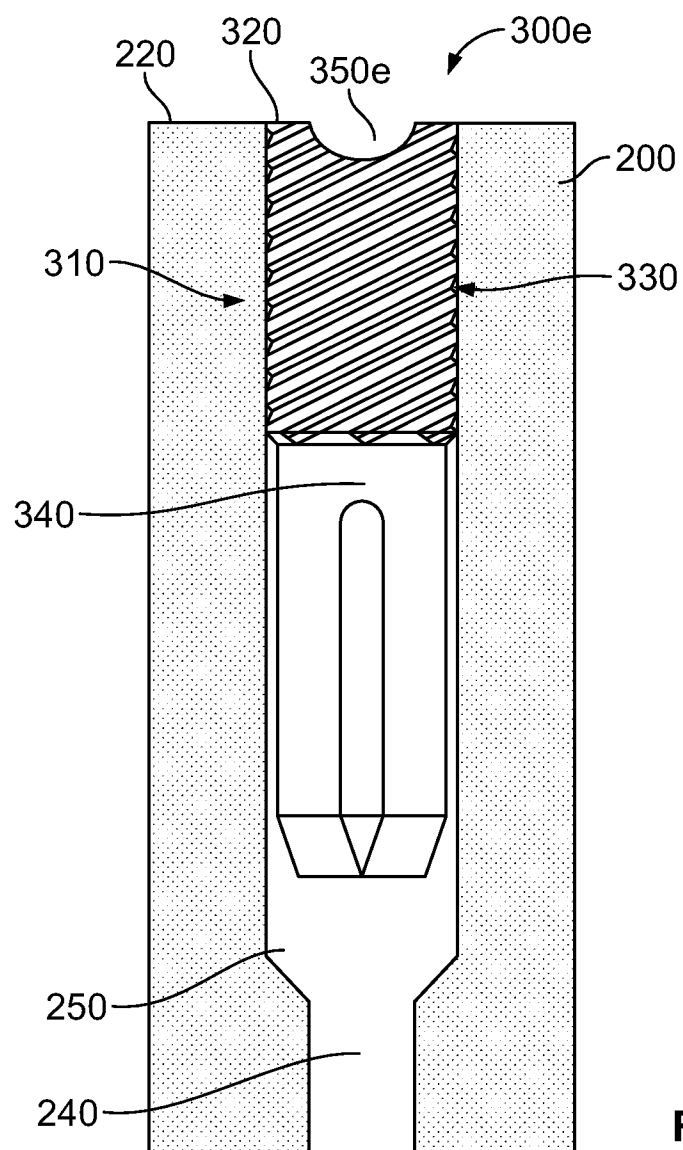


FIG. 7B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/067038**A. CLASSIFICATION OF SUBJECT MATTER****B29D 30/06(2006.01)i, B29D 30/08(2006.01)i**

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

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
B29D 30/06; B29D 30/00; B29C 35/00; B60C 5/00; B29C 33/10; B29D 30/08Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords tire mold, non-smooth, vent**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006-129642 A1 (BRIDGESTONE CORPORATION et al.) 07 December 2006 See abstract; paragraphs [0034]-[0036]; and figures 1-8.	1-3, 5-10, 12-15
Y		4, 11
Y	WO 2008-136904 A1 (BRIDGESTONE FIRESTONE NORTH AMERICAN TIRE, LLC.) 13 November 2008 See abstract; claims 1, 9; and figures 1-4.	4, 11
A	US 2002-0162941 A1 (HANYA, MASAHIRO) 07 November 2002 See abstract; paragraphs [0032], [0039]-[0043], [0048]; and figures 2, 8.	1-15
A	US 2010-0230019 A1 (SUGATA, MICHIOHRO) 16 September 2010 See abstract; claims 1-11.	1-15
A	US 8834143 B2 (MIYAZAKI, YUSAKU) 16 September 2014 See abstract.	1-15

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

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"&" document member of the same patent family

Date of the actual completion of the international search

19 February 2016 (19.02.2016)

Date of mailing of the international search report

01 April 2016 (01.04.2016)

Name and mailing address of the ISA/KR

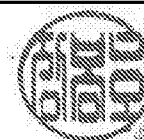
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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