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DESCRIPTION

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The present invention relates to a tire, and more particularly to a tire having good drainage performance.

2. Description of Related Art

[0002] Part of a conventional tire 100 is illustrated in FIG. 1, including a body 10 and a tread 20 engaged with an outer side of the body 10. The tread 20 has a plurality of blocks 22 thereon, wherein the blocks 22 are provided along an outer circumferential surface of the tire 100 to form multiple parallel circles of blocks, each of which has two grooves 24 formed on two lateral sides thereof. Each block 22 has an outer surface 222 adapted to contact the road surface. The outer surface 222 is flat in a transverse direction (i.e., the width direction) of the tire 100. When the tire 100 is rolling on the ground, the outer surface 222 would abut against the ground. When the tire 100 is rolling on a wet ground, the water on the ground would be squeezed into the grooves 24 by the outer surfaces 222 of the blocks 22, whereby to maintain a certain grip.

[0003] However, the outer surfaces 222 of the blocks 22 of the tire 100 would gradually become worn with age, causing the outer surfaces 222 to recess inward (as shown in FIG. 2). Once recessed, the contact area between the outer surfaces 222 of the blocks 22 and the ground would be reduced, making the grip of the tire 100 worse. In addition, when the worn tire 100 rolls on the wet ground, the water could not be smoothly squeezed into the grooves 24 and dissipated; instead, the water would be confined in the recessed portions on the outer surfaces 222, causing hydroplaning. In all aspects, such a conventional tire still has room for improvements. Document EP2067636 A1 discloses a tire on which the preamble of claim 1 is based.

BRIEF SUMMARY OF THE INVENTION

[0004] In view of the above, the primary objective of the present invention is to provide a tire, which provides good drainage performance and long service life.

[0005] To achieve the objective of the present invention, the present invention provides a tire

according to claim 1. Said tire includes a body and a tread engaged with the body. The tread includes a plurality of blocks and at least two grooves. The blocks and the at least two grooves are respectively provided along an outer circumferential surface of the tire. Each of the blocks are located between two of the at least two grooves. Each of the blocks has an outer surface bulging outward, wherein the outer surface is a part of the tire that contacts a ground. Each of the blocks has two lateral walls in a transverse direction of the tire. Each of the lateral walls has a flat segment, wherein a surface of each of the flat segments is flat. An extension line is defined along the surface of each of the flat segments in a vertical cross section of each of the blocks, wherein the extension line extends from a bottom of the belonged block toward the outer surface, and a first point is defined at where the extension line leaves the relevant surface. Each extension line has no contact with the belonged block after passing the first point. A first horizontal reference line is defined by connecting the two first points of each of the blocks. A second horizontal reference line and a vertical reference line are defined on the outer surface of each of the blocks, wherein the second horizontal reference line is parallel to the first horizontal reference line, and two ends of the second horizontal reference line contact the relevant outer surface at two second points. A length of the second horizontal reference line is 0.85 times a length of the first horizontal reference line. The vertical reference line is perpendicular both to the first horizontal reference line and the second horizontal reference line, passing through a center of the first horizontal reference line and a center of the second horizontal reference line, wherein a vertical distance is defined between the center of the second horizontal reference line and an intersection of the vertical reference line and the outer surface. The vertical distance is between 0.2 mm and 0.8 mm.

[0006] With the outward bulging blocks having the vertical distance of 0.2-0.8 mm, the tire could still maintain good contact with the ground even if the outer surfaces of the blocks are worn. Therefore, the tire could provide good drainage performance and adequate grip. Furthermore, such design could extend the service life of the tire, and enhance security while using the tire.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0007] The present invention will be best understood by referring to the following detailed description of some illustrative embodiments in conjunction with the accompanying drawings, in which

FIG. 1 is a schematic diagram, showing part of a conventional tire;

FIG. 2 is a schematic diagram, showing the situation when a worn conventional tire rolls on the wet ground;

FIG. 3 is a schematic diagram, showing part of the tire of a first embodiment of the present invention;

FIG. 4 is a schematic diagram, showing the first blocks of the tire of the first embodiment;

FIG. 5 is a schematic diagram, showing the situation that the tire of the first embodiment rolls on the wet ground when it gets worn; and

FIG. 6 is a schematic diagram, showing the blocks of a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0008] A tire 200 of a first embodiment of the present invention is illustrated in FIG. 3 and FIG. 4, showing a part of the tire 200, wherein the tire 200 includes a body 30 and a tread 40 engaged with outer sides of the body 30. The essence of the present invention is on a structure of the tread 40.

[0009] The tread 40 includes a plurality of blocks and four grooves. The blocks and the four grooves are respectively provided along an outer circumferential surface of the tire 200, wherein each of the blocks is located between two of the four grooves, and the blocks form at least one full circle of blocks. More specifically, the four grooves include two first grooves 42 and two second grooves 44. The tread 40 includes a middle portion 40a and two lateral portions 40b located on two lateral sides of the middle portion 40a, wherein the middle portion 40a is located between the first grooves 42, and each of the lateral portions 40b is located between one of the first grooves 42 and one of the second grooves 44. The blocks include a plurality of first blocks 46 and a plurality of second blocks 46', wherein the first blocks 46 are located on the middle portion 40a, and are arranged along the outer circumferential surface of the tire 200 in a full circle, while the second blocks 46' are respectively located on the lateral portions 40b, and the second blocks 46' on each of the lateral portions 40b are arranged along the outer circumferential surface of the tire 200 to respectively arranged in a full circle. In practice, the middle portion 40a could have two circles of the first blocks 46 arranged thereon, with a central groove formed between said two circles of the first blocks 46.

[0010] In order to illustrate easily, we take one of the first blocks 46 for explanation herein. A structure of said block 46 shown in FIG. 4 is in the condition when the tire 200 is unfilled.

[0011] The first block 46 has an outer surface 462 bulging outward, wherein the outer surface 462 is the part of the tire 200 that contacts the road surface. In the first embodiment, the outer surface 462 is a curved surface. The first block 46 has two lateral walls 464 in a transverse direction (i.e., a width direction) of the tire 200. Each of the lateral walls 464 has a flat segment 464a, wherein a surface of each of the flat segment 464a is flat, and each of the flat segments 464a is the longest segment of the belonged lateral wall 464. In a vertical cross section of the first block 46, an extension line E is defined along the surface of each of the flat segments 464a, extending from a bottom of the first block 46 toward the outer surface 462, wherein the point where the extension line E leaves the physical surface is defined as a first point P1. Each

extension line E has no contact with the first block 46 after passing the first point P1. In other words, for each of the flat segments 464a, the first point P1 thereon is the closest point to the outer surface 462. By lining two first points P1 on the flat segments 464a, a first horizontal reference line H1 could be determined.

[0012] In order to define a degree of bulging of the outer surface 462 more accurately, a second horizontal reference line H2 and a vertical reference line V are further defined on the outer surface 462. The second horizontal reference line H2 is parallel to the first horizontal reference line HI, with two ends thereof respectively contacting the outer surface 462 at two second points P2 in the vertical cross section of the first block 46. A length of the second horizontal reference line H2 is 0.85 times a length of the first horizontal reference line H1. The vertical reference line V is perpendicular both to the first horizontal reference line H1 and the second horizontal reference line H2, passing through a center of the first horizontal reference line H1 and a center of the second horizontal reference line H2. The vertical reference line V is parallel to a radial direction of the tire 200. Whereby, a vertical distance D between a point of intersection of the vertical reference line V and the outer surface 462 and the center of the second horizontal reference line H2 could be defined. In the first embodiment, the first block 46 is symmetrical, which are centered on the vertical reference line V. However, this is not a limitation of the present invention. In other embodiments, the first blocks 46 could be also non-symmetrical on two sides of the vertical reference line V.

[0013] In the first embodiment, each of the second blocks 46' has the same structure with said first block 46. Thus we are not going to describe it in details herein. By experiments, the vertical distance D of the first block 46 (and each of the second blocks 46') is found optimal when between 0.2 mm and 0.8 mm, for the tire 200 could offer good drainage performance and adequate grip.

[0014] The tire 200 shown in FIG. 5 is filled and rolling on a ground G, wherein the outer surfaces 462 of the first blocks 46 and the second blocks 46' could still maintain good contact with the ground G even if the outer surfaces 462 bulging from the first blocks 46 and the second blocks 46' are becoming flat due to wear and tear. Whereby, when the tire 200 rolls on the wet ground G, the water of the ground G could be squeeze in the first grooves 42 and the second grooves 44 through the outer surface 462 of each of the first blocks 46 and each of the second blocks 46', whereby to provide good drainage performance.

[0015] In addition, due to the maximum vertical distance D is 0.8 mm, even when the tire 200 is loaded, and the first blocks 46 and the second blocks 46's are therefore under pressure, each of the first blocks 46 and each of the second blocks 46' could still maintain good contact with the ground G, whereby to offer good grip. Furthermore, in consideration of the endurance of the tire 200, the vertical distance D would be preferred to be greater than or equal to 0.2 mm. Therefore, preferably, a numerical range of the vertical distance D would be between 0.2 mm and 0.8 mm.

[0016] Said vertical distance D of each of the first blocks 46 is equal to the vertical distance D

of each of the second blocks 46' According to the present invention the vertical distance D of each of the first blocks 46 is greater than that of each of the second blocks 46', since the middle portion 40a of the tread 40 is worn more easily than the lateral portions 40b.
Therefore, by further bulging the outer surface 462 of each of the first blocks 46 on the middle portion 40a to a greater degree than that of the outer surface 462 of each of the second blocks 46' on the lateral portions 40b, a service life of the tire 200 can be extended . According to the invention the vertical distance D of each of the first blocks 46 located on the middle portion 40a would be between 0.5 mm and 0.8mm, and the vertical distance D of each of the second blocks 46' located on each of the lateral portions 40b is smaller than 0.5 mm, but greater than or equal to 0.2 mm.

[0017] Blocks 50 of a tire of a second embodiment of the present invention is illustrated in FIG. 6, each of which has almost the same structure as described in the first embodiment, wherein the difference between the first and the second embodiments is that, each lateral wall 502 of each of the blocks 50 has a flat segment 502a and a chamfered segment 502b, wherein the chamfered segment 502b is located between the flat segment 502a and an outer surface 504. Each flat segment 502a is the longest segment on each of the lateral walls 502. In the second embodiment, the first point P1 where the extension line E leaves each of the flat segments 502a is located at the junction between the relevant flat segment 502a and the adjacent chamfered segment 502b. The definitions of the first horizontal reference line HI, the second horizontal reference line H2, the second points P2, the vertical reference line V, and the vertical distance D are all the same as described in the first embodiment, which we are not going to discuss in more details herein.

[0018] In conclusion, with the outward bulging blocks having the vertical distance of 0.2-0.8 mm, the outer surfaces of the blocks of the tire could maintain good contact with the ground to provide good drainage performance and adequate grip. Furthermore, such design could extend the service life of the tire, and enhance high security while using the tire.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP2067636A1 **[0003]**

Patenkrav

1. Dæk (200), omfattende:

et legeme (30) og en slidbane (40) i indgreb med legemet (30), hvor slidbanen (40) omfatter en flerhed af blokke (46, 46', 50) og mindst to riller (42, 44); blokkene (46, 46', 50) og de mindst to riller (42, 44) er henholdsvis tilvejebragt langs en ydre omkredsoverflade af dækket (200); hver af blokkene (46, 46', 50) er placeret mellem to af de mindst to riller (42, 44); hver af blokkene (46, 46', 50) har en ydre overflade (504), der buler udad; den ydre overflade (504) er en del af dækket (200), der er i kontakt med et underlag; hver af blokkene (46, 46', 50) har to laterale vægge (464) i en tværgående retning af dækket (200); hver af de laterale vægge (464, 502) har et fladt segment (464a, 502a), hvor en overflade af hver af de flade segmenter (464a, 502a) er flade; en forlængerlinje (E) er defineret langs overfladen af hvert af de flade segmenter (464a, 502a) i et vertikalt tværsnit af hver af blokkene (46, 46', 50), hvor forlængerlinjen (E) strækker sig fra en bund af den tilhørende blok (46, 46', 50) mod den ydre overflade (504), og et første punkt (P1) er defineret ved hvor forlængerlinjen (E) forlader den relevante overflade; hver forlængerlinje (E) har ingen kontakt med tilhørende blok (46, 46', 50) efter at have passeret det første punkt (PI); en første horisontal referencelinje (H1) er defineret ved at forbinde de to første punkter (P1) af hver af blokkene (46, 46', 50); en anden horisontal referencelinje (H2) og en vertikal referencelinje (V) er defineret på den ydre overflade (504) af hver af blokkene (46, 46', 50), hvor den anden horisontale referencelinje (H2) er parallel med den første horisontale referencelinje (H1), og to ender af den anden horisontale referencelinje (H2) er i kontakt med den relevante ydre overflade (504) ved to anden punkter (P2); en længde (L2) af den anden horisontale referencelinje (H2) er 0,85 gange en længde (L1) af den første horisontale referencelinje (H1); den vertikale referencelinje (V) er vinkelret både på den første horisontale referencelinje (H1) og den anden horisontale referencelinje (H2), der passerer gennem en midte af den første horisontale referencelinje (H1) og en midte af den anden horisontale referencelinje (H2);

hvor en vertikal afstand (D) er defineret mellem midten af den anden horisontale referencelinje (H2) og et skæringspunkt af den vertikale referencelinje (V) og den ydre overflade (504),
de mindst to riller (42, 44) omfatter mindst fire riller (42, 44), inklusive to første riller (42) og to anden riller (44); slidbanen (40) omfatter en mellemdel (40a) og to laterale dele (40b) placeret på to laterale sider af mellemdelen (40a); mellemdelen (40a) er placeret mellem de første riller (42), og hver af de laterale dele (40b) er placeret mellem en af de første riller (42) og en af de anden riller (44); blokkene (46, 46') omfatter en flerhed af første blokke (46) og en flerhed af anden blokke (46'), de anden blokke (46') er henholdsvis placeret på de laterale dele (40b) og den vertikale afstand (D) af hver af de første blokke er større end den vertikale afstand (D) af hver af de anden blokke (46'); **kendetegnet ved at**
den vertikale afstand (D) er mellem 0,2 mm og 0,8 mm; de første blokke (46) er placeret på mellemdelen (40a); den vertikale afstand (D) af hver af de første blokke (46) er mellem 0,5 mm og 0,8 mm, og den vertikale afstand (D) af hver af de anden blokke (46') er mindre end 0,5 mm.

2. Dækket (200) ifølge krav 1, hvor den ydre overflade (504) af hver af blokkene (46, 46', 50) er buet.

3. Dækket (200) ifølge krav 1, hvor hver af blokkene (46, 46', 50) er symmetriske på to sider af den vertikale referencelinje (V).

4. Dækket (200) ifølge krav 1, hvor den vertikale referencelinje (V) er parallel med en radial retning af dækket (200).

DRAWINGS

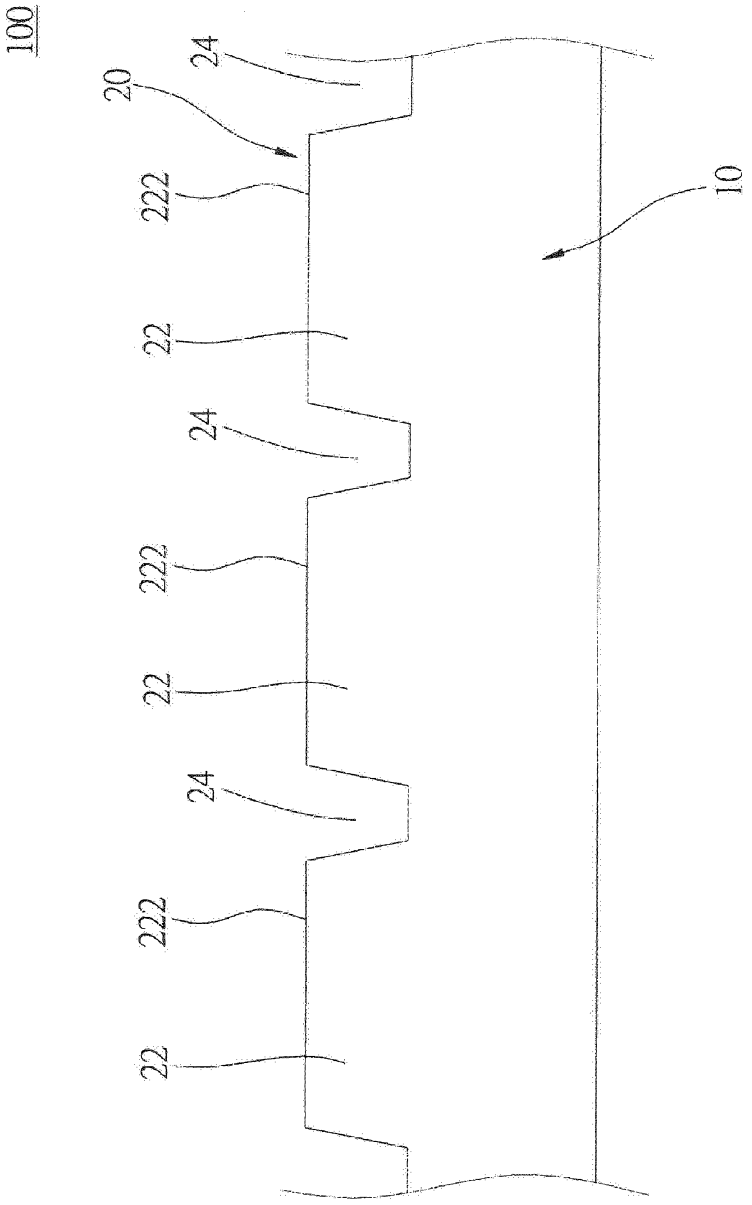

FIG. 1

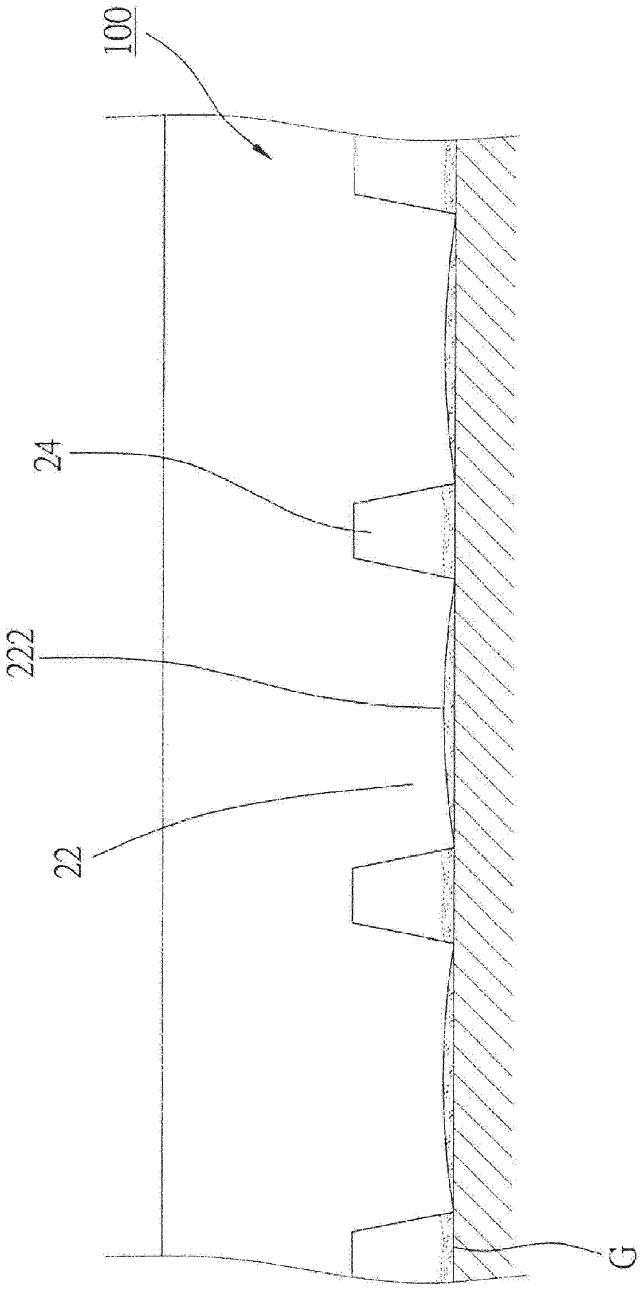

FIG. 2

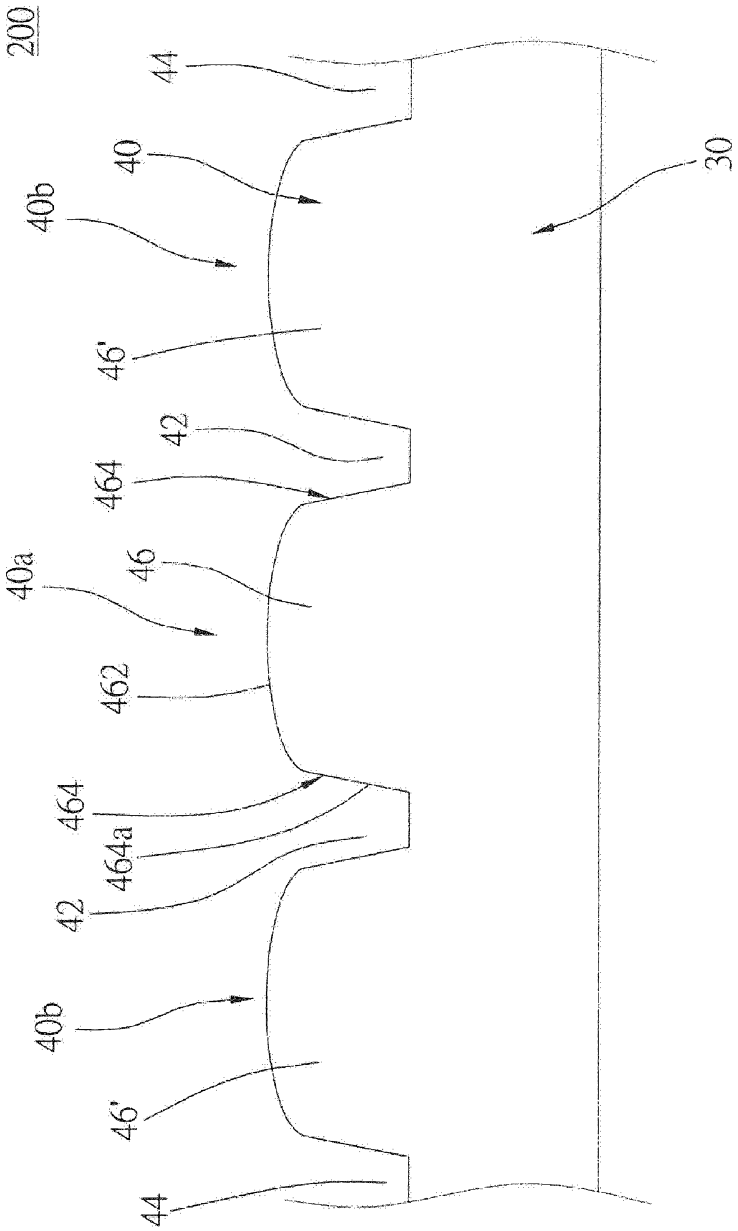

FIG. 3

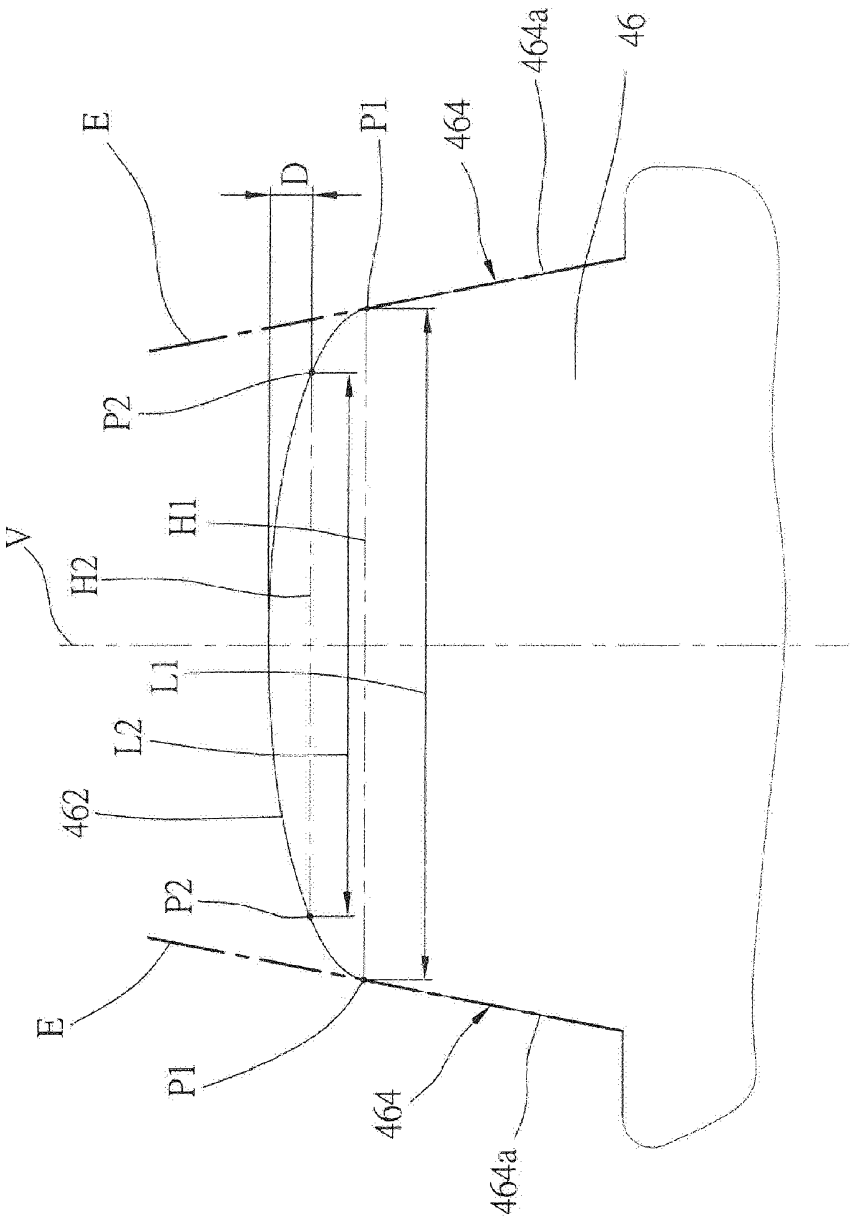

FIG. 4

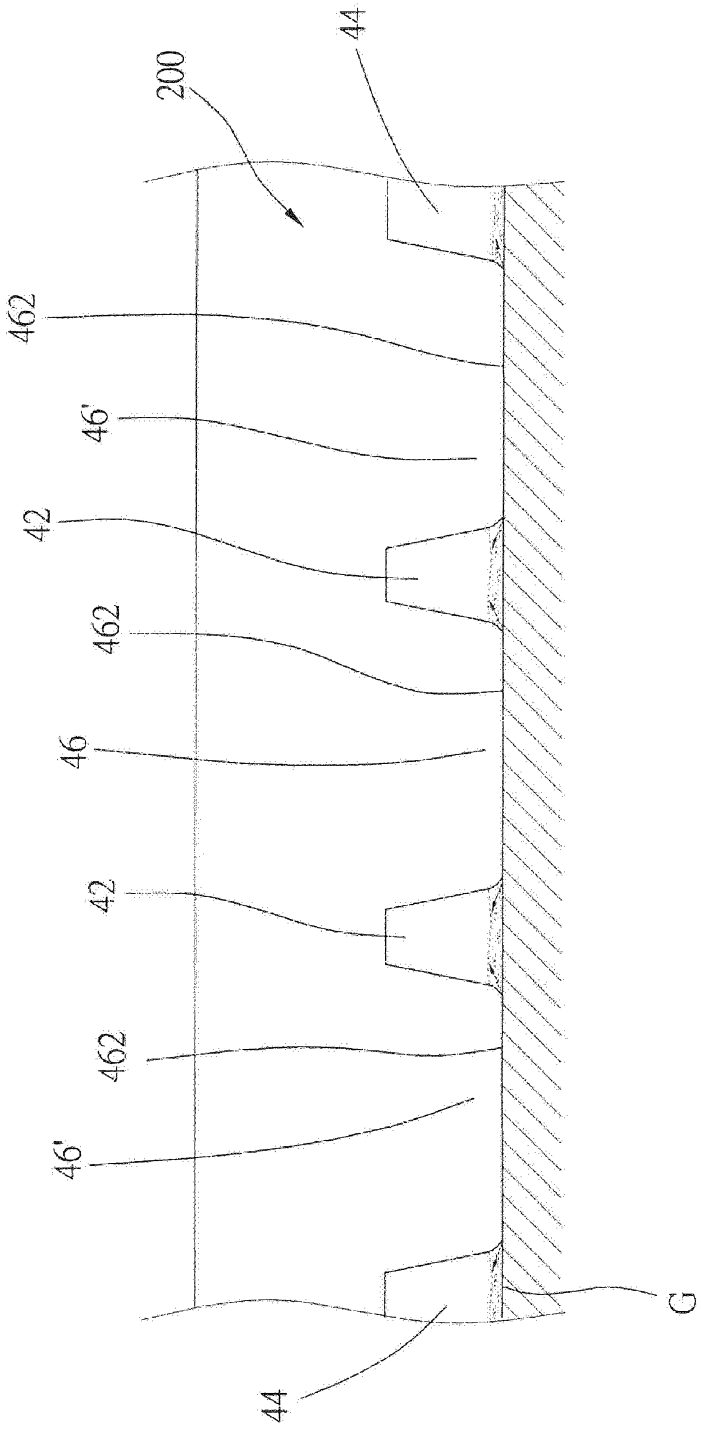

FIG. 5

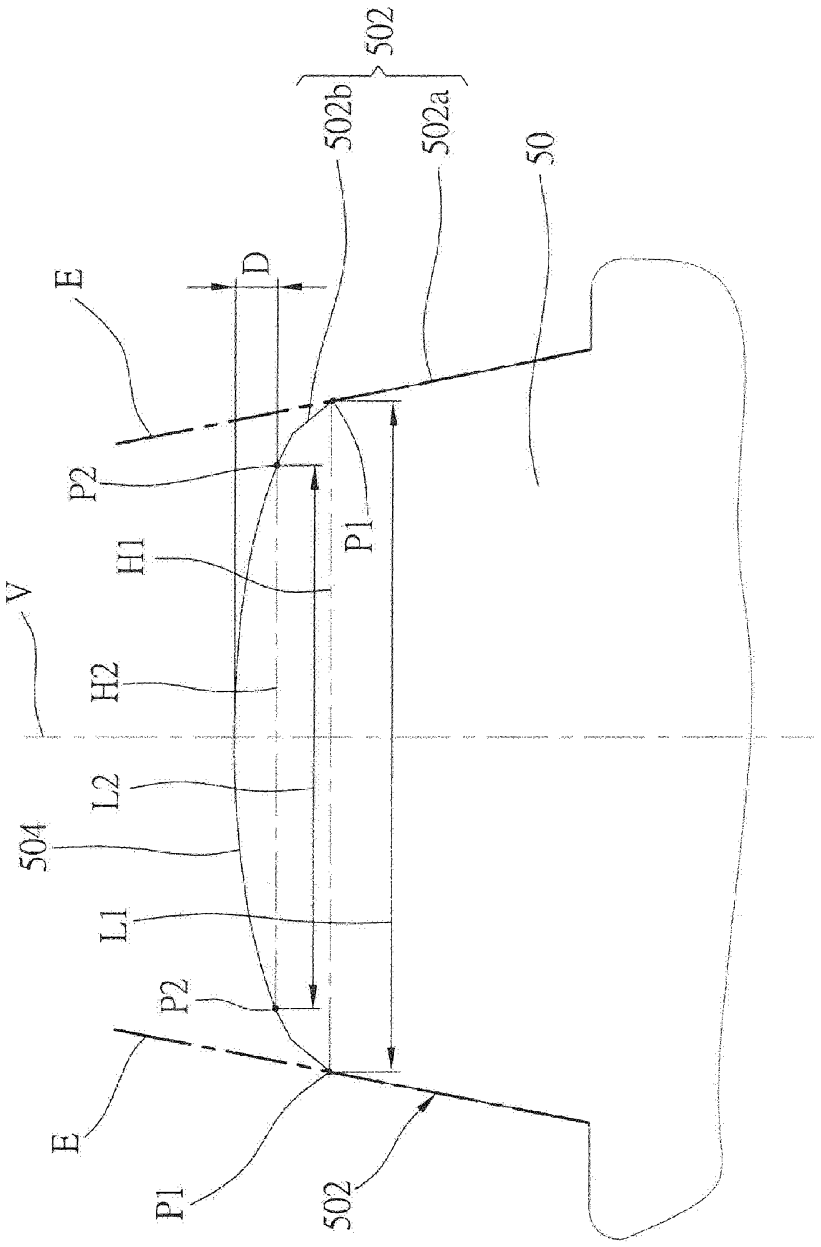

FIG. 6