



(22) Date de dépôt/Filing Date: 2005/02/04
(41) Mise à la disp. pub./Open to Public Insp.: 2006/08/04

(51) Cl.Int./Int.Cl. *B62D 55/26* (2006.01),
B62D 55/24 (2006.01), *B62D 55/07* (2006.01)
(71) Demandeur/Applicant:
BOMBARDIER RECREATIONAL PRODUCTS INC., CA
(72) Inventeur/Inventor:
LANGLAIS, STEVE, CA
(74) Agent: CUTLER, JONATHAN DAVID

(54) Titre : COURROIE D'ENTRAINEMENT DE MOTONEIGE A POSITIONS DE CLOUS PREMARQUEES
(54) Title: SNOWMOBILE DRIVE TRACK WITH PRE-MARKED STUD POSITIONS

(57) **Abrégé/Abstract:**

A drive track for a snowmobile includes a plurality of pre-marked stud-mounting sites, each site being pierceable or drillable to define a passage or bore for receiving a stud. The pre-marked sites are locations where drilling of the track does not unduly compromise track strength. The pre-marked sites can be cylindrical protrusions on the outer surface of the track to facilitate drilling out of the bores using a track bit. The protrusions can be located in spaced-apart pairs on a middle portion of the track in a protrusion pattern that repeats every six pairs. The drive track having these pre-marked stud positions enables end-users to install studs without damaging the track or without having to purchase and install an aftermarket pre-pierced track.



ABSTRACT OF THE DISCLOSURE

A drive track for a snowmobile includes a plurality of pre-marked stud-mounting sites, each site being pierceable or drillable to define a passage or bore for receiving a stud. The pre-marked sites are locations where drilling of the track does not unduly compromise track strength. The pre-marked sites can be cylindrical protrusions on the outer surface of the track to facilitate drilling out of the bores using a track bit. The protrusions can be located in spaced-apart pairs on a middle portion of the track in a protrusion pattern that repeats every six pairs. The drive track having these pre-marked stud positions enables end-users to install studs without damaging the track or without having to purchase and install an aftermarket pre-pierced track.

SNOWMOBILE DRIVE TRACK WITH PRE-MARKED STUD

POSITIONS

FIELD OF THE INVENTION

[0001] The present invention relates generally to a snowmobile drive track and, more particularly, to studded drive tracks.

BACKGROUND OF THE INVENTION

[0002] Snowmobile drive tracks are typically made of fabric-reinforced natural or synthetic rubber. Usually, several layers of rubber are reinforced with fabric and polyester cord. The tracks are typically further reinforced with embedded stiffener rods, or reinforcing rods, which traverse the width of the track to provide bending resistance as is well known in the art.

[0003] On the outer surface of the track, ground-engaging lugs (also known in the art as "paddles", "profiles" or "ribs") are integrally formed with the base of the track. These ground-engaging lugs provide traction, particularly in deep snow, as is well known in the art.

[0004] In accordance with conventional nomenclature, the track has a number of transverse rows known as "pitches". A particular arrangement of lugs along a given pitch defines a "pitch pattern". In other words, the presence and absence of the lugs along the transverse direction of a pitch defines the pitch pattern. An arrangement of pitch patterns over a predetermined number of successive pitches defines a "tread pattern." In other words, the tread pattern repeats over a consecutive number of pitches. The arrangement of the repeating tread patterns over the entire length of the track defines a "track pattern". Conventionally, snowmobile tracks usually employ dual-pitch tread patterns or three-pitch tread patterns, as is explained in greater detail in U.S. Patent 6,772,852 (Morin *et al.*) entitled LONG TRACK MOUNTAIN SNOWMOBILE AND A TRACK THEREFOR which issued August 10, 2004, the entirety of which is hereby incorporated by reference.

[0005] While lugs on the drive track enhance the snowmobile's traction in deep snow, they are generally considered to be of little assistance on hard, icy surfaces such as glare ice or hard-packed snow. To contend with icy conditions, therefore, snowmobile tracks are often studded, typically with steel studs. As is known by snowmobile enthusiasts, metal studs can be installed in the central region of the track to enhance acceleration on ice or hard-packed snow. Studs can also be affixed to the outer portions of the track to improve the acceleration and cornering on ice.

[0006] There are many types of studs known in the art and many methods of affixing them to the track of a snowmobile. Some recent examples of studs for snowmobile drive tracks and track-studding techniques are found in U.S. Patent 6,609,772 (Musselman *et al.*) entitled TRACTION STUD FORCE DISTRIBUTING BACKER MEMBER which issued August 26, 2003; U.S. Patent 6,264,293 (Musselman *et al.*) entitled TRACTION STUD MOUNT AND METHOD OF MANUFACTURING AND MOUNTING which issued July 24, 2001; and U.S. Patent 5,299,860 (Anderson) entitled SNOWMOBILE STUD FASTENER which issued April 5, 1994. For example, in U.S. Patent 6,264,293, the studs are screwed into the ground-engaging lugs. This type of stud is known as a "track lug stud" or "TLS". In U.S. Patent 6,609,772, the studs are installed between the lugs. In U.S. Patent 6,609,772, each stud has a wide, flat head defining an inner flange for engaging an inner surface of the track, thus preventing the stud from being pulled through the hole. The stud further includes a threaded shank for receiving a complementarily threaded nut. The nut locks down a washer (defining an outer flange) against the outer surface of the track, thus securing the stud to the track. The stud also has a pointed tip to further increase traction on ice.

[0007] As is known by snowmobile enthusiasts, studding a snowmobile track is a challenging task, requiring careful use of a specially designed "track bit". Use of a standard drill bit or a heated screwdriver will tend to damage the track. An improperly cut hole is not repairable and can also considerably reduce the strength and durability of the track. For instance, an improperly cut hole may

have sharp edges from which cracks propagate, leading to tears or rips in the track, which can lead to failure of the track under high-load conditions.

[0008] Moreover, snowmobile enthusiasts have a propensity to pierce too many holes in the track or to pierce holes in suboptimal locations in the track that diminish the track's strength and durability. Because of the inherent difficulty of properly studding a standard, non-pierced track, snowmobile and track manufacturers have traditionally refused to guarantee tracks that an end-user studs or customizes.

[0009] Some aftermarket tracks are sold "pre-pierced" for studding. An example of a pre-pierced track is the Kimpex Ultimate Traxtion™ which has 144 pre-molded stud holes. However, this still requires the end-user to replace the "stock" non-pierced track that comes on the snowmobile with the aftermarket pierced track before the track can be studded. Further, the consumer ends up owning two tracks (one non-pierced and the other non-pierced) which represents an extra expenditure.

[0010] It would therefore be highly desirable to provide a factory-installed, non-pierced snowmobile track that is designed to facilitate studding of the track by an end-user.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide a factory-installed, non-pierced snowmobile track that facilitates studding of the track by an end-user.

[0012] In accordance with one aspect of the present invention, a drive track for a snowmobile includes a plurality of lugs integrally formed on an outer surface of a base of the track; and a plurality of pre-marked stud-mounting sites, each site being pierceable or drillable to define a passage or bore for receiving a stud whereby the pre-marked sites are locations where drilling of the track does not unduly compromise track strength.

[0013] In accordance with another aspect of the present invention, a snowmobile has a frame including a tunnel; an engine disposed on the frame; and a drive track as described in the preceding paragraph, the drive track being disposed below and supported by the tunnel and operatively connected to the engine for propulsion of the snowmobile. The snowmobile further includes a straddle seat disposed on the tunnel above the drive track and rearward of the engine; and two steerable skis disposed on the frame, each via a front suspension.

[0014] Preferably, the pre-marked stud-mounting sites are cylindrical protrusions protruding from the outer surface of the track.

[0015] More preferably, the protrusions are disposed in a repeating pattern that matches a track pattern of the drive track or, alternatively, the protrusions define a protrusion pattern having a pitch that is a multiple of the pitch of the track pattern.

[0016] Because the drillable protrusions of the drive track are located at carefully selected positions, drilling and studding of the track does not compromise the strength or structural integrity of the track. The drive track of the present invention therefore facilitates studding of the track by an end-user and helps to ensure that the studded track is durable.

[0017] Other features and advantages of the present invention will be better understood with reference to the preferred embodiment described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Having thus generally described the nature of the present invention, reference will now be made to the accompanying drawings by way of illustration showing a preferred embodiment, in which:

[0019] FIG. 1 is a side view of a snowmobile having a drive track in accordance with an embodiment of the present invention;

[0020] FIG. 2 is a perspective view of a portion of a drive track in accordance with an embodiment of the present invention;

[0021] FIG. 3 is top plan view of a portion of a drive track showing a stud-site pattern in accordance with a preferred embodiment of the present invention;

[0022] FIG. 4 is a top plan view of a portion of a drive track showing a protrusion pattern corresponding to the stud-site pattern of FIG. 3;

[0023] FIG. 5 is a side view of a portion of a drive track having cylindrical protrusions on an outer surface of the track in accordance with the preferred embodiment of the present invention;

[0024] FIG. 6 is a side view of a portion of a drive track having frusta-conical protrusions on an outer surface of the track in accordance with another embodiment of the present invention;

[0025] FIG. 7 is a side view of a portion of a drive track having semi-spherical protrusions on an outer surface of the track in accordance with another embodiment of the present invention; and

[0026] FIG. 8 is a side view of a portion of a drive track having cylindrical protrusions on an inner surface of the track in accordance with another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0027] Referring now to FIG. 1, a snowmobile incorporating an embodiment of the present invention is designated generally by reference numeral 10. Although certain aspects of the present invention are applicable in other types of tracked vehicles, the present invention has particular utility in connection with snowmobiles.

[0028] The snowmobile 10 includes a forward end 12 and a rearward end 14 which are defined consistently with a travel direction of the vehicle. The snowmobile 10 includes a frame or chassis 16 which normally includes a rear tunnel 18, an engine cradle portion 20 and a front suspension assembly portion

22. An engine 24, which is schematically illustrated in FIG. 1, is carried by the engine cradle portion 20 of the frame 16. A ski and steering assembly (not indicated) is provided, in which two skis 26 are positioned at the forward end 12 of the snowmobile 10 and are attached to the front suspension assembly portion 22 of the frame 16 through a front suspension assembly 28. The front suspension assembly 28 includes ski legs 30, supporting arms 32 and ball joints (not shown) for operatively joining the respective ski legs 30, supporting arms 32 and a steering column 34. The steering column 34 at its upper end is attached to a steering device such as a handlebar 36 which is positioned forward of a rider and behind the engine 24 to rotate the ski legs 30 and thus the skis 26, in order to steer the vehicle.

[0029] An endless drive track 100 in accordance with embodiments of the present invention (and which will be described in greater detail below) is positioned at the rear end 14 of the snowmobile 10. The drive track 100 is disposed generally under the tunnel 18, being connected operatively to the engine 24 through a belt transmission system 40 which is schematically illustrated by broken lines in FIG. 1. Thus, the endless drive track 100 is driven to run about a rear suspension assembly 42 for propulsion of the snowmobile 10. The rear suspension assembly 42 includes a pair of slide rails 44 in sliding contact with the endless drive track 100. The rear suspension assembly 42 also includes one or more shock absorbers 46 which may further include a coil spring (not shown) surrounding the individual shock absorbers 46. Front and rear suspension arms 48 and 50 are provided to attach the slide rails 44 to the frame (chassis) 16. One or more idler wheels 52 are also provided in the rear suspension assembly 42.

[0030] At the front end 12 of the snowmobile 10, fairings 54 enclose the engine 24 and the belt transmission system 40, thereby providing an external shell that not only protects the engine 24 and the belt transmission system 40, but can also be decorated to make the snowmobile 10 more aesthetically pleasing. Typically, the fairings 54 include a hood (not indicated) and one or more side panels which can be opened to allow access to the engine 24 and the belt transmission system 40 when this is required, for example, for

inspection or maintenance of the engine 24 and/or the belt transmission system 40. In the particular snowmobile 10 shown in FIG. 1, the side panels can be opened along a vertical axis to swing away from the snowmobile 10. A windshield 56 may be connected to the fairings 54 near the front end 12 of the snowmobile 10 or directly to the handlebar 36. The windshield 56 acts as a wind screen to lessen the force of the air on the rider while the snowmobile 10 is moving.

[0031] The engine 24 is a type of internal combustion engine that is supported on the frame 16 and is located at the engine cradle portion 20. The internal construction of the engine 24 may be of any known type, however the engine 24 drives an engine output shaft (not shown) that rotates about a horizontally disposed axis that extends generally transversely to a longitudinal centerline 61 of the snowmobile 10. The engine output shaft drives the belt transmission system 40 for transmitting torque to the endless drive track 100 for propulsion of the snowmobile 10.

[0032] A straddle-type seat 58 is positioned atop the frame 16 and extends from the rear end 14 of the snowmobile 10 to the fairings 54. A rear portion of the seat 58 may include a storage compartment or can be used to accommodate a passenger seat (not indicated). Two footrests 60 are positioned on opposite sides of the snowmobile 10 below the seat 58 to accommodate the driver's feet.

[0033] As shown in FIG. 1, the endless drive track 100 includes a plurality of lugs 110 (also known as profiles, ribs or paddles) protruding from an outer surface of the track 100. The lugs are integrally formed with a base of the track and extend outwardly to enhance traction in deep snow. In a preferred embodiment, the drive track further includes a plurality of pre-marked drillable stud-mounting sites 120. Each site can be drilled or bored out, preferably using a specialized track bit, to define a bore for receiving a stud. The pre-marked stud-mounting sites 120 are locations where drilling of the track does not unduly compromise track strength. The pre-marked stud-mounting sites preferably take the form of outward protrusions protruding from the outer surface of the

track 100. Although the stud-mounting sites 120 are preferably protrusions protruding from the outer surface of the base of the track, the protrusions can also be formed to protrude from an inner surface of the base of the track, as will be described and illustrated in greater detail below.

[0034] FIG. 2 illustrates a portion of a drive track 100 having a plurality of lugs 110 protruding above embedded stiffener rods 108. The lugs 110 and embedded stiffener rods 108 are transversely disposed to define consecutive pitches that are mutually parallel and spaced-apart by a constant distance known as a "drive pitch". The lugs 110 are arranged in a six-pitch track pattern (meaning that the pattern repeats itself every six pitches of lugs). The track pattern illustrated in FIG. 2 was disclosed in U.S. Patent 6,772,852 (Morin *et al.*) and is an example of a modern, high-performance track, although it should be expressly understood that the present invention can be applied to other any other track having any other track pattern.

[0035] As shown in FIG. 2, the drive track 100 includes a plurality of cylindrical protrusions 120 defining pre-marked stud-mounting sites. The protrusions 120 protrude from the outer surface of the track 100. In this particular embodiment, for the sake of clarity of illustration, only six cylindrical protrusions are illustrated, grouped into three pairs disposed symmetrically about a centerline or central longitudinal axis 130 of the track. Preferably, and as will be illustrated in subsequent figures, twelve cylindrical protrusions would be disposed in six pairs, with each pair being spaced apart by a different distance to define a six-pitch stud pattern, *i.e.* a pattern of studs (or drillable protrusions) that repeats itself every six pitches, as do the lugs.

[0036] As shown in FIG. 2, the drive track 100 has two longitudinal rows of clips 104, 106 defining a central region or "middle portion" 107. Preferably, as shown in FIG. 2, the protrusions 120 are located within the middle portion of the track although protrusions could also be provided in the outer regions of the track too. However, as is known in the art, studding the central region of the track enhances acceleration on ice or hard-packed snow. The protrusions can thus be formed at a variety of positions to provide a stud pattern most suitable

for the particular type of snowmobile. Moreover, it should be noted that, as a variant, the track could have a greater number of pre-marked sites than the number of studs to be installed, thus enabling the end-user to choose one of a number of possible stud patterns for the track.

[0037] FIG. 3 is a top plan view of a portion of a drive track 100 showing a six-pitch stud pattern in accordance with a preferred embodiment of the present invention. In this preferred embodiment, the six pairs of stud positions are pre-marked on the base of the track in the middle portion 107 between the longitudinal rows of clips 104, 106. The stud sites are preferably disposed in the "valleys" between adjacent pitches, as it is best to avoid having to drill through lugs or stiffener rods. As shown in FIG. 3, the six-pitch stud pattern matches the six-pitch track pattern, meaning that the pitch pattern repeats every six pitches while the stud pattern repeats every six pairs of studs. The pre-marked stud-mounting sites shown in FIG. 3 can be protrusions or merely circular markings on the base of the track where drilling of the track minimally degrades structural integrity of the track. Although a six-pitch pattern is preferred, a different stud pattern can, of course, be utilized.

[0038] As shown in FIG. 3, the pre-marked stud-mounting sites enable installation of a repeating pattern of six pairs of studs, namely: a first pair of stud sites 121, a second pair of stud sites 122, a third pair of stud sites 123, a fourth pair of stud sites 124, a fifth pair of stud sites 125 and a sixth pair of stud sites 126. In the preferred embodiment, the distance (or gap) between corresponding stud sites of each of the six pairs is different. In other words, each of the six pairs of pre-marked sites is spaced apart a different amount to optimize traction on ice or hard-packed surfaces. In the preferred embodiment, for a 15"-wide track, the six stud sites are preferably spaced apart as follows: 3.375 between the first pair of stud sites 121, 5.125" between the second pair of stud sites 122, 4.125" between the third pair of stud sites 123, 3.563" between the fourth pair of stud sites 124, 4.875" between the fifth pair of stud sites 125, and 5.375" between the sixth pair of stud sites 126. These dimensions are provided merely for the sake of illustration and should not be construed as limiting the scope of the invention in any way whatsoever.

[0039] FIG. 4 is a top plan view of a portion of the drive track 100 shown in FIG. 3. Once stud positions are selected such as the stud pattern shown in FIG. 3, the track is then preferably manufactured with drillable cylindrical protrusions on the outer surface of the track corresponding to define the six pairs of stud-mounting sites 121-126. It should be recalled that FIG. 3 and FIG. 4 illustrate the preferred embodiment and that track type, track dimensions and stud patterns could vary. For example, the preferred embodiment is described as having six *pairs* of stud-sites. However, it should be noted that the stud pattern could not only include a different number of pitches in the pattern but also a different number of studs across one transverse pitch. For example, the stud pattern could have three (or more) transversely aligned studs per pitch. However, a pitch with only two studs is generally preferred as this provides good traction without unduly compromising track strength. As is known in the art, track strength diminishes as more holes are bored into the track.

[0040] A tradeoff therefore arises between the improvement in traction from studding the track and the resulting degradation of track strength due to piercing of the track. As will be appreciated by those of ordinary skill in the art, an optimization can be performed for a given track to determine a stud pattern that enhances traction without unduly compromising track strength. For the purposes of this specification, the expression "unduly comprising track strength" means that the incremental improvement in traction due to further studding of the track is outweighed by the incremental degradation of track strength. For a typical 15" track having a six-pitch track pattern, an optimal stud pattern would be the one presented in FIGS. 3 and 4.

[0041] Referring now to FIGS. 5 to 8, the stud-mounting sites 120 are preferably protrusions protruding from the outer surface of the base 102 of the track 110 as was mentioned above. Alternatively, stud-mounting sites 120 can be protrusions protruding from an inner surface of the base 102 of the track 100. The protrusions are preferably cylindrical as shown in FIG. 5, but they could also be frusta-conical, as shown in FIG. 6, or semi-spherical, as shown in FIG. 7. The cylindrical, frusta-conical or semi-spherical protrusions are so shaped to encourage use of a specially-designed track bit rather than a

standard drill bit or heated screwdriver. The protrusions are also dimensioned to have a diameter (or base diameter in the case of a conical or tapered protrusion) that is substantially equal to a diameter of a shank of the stud. The shank of the stud, as is known in the art, is the generally cylindrical body (longitudinal shaft) of the stud that penetrates through the bore or hole in the track. Also within the scope of the present invention, the stud mounting sites could be embosses within the outer or inner surface of the track. These embosses could be small cavities within the surface of the track to designate the particular place to create the bore for the stud. Throughout the specification, reference has been made to drill and bore. It is to be understood that to drill a hole or to bore a hole or to drill a bore is to be given the broadest meaning to pierce completely through the base of the track and create a passage through which the shank of a stud can be passed. In the preferred embodiment the shank of the stud is passed through the passage from the inside surface to the outside surface of the track. The normal practice is to use a track bit which is a hollow cylinder having sharp teeth at one end to pierce the rubber of the track. The hollow cylinder cuts out a cylindrical-shaped piece of track and thus creates a passage which decreases the chances of tearing.

[0042] As shown in FIGS. 5 to 7, the drillable protrusions 120 are preferably formed on the outer surface of the base 102 of the track 100 to facilitate drilling of the protrusions with the track bit. Furthermore, where the track is not studded, the outwardly extending rubber protrusions provide additional traction, acting as cleats or "mini-lugs". However, as shown in FIG. 8, cylindrical protrusions 120 (or other shaped protrusions) can be formed to protrude from the inner surface of the base 102 of the track 100.

[0043] As shown in the foregoing figures, the drillable protrusions (or pre-marked stud sites) preferably define a repeating protrusion pattern (or stud pattern) that matches a track pattern of the track. In other words, the stud pattern and track pattern correspond in a one-to-one ratio. For instance, in the preferred embodiment, the track has a six-pitch track pattern and the stud pattern (or protrusion pattern) also repeats every six pair of studs. Alternatively, the protrusion pattern can be a multiple of a track pattern of the track. For

example, a two-pitch protrusion pattern can be used with a six-pitch track pattern. Likewise, a three-pitch protrusion pattern can be used with the six-pitch track pattern. In other words, the number of pitches in the protrusion pattern should be an integer divisor of the number of pitches in the track pattern.

[0044] As is already well known in the art, the lugs (or "profiles") are typically in the neighborhood of about one inch high, although lug/profile height can typically vary from about half an inch to over two inches. Track width is usually about 15 inches although wider tracks (up to about 20 inches) are available on certain models of snowmobiles. A typical drive pitch (track length divided by number of pitches) is 2.52 although this too can vary, usually ranging between 2 and 3. A variety of stud types can be used, including shank-type and star-type studs. As is known in the art, the desired stud penetration is usually computed by adding the stud length to the washer/flange thickness and then subtracting the lug height. A rule of thumb is to provide about 1/4" to 3/8" of penetration depending on riding conditions. It should be expressly understood that the track patterns and dimensions, drive pitch, and stud type disclosed or illustrated herein are merely meant to be exemplary of one track to which the present invention can be applied. As will be readily appreciated by those of ordinary skill in the art, the present invention can be applied to any other track irrespective of its pattern, drive pitch or dimensions.

[0045] Modifications and improvements to the above-described embodiment of the present invention may become apparent to those skilled in the art. The foregoing description is intended to be exemplary rather than limiting. The scope of the present invention is therefore intended to be limited solely by the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A drive track for a snowmobile, the drive track comprising:
a plurality of lugs integrally formed on an outer surface of a base of the track; and
a plurality of pre-marked stud-mounting sites, each site being pierceable to define a bore for receiving a stud.
2. The drive track as claimed in claim 1 wherein the stud-mounting sites are protrusions protruding from the outer surface of the base of the track.
3. The drive track as claimed in claim 1 wherein the stud-mounting sites are protrusions protruding from an inner surface of the base of the track.
4. The drive track as claimed in claim 1 wherein the protrusions are selected from a group of geometrical shapes consisting of: cylindrical, frusta-conical and semi-spherical.
5. The drive track as claimed in claim 4 wherein each protrusion has a diameter substantially equal to a diameter of a shank of the stud.
6. The drive track as claimed in claim 1 wherein the protrusions are located in pairs in a middle portion of the track, each pair of protrusions being symmetrically disposed about a longitudinal axis of the track.
7. The drive track as claimed in claim 1 wherein the protrusions define a repeating protrusion pattern.
8. The drive track as claimed in claim 7 wherein the protrusion pattern matches a track pattern of the track in a one-to-one ratio.

9. The drive track as claimed in claim 7 wherein the protrusion pattern repeats every six pairs of protrusions.

10. A snowmobile comprising:
 - a frame including a tunnel;
 - an engine disposed on the frame;
 - a drive track as claimed in claim 1, the drive track being disposed below and supported by the tunnel and operatively connected to the engine for propulsion of the snowmobile;
 - a straddle seat disposed on the tunnel above the drive track and rearward of the engine; and
 - two steerable skis disposed on the frame, each via a front suspension.

11. The snowmobile as claimed in claim 1, wherein the pre-marked sites are locations where the piercing of the track does not unduly compromise track strength

Application number numéro de demande: 2, 496, 052

Figures: 2, 3, 4

Pages: _____

DRW-1P

Unscannable items
received with this application
(Request original documents in File Prep. Section on the 10th Floor)

Documents reçus avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au
10ième étage)

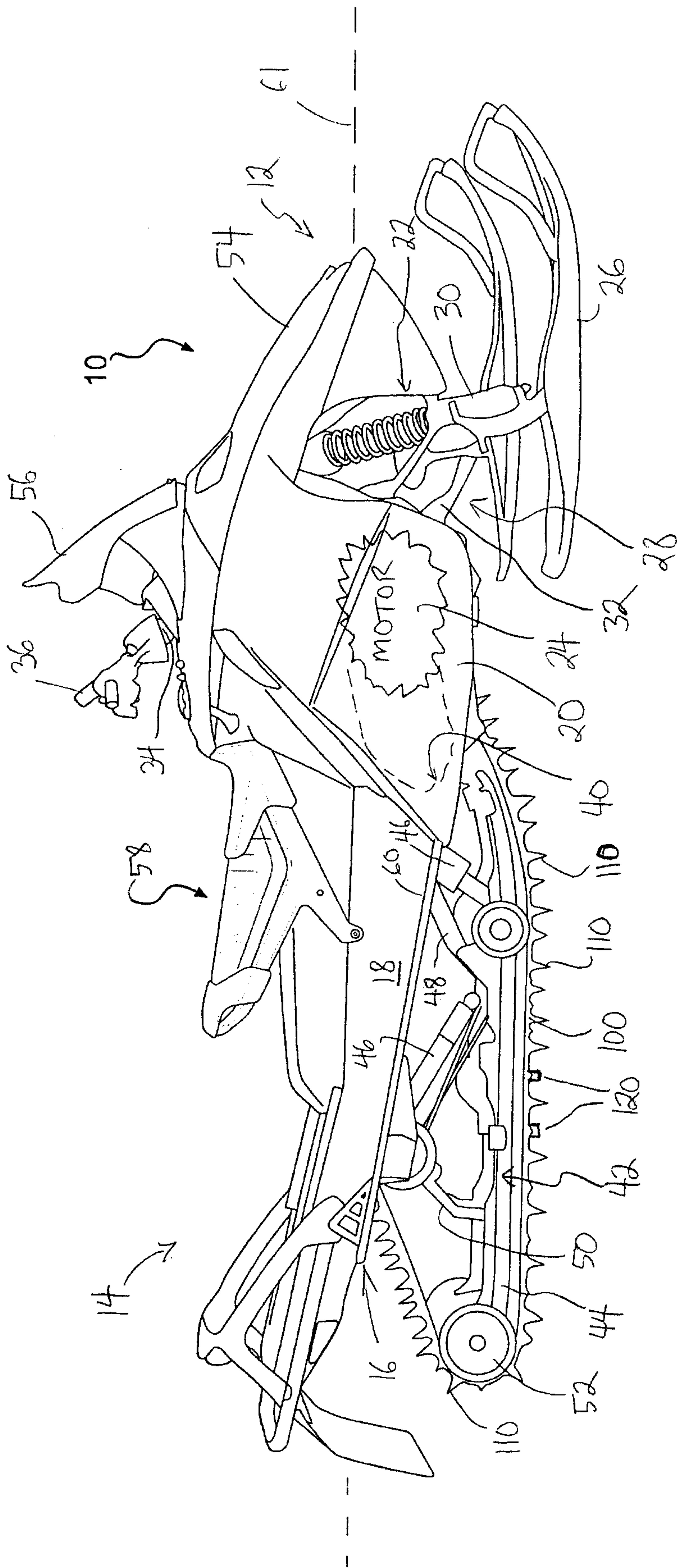


FIG. 1

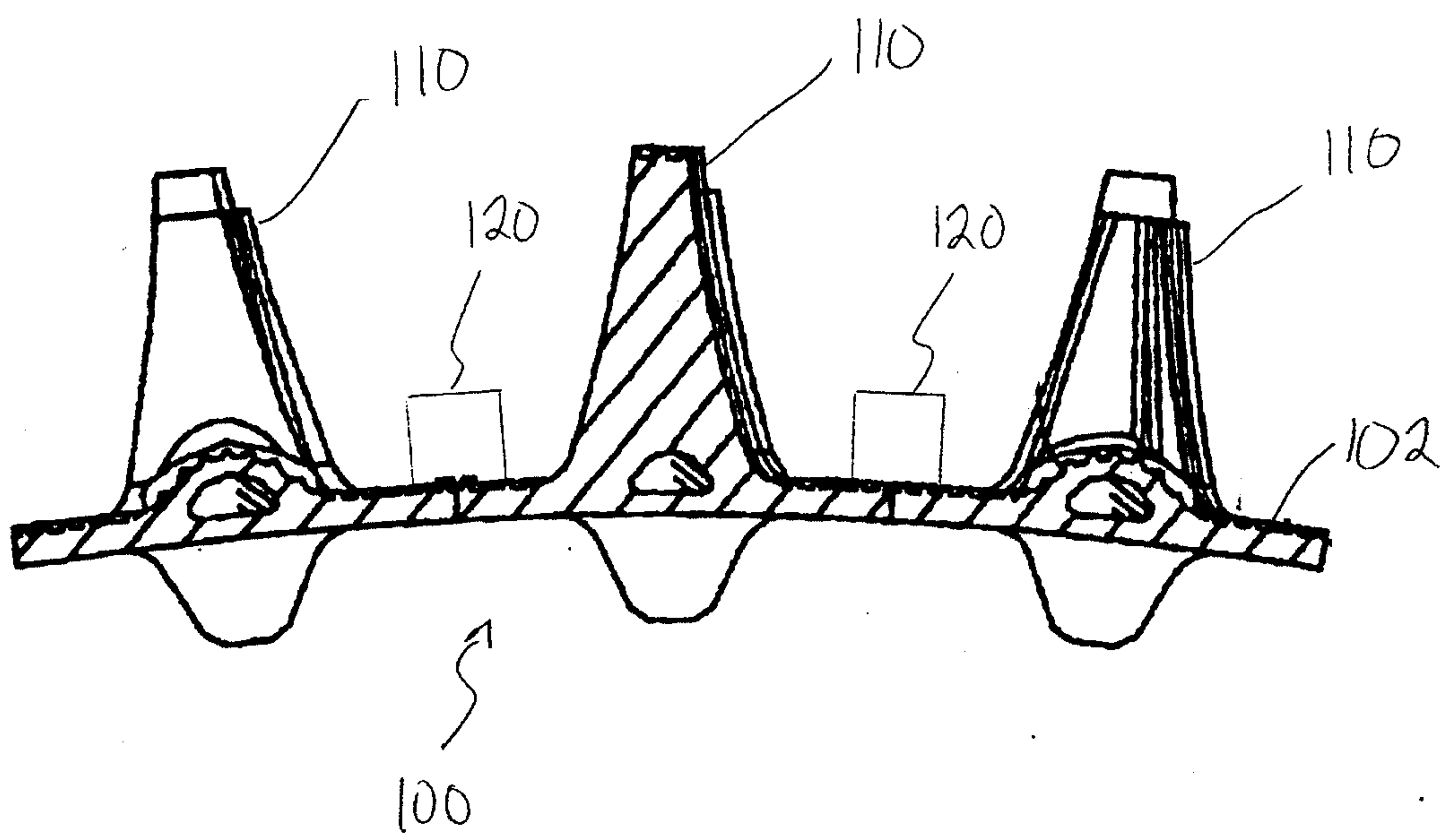


FIG. 5

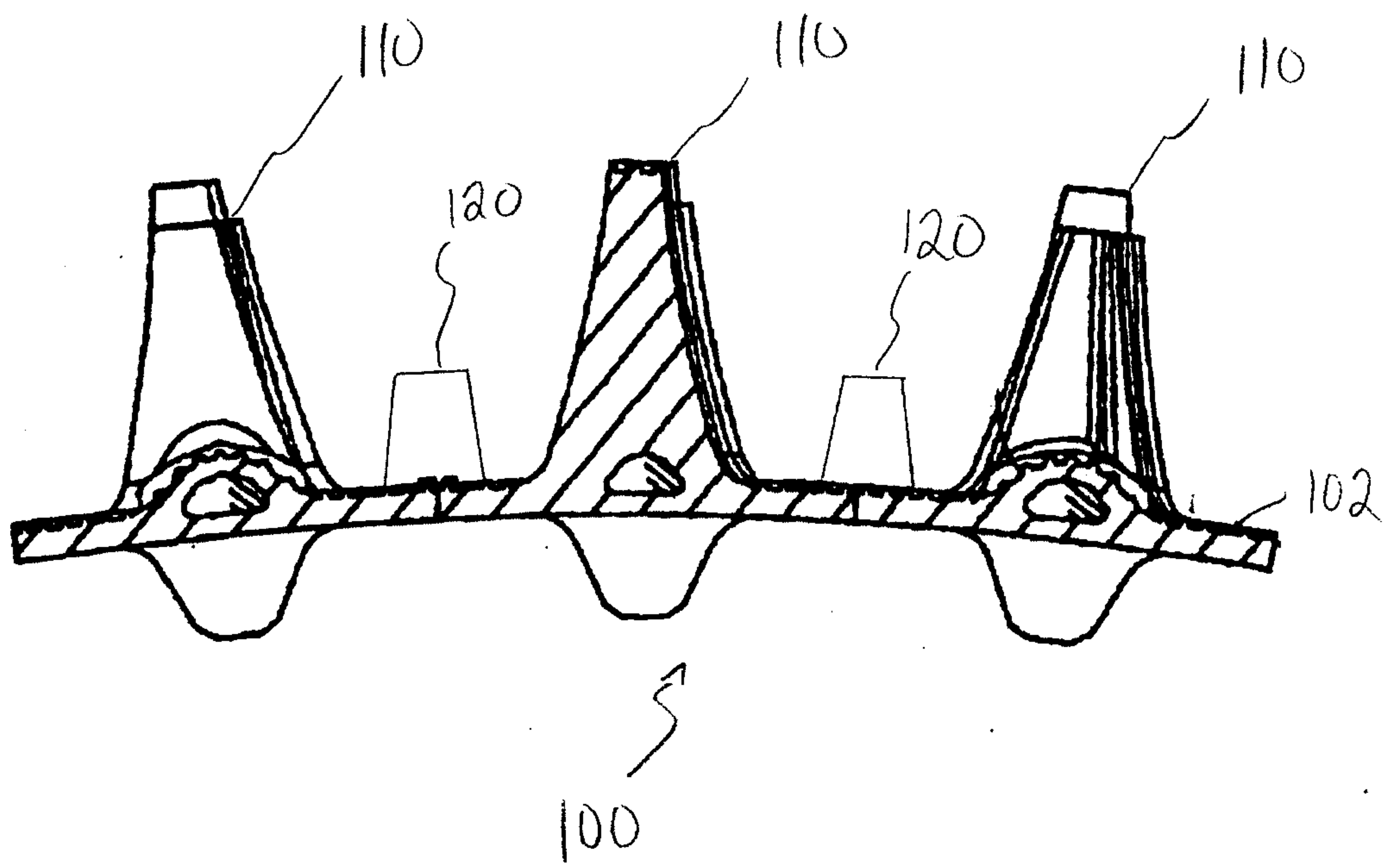


FIG. 6

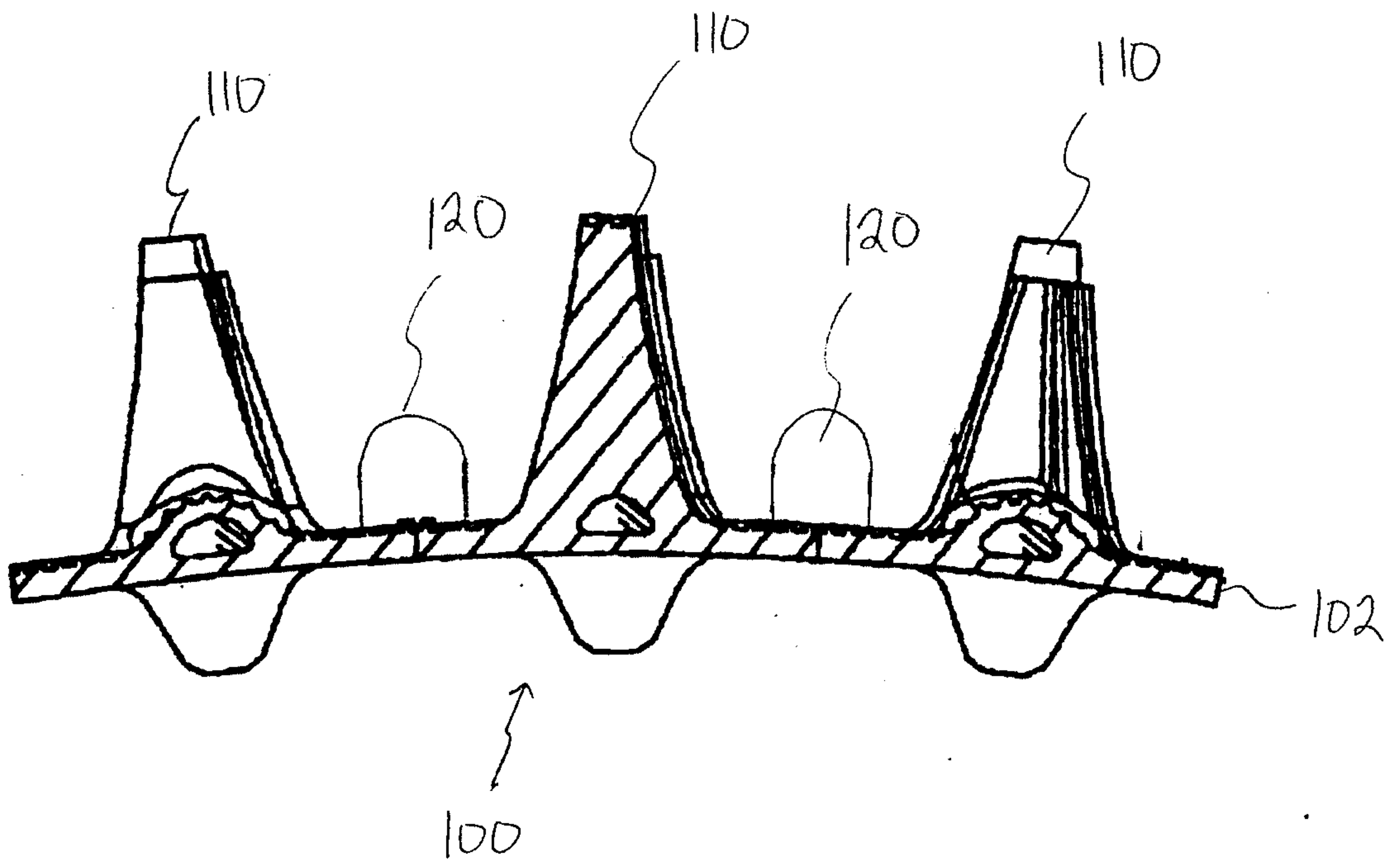


FIG. 7

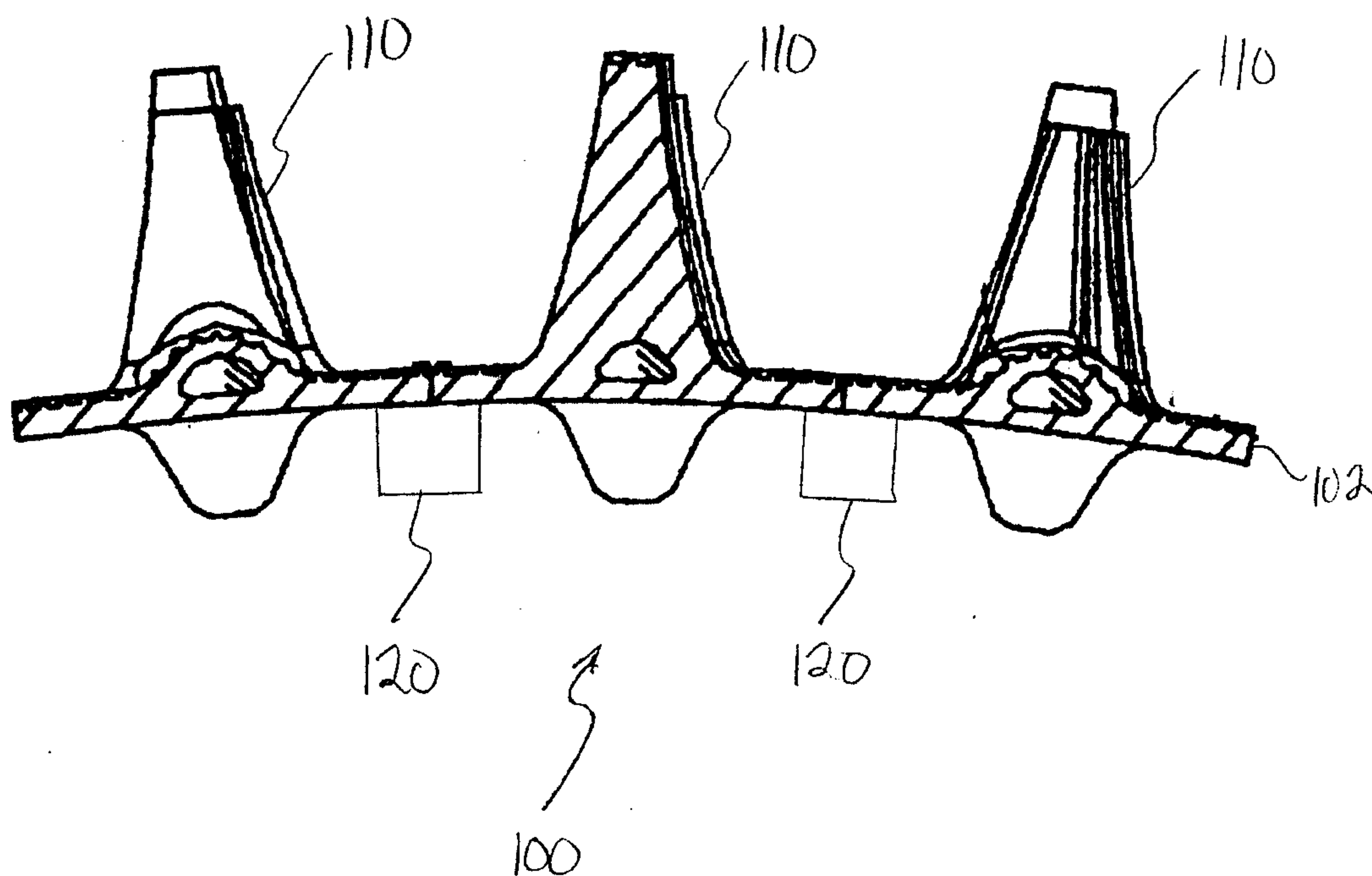


FIG. 8