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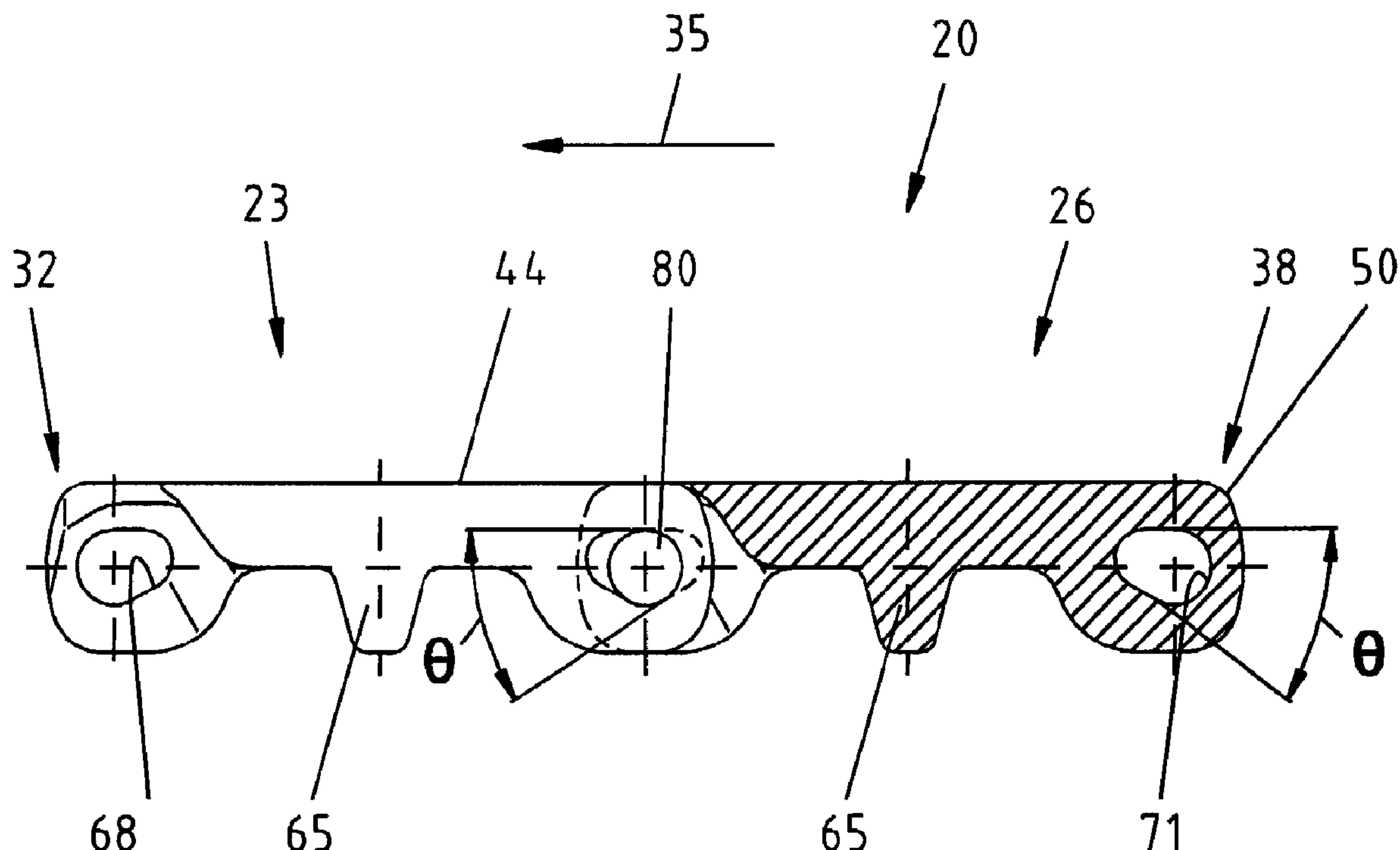
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(54) Title: BELT MODULE WITH OBLONG PIVOT HOLE



(57) Abrégé/Abstract:

A modular conveyor belt (20) is formed of rows of belt modules (23, 26) pivotally interlinked by transverse pivot rods (80). The modules (23, 26) include a top, product conveying surface (44) and a bottom, sprocket-driven surface. The belt modules (23, 26) have a plurality of first link ends (32) disposed in the direction of travel (35) of the conveyor belt and a plurality of second link ends (38) disposed in the opposite direction. Transverse holes (68, 71) in the link ends (32, 38) are aligned to accommodate a pivot rod (80). When the link ends (32, 38) of the consecutive rows of side by side modules (23, 26) are intercalated, the pivot rod (80) serves as a hinge pin in a hinged joint between consecutive interlinked rows. The transverse holes (68, 71) are disposed at an angle (θ) relative to the top surface (44) of the belt module (23, 26) such that when the belt modules (23, 26) are connected to form a belt (20) the transverse holes (68, 71) in adjacent link ends (32, 38) are disposed at opposite angles (θ).

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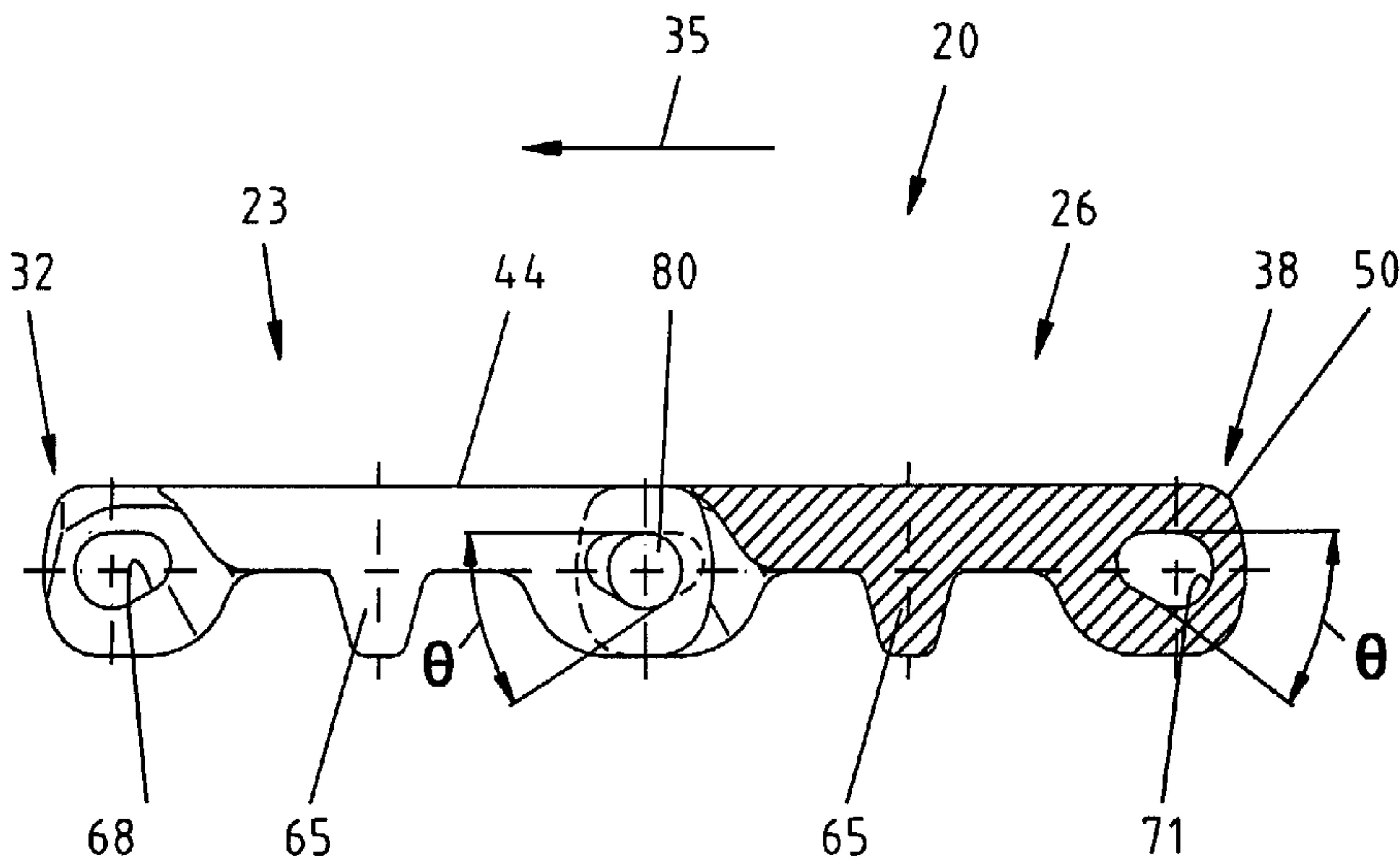
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(54) Title: BELT MODULE WITH OBLONG PIVOT HOLE

(57) Abstract: A modular conveyor belt (20) is formed of rows of belt modules (23, 26) pivotally interlinked by transverse pivot rods (80). The modules (23, 26) include a top, product conveying surface (44) and a bottom, sprocket-driven surface. The belt modules (23, 26) have a plurality of first link ends (32) disposed in the direction of travel (35) of the conveyor belt and a plurality of second link ends (38) disposed in the opposite direction. Transverse holes (68, 71) in the link ends (32, 38) are aligned to accommodate a pivot rod (80). When the link ends (32, 38) of the consecutive rows of side by side modules (23, 26) are intercalated, the pivot rod (80) serves as a hinge pin in a hinged joint between consecutive interlinked rows. The transverse holes (68, 71) are disposed at an angle (θ) relative to the top surface (44) of the belt module (23, 26) such that when the belt modules (23, 26) are connected to form a belt (20) the transverse holes (68, 71) in adjacent link ends (32, 38) are disposed at opposite angles (θ).

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BELT MODULE WITH OBLONG PIVOT HOLE

5 FIELD OF INVENTION

This invention relates to conveyor belts and, more particularly, to modular plastic conveyor belts formed of rows of plastic belt modules pivotally interlinked by 10 transverse pivot rods.

BACKGROUND OF THE INVENTION

Because they are lightweight, do not corrode, and are 15 easy to clean, unlike metal conveyor belts, plastic conveyor belts are used widely, especially in conveying food products. Modular plastic conveyor belts are made up of molded plastic modular links, or belt modules, that can be arranged side by side in rows of selectable 20 width. A series of spaced apart link ends extending from each side of the modules include aligned apertures or holes to accommodate a pivot rod. The link ends along one end of a row of modules are interconnected with the link ends of an adjacent row. A pivot rod 25 journaled in the aligned apertures of the side-by-side and end-to-end connected modules forms a hinge between adjacent rows. Rows of belt modules are connected together to form an endless conveyor belt capable of articulating about a drive sprocket.

30

In order to avoid having parts of the goods that are to be conveyed, such as food particles, from entering into the apertures or holes in the link ends and contacting the pivot rods, which can cause unsanitary conditions,

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modular flat top conveying belts are typically designed such that when they are rectilinear, they form a totally continuous, planar conveying surface. Typically, the link ends are narrow and in an assembled conveyor belt,

5 the interconnected link ends completely enclose the pivot rods where they pass through the link ends. Having large portions of the pivot rods fully enclosed at all times by the link ends prevents thorough cleaning of both the pivot rods and their apertures or holes,

10 unless the conveying belt is dismantled.

A conveyor belt constructed of modules designed such that the pivot rods and the link end apertures or holes can be cleaned without dismantling the belt is disclosed

15 in US-B-6 305 530 assigned to Habasit AG, which is the assignee of the present invention, and is incorporated herein by reference.

While the belt module shown in US-B-6 305 530 leaves

20 open space on the side of the rod to allow access for cleaning fluid, the design reduces the link thickness above the oblong hole. This reduction in thickness may weaken the link and therefore limit the length of the oblong hole that is possible. Accordingly, there is a

25 need for a design that provides open space on the side of the rod but does not significantly weaken the link.

SUMMARY OF THE INVENTION

30 This object is achieved by the belt module according to independent Claim 1 and the modular belt according to

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independent Claim 8. Preferred embodiments are defined in the dependent claims.

The present invention meets the above-described need by 5 providing an endless conveyor belt formed of plastic belt modules having pivot holes in their link ends that are disposed at an angle relative to the plane defined by the top surface of the belt module. In comparison with a completely round hole, the shape of the angled, 10 oblong pivot holes do not reduce the thickness of the module between the pivot holes and the top surface of the module. Therefore the pivot holes of the present invention do not significantly weaken the module and can be extended lengthwise to provide a larger opening for 15 cleaning.

The modules include first and second module surfaces, i.e., a top, product-conveying surface and a bottom, sprocket-driven surface. An intermediate section 20 extends between the first and second module surfaces and across each module transverse to the direction of belt travel. The intermediate section supports a first plurality of link ends at one end and supports a second plurality of link ends at the opposite end. Elongate 25 transverse holes are disposed in the link ends and are aligned to accommodate a pivot rod. When the link ends of consecutive rows of side-by-side modules are intercalated, the pivot rod serves as a hinge pin in a hinged joint between consecutive interlinked rows.

30

The belt is driven by engagement of the teeth on a

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sprocket as known to those of ordinary skill in the art to which the invention pertains.

In an assembled conveyor belt, adjacent belt modules 5 align with each other such that the transverse holes in the adjacent link ends are angled in opposite directions. As a result, the pivot rod is captured by the respective holes in an overlapping area so that the pivot rod is confined to a portion of each of the 10 elongate holes and is not free to move along the entire length of either of the holes. The cooperation of the adjacent angled holes prevents translatory motion of the pivot rod, and provides access to the transverse hole and to the pivot rod for cleaning. Accordingly, the 15 present design provides for greater access to the inside of the transverse holes and to the pivot rods for better cleaning and easier maintenance. The enhancement is provided without introducing any undesirable translatory motion or "play" in the belt.

20

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated in the drawings in which like reference characters designate the same or similar 25 parts throughout the figures of which:

FIG. 1 is a side elevational view of a prior art belt module;

30 FIG. 2 is a top plan view of an embodiment of a belt module of the present invention;

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FIG. 3 is a bottom plan view of the belt module of FIG. 2;

5 FIG. 4 is a side elevational view of an embodiment of a belt module according to the present invention; and,

10 FIG. 5 is a side elevational view of an embodiment of a belt of the present invention showing two belt modules with link ends intercalated.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In Fig. 1, a prior art module is shown, a curved portion 147 of a link end 132 is shown at one end of the figure and at the opposite end of the figure a curved surface 150 at the end of a second link end 138 is shown. Also, first and second elongate transverse holes 168, 171 are shown. The transverse holes 168, 171 have longitudinal axes 174 and 177 respectively. The transverse holes 168, 171 are preferably elongate and oval-shaped. The transverse hole 168 is angled at an angle α which is 10° to 80° relative to the horizontal axis defined by top surface 144. The preferred embodiment provides for an angle α of approximately 45° . The transverse hole 171 on the opposite end of the module is rotated by approximately 90° such that it is disposed at an angle β approximately 100° to 170° to the top surface 144. The preferred embodiment for the second hole 171 is an angle β of approximately 135° . As shown, the shape of holes 168 and 171 being elongate and extending at a 45° angle

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with respect to the top surface 144 results in a reduction in the distance D between the top of hole 168 and top surface 144. This reduction may weaken the module as discussed above.

5

Referring to FIGS. 2 to 5 generally and initially to FIG. 5, a flat top modular belt 20 of the present invention is formed from interconnected belt modules 23 and 26. Although the belt 20 is shown with two modules 10 23, 26, the belt 20 may include several modules in order to provide belts 20 having different widths. Also, each module does not have to be the same width, and the belt can be formed by arranging the modules 23, 26 in "bricklayered" fashion as will be evident to those of 15 ordinary skill in the art.

Referring to FIG. 2, belt module 23 is preferably formed out of plastic or other material suitable for food handling which is lightweight, does not corrode, and may 20 be easily cleaned. The belt module 23 is preferably thermoformed out of a plastic resin raw material as known to those of ordinary skill in the art. The module 23 has an intermediate section 29 that supports a first set of link ends 32 disposed in the direction of belt 25 travel indicated by arrow 35. The direction of belt travel is provided for reference only as the belt 20 of the present invention may be driven in either direction. The link ends 32 have opposed side walls 33 providing a first transverse thickness 34. The transverse thickness 30 34 is connected to the intermediate section 29 at a proximal portion 36 and extends from the intermediate

section 29 in a direction of belt travel to a first distal portion 41.

The intermediate section 29 also supports a second set 5 of link ends 38 that are disposed in the opposite direction from the first set of link ends 32. The second link ends 38 also have opposed walls 43 defining a transverse thickness 49 and extending from a proximal portion 45 to a distal portion 48. The spaces 39 10 between successive link ends 32, 38 are sized so as to accept a link end 32, 38 from an adjacent belt module (best shown in FIG. 5). The intermediate section 29 and portions 40, 42 of the link ends 32, 38, respectively, are coplanar along the top surface 44 such that the top 15 surface 44 is substantially flat when adjacent modules 23, 26 are connected. The ends 47, 50 of the link ends 32, 38 are curved to fit into the curved section 53 (best shown in FIG. 4) formed along portions of the edge 59 of the intermediate section 29. Accordingly, when 20 the belt 20 is assembled with pivot rods as described hereafter, the top surface 44 is substantially flat and the gaps, which are located between modules and where food parts can enter the belt 20, are minimized.

25 As shown in FIG. 3, the bottom surface 62 of the belt module 23 has a stiffening web 65 disposed along the center of the module 23. The stiffening web 65 provides structural rigidity to the module 23 and also may be used for a contact point for the sprocket (not shown) 30 that drives the belt 20 from below. As known to those of ordinary skill in the art, a drive sprocket may

engage the link ends 32, 38 or the web 65 to drive the belt 20 from below. The modules 23, 26 are connected end to end as shown in FIG. 5 and are combined with other modules to form an endless belt that is driven and 5 guided by drive sprockets and idler sprockets (not shown) as known to those of ordinary skill in the art.

As shown in FIG. 3, the curved portion 53 of the intermediate section 29 is disposed adjacent to the 10 spaces 39 between the link ends 32, 38 to accept the curved portions 47, 50 of the link ends 32, 38.

Turning to Fig. 4, a module 23 has a top surface 44 disposed along an axis 200. Link ends 32, 38 extend in 15 opposite directions with respect to axis 200. Stiffening web 65 extends downward relative to the top surface 44 and is disposed along a central longitudinal axis of the module 23 disposed normal to the page.

20 Link end 32 is provided with a pivot hole 68 capable of receiving pivot rod 80 as shown in Fig. 5. The pivot hole 68 has an upper wall 203 disposed along an axis 206. Upper wall 203 is substantially straight and is disposed substantially parallel to the top surface 44. 25 The pivot hole 68 also has a substantially straight wall 209 that is disposed along axis 212 which is disposed at an angle θ with respect to upper wall 203. The angle θ is acute and in the example shown is approximately thirty degrees. Walls 203 and 209 are connected at 30 opposite ends by curved portions 215 and 218. Curved portion 215 is shorter in length than curved portion 218

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because of the angle between the two walls 203 and 209. Accordingly, because of the angle between the walls, pivot hole 68 has an overall shape that resembles a cone. The distance D_2 between the upper wall 203 and the 5 top surface 44 is the same as for a standard module having a fully round pivot hole.

The pivot holes 68, 71 have a rod receiving portion 72 indicated by broken lines in the figures. The rod 10 receiving portion is disposed adjacent to curved wall 218. From the rod receiving portion 72 to the opposite end where curved wall 215 is located the holes 68, 71 become narrower such that the pivot rod 80 is not capable of translatory motion when adjacent modules are 15 intercalated.

With reference to the right hand side of Fig. 4, pivot hole 71 is a mirror image of pivot hole 68. When the modules 23 and 26 are intercalated as shown in Fig. 5, 20 the holes 68 and 71 from adjacent modules overlap to form a substantially round portion that receives the pivot rod 80. The remaining portions of the pivot holes 68 and 71 provide access to the pivot rod 80 for cleaning.

25

Referring to Fig. 5, when the modules 23, 26 are intercalated, the pivot rod 80 is captured in the area of overlap of the adjacent holes 68, 71 and is not allowed to travel along the length of the elongated 30 holes 68, 71. In this manner and even though the angled holes 68, 71 are elongate, the link ends 32, 38 are

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fixed relative to each other and are not capable of translatory movement relative to each other. The link ends 32, 38 are only capable of rotating about the pivot rod 80 relative to each other. Accordingly, there is a 5 very small, if any, amount of "play" in the direction of belt travel 35 or the opposite direction, and the modules 23, 26 cannot make translatory motion relative to one another.

10 Accordingly, because the angled transverse holes 68, 71 are oversized and elongate relative to the pivot rod 80, there is much greater access to the transverse holes 68, 71 and to the pivot rod 80 in comparison to conventional transverse holes. Accordingly, the belt 20 of the 15 present invention is easier to clean without disassembling the belt. The link ends 32, 38 provide a gap, leaving the pivot rod 80 exposed from the bottom side of the module, whereas it remains totally closed from the top side. During cleaning operation 20 pressurized cleaning fluid such as water spray may easily enter the gap from the bottom of the module and reach the exposed pivot rod 80 through the enlarged holes 68, 71. Further, the transverse holes 68, 71 allow the fluid to enter from the side of the link and 25 get access to the pivot rod also inside of the holes 68, 71.

While the invention has been described in connection with certain preferred embodiments, it is not intended 30 to limit the scope of the invention to the particular forms set forth, but, on the contrary, it is intended to

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cover such alternatives, modifications, and equivalents as may be included within the scope of the invention as defined by the appended claims.

CLAIMS

1. Belt module (23, 26), comprising:
 - 5 (a) an intermediate section (29) having a top surface (44);
 - (b) a first plurality of link ends (32), each having opposed side walls (33) providing the first link ends (32) with a first transverse thickness (34) connected to the intermediate section (29) at a first proximal portion (36) and extending from the intermediate section (29) in a direction of belt travel (35) to a first distal portion (41), wherein the first link ends (32) each have a first pivot hole (68) through 15 the thickness (34) between and to the opposed side walls (33);
 - (c) a second plurality of link ends (38), each having opposed side walls (43) providing the second link ends (38) with a second transverse thickness (49) connected to the intermediate section (29) at a second proximal portion (45) and extending from the intermediate section (29) in a direction opposite to the first link ends (32) to a second distal portion (48), wherein the second link ends (38) each have a second 20 pivot hole (71) through the thickness (49) between and to the opposed side walls (43), and wherein the second link ends (38) are offset from the first link ends (32) such that adjacently positioned belt modules (23, 26) are capable of being intercalated so that the first link 25 ends (32) of one belt module (26) fit into spaces defined between the second link ends (38) of an adjacent 30

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belt module (23);

characterized in that

the first pivot hole (68) is formed from a first wall (203) disposed substantially parallel to the top surface (44) and a second wall (209) disposed at an acute angle (θ) to the first wall (203), the first and second walls (203, 209) being connected to each other by first and second curved walls (215, 218) disposed at opposite ends of the first pivot hole (68);

10 the second pivot hole (71) is formed from a third wall disposed substantially parallel to the top surface (44) and a fourth wall disposed at a second acute angle (θ) to the third wall, the third and fourth walls being connected to each other by third and fourth curved walls 15 disposed at opposite ends of the second pivot hole (71), the first and second acute angles (θ) being reflective,

wherein the first and second pivot holes (68, 71) have a rod receiving portion (72) disposed adjacent to the second curved wall (218), the first and second pivot 20 holes (68, 71) becoming narrower from the rod receiving portion (72) in a direction away from the rod receiving portion (72) toward the first curved wall (215).

2. Belt module (23, 26) according to Claim 1, wherein 25 the intermediate section (29) has a stiffening web (65) disposed thereon.

3. Belt module (23, 26) according to Claim 2, wherein the stiffening web (65) is disposed on a side of the 30 belt module (23, 26) opposite from the top surface (44).

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4. Belt module (23, 26) according to anyone of Claims 1 to 3, wherein the first and second acute angles (θ) are approximately thirty degrees.

5 5. Belt module (23, 26) according to anyone of Claims 1 to 4, wherein the first and second pivot holes (68, 71) are disposed at acute angles with respect to the top surface (44).

10 6. Belt module (23, 26) according to anyone of Claims 1 to 5, wherein the first and second pivot holes (68, 71) have an overall shape resembling a cone.

15 7. Belt module (23, 26) according to anyone of Claims 1 to 6, wherein the first and second pivot holes (68, 71) overlap such that a substantially round portion (72) of each pivot hole (68, 71) is placed in registry when adjacent modules (23, 26) are intercalated.

20 8. Modular belt (20), comprising:

(a) a plurality of belt modules (23, 26), each having an intermediate section (29) having a top surface (44), a first plurality of link ends (32), each having opposed side walls (33) providing the first link ends (32) with a first transverse thickness (34) connected to the intermediate section (29) at a first proximal portion (36) and extending from the intermediate section (29) in a direction of belt travel (35) to a first distal portion (41), wherein the first link ends (32) each have a first pivot hole (68) through the thickness (34) between and to the opposed side walls (33); and a

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second plurality of link ends (38), each having opposed side walls (43) providing the second link ends (38) with a second transverse thickness (49) connected to the intermediate section (29) at a second proximal portion (45) and extending from the intermediate section (29) in a direction opposite to the first link ends (32) to a second distal portion (48), wherein the second link ends (38) each have a second pivot hole (71) through the thickness (49) between and to the opposed side walls (43), and wherein the second link ends (38) are offset from the first link ends (32) such that adjacently positioned belt modules (23, 26) are capable of being intercalated so that the first link ends (32) of one belt module (26) fit into spaces defined between the 15 second link ends (38) of an adjacent belt module (23); and,

(b) a pivot rod (80) disposed through the first and second pivot holes (68, 71) in the first and second link ends (32, 38) of adjacent belt modules (23, 26);
20 characterized in that

the first pivot hole (68) is formed from a first wall (203) disposed substantially parallel to the top surface (44) and a second wall (209) disposed at an acute angle (θ) to the first wall (203), the first and 25 second walls (203, 209) being connected to each other by first and second curved walls (215, 218) disposed at opposite ends of the first pivot hole (68);

the second pivot hole (71) is formed from a third wall disposed substantially parallel to the top surface 30 (44) and a fourth wall disposed at a second acute angle (θ) to the third wall, the third and fourth walls being

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connected to each other by third and fourth curved walls disposed at opposite ends of the second pivot hole (71), the first and second acute angles (θ) being reflective, wherein the first and second pivot holes (68, 71) have a rod receiving portion (72) disposed adjacent to the second curved wall (218), the first and second pivot holes (68, 71) becoming narrower from the rod receiving portion (72) in a direction away from the rod receiving portion (72) toward the first curved wall (215).

10 9. Modular belt (20) according to Claim 8, wherein the intermediate section (29) has a stiffening web (65) disposed thereon.

15 10. Modular belt (20) according to Claim 9, wherein the stiffening web (65) is disposed on a side of the belt module (23, 26) opposite from the top surface (44).

20 11. Modular belt (20) according to anyone of Claims 8 to 10, wherein the first and second acute angles (θ) are approximately thirty degrees.

25 12. Modular belt (20) according to anyone of Claims 8 to 11, wherein the first and second pivot holes (68, 71) are elongated.

30 13. Modular belt (20) according to anyone of Claims 8 to 12, wherein the first and second pivot holes (68, 71) are disposed at acute angles with respect to the top surface (44).

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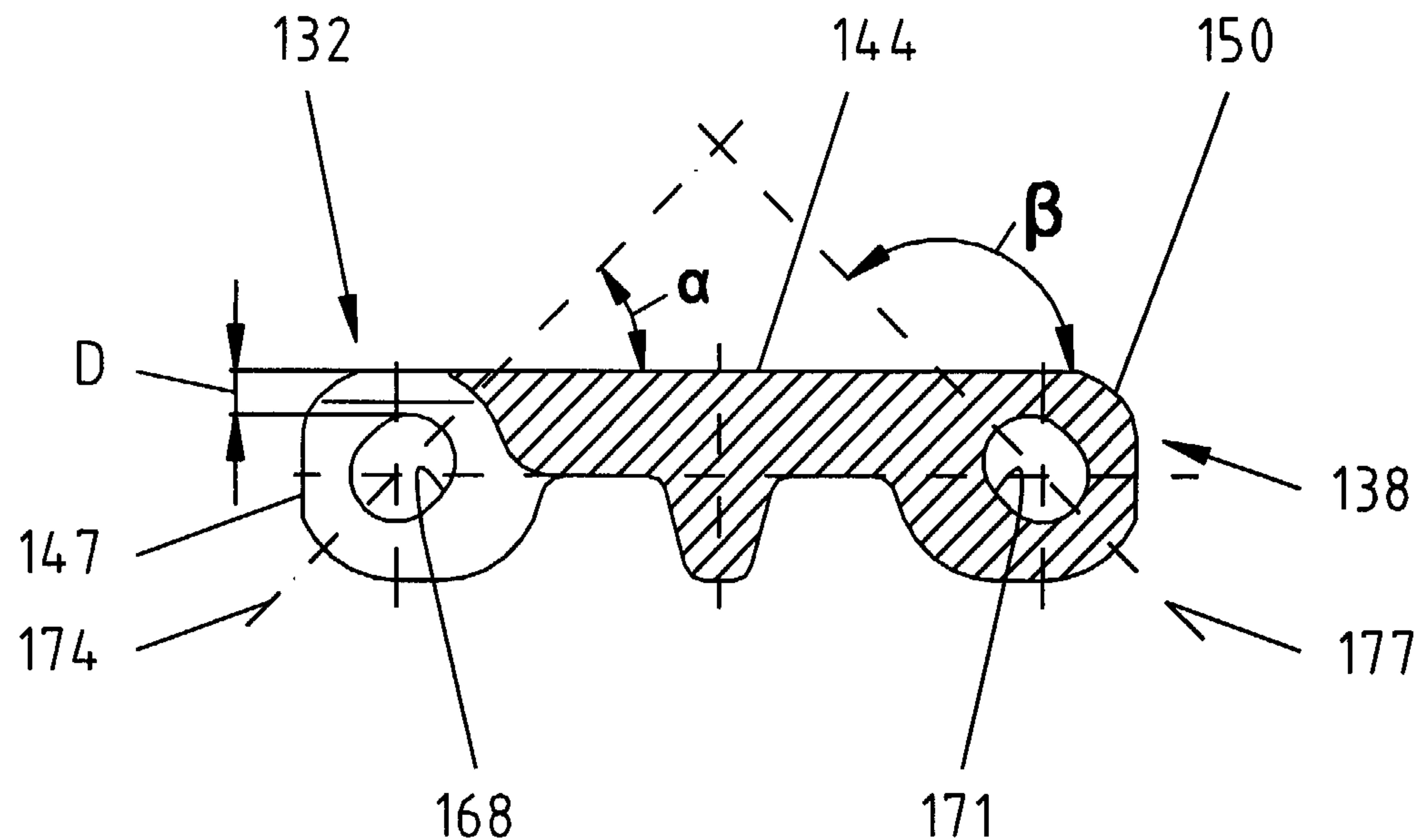
14. Modular belt (20) according to anyone of Claims 8 to 13, wherein the first and second pivot holes (68, 71) have an overall shape resembling a cone.

5 15. Modular belt (20) according to anyone of Claims 8 to 14, wherein the first and second pivot holes (68, 71) overlap such that a substantially round portion (72) of each pivot hole (68, 71) is placed in registry when adjacent modules (23, 26) are intercalated.

10

16. Modular belt (20) according to anyone of Claims 8 to 15, wherein the plurality of modules (23, 26) are arranged in bricklayed fashion.

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PRIOR ART

FIG. 1

ERSATZBLATT (REGEL 26)

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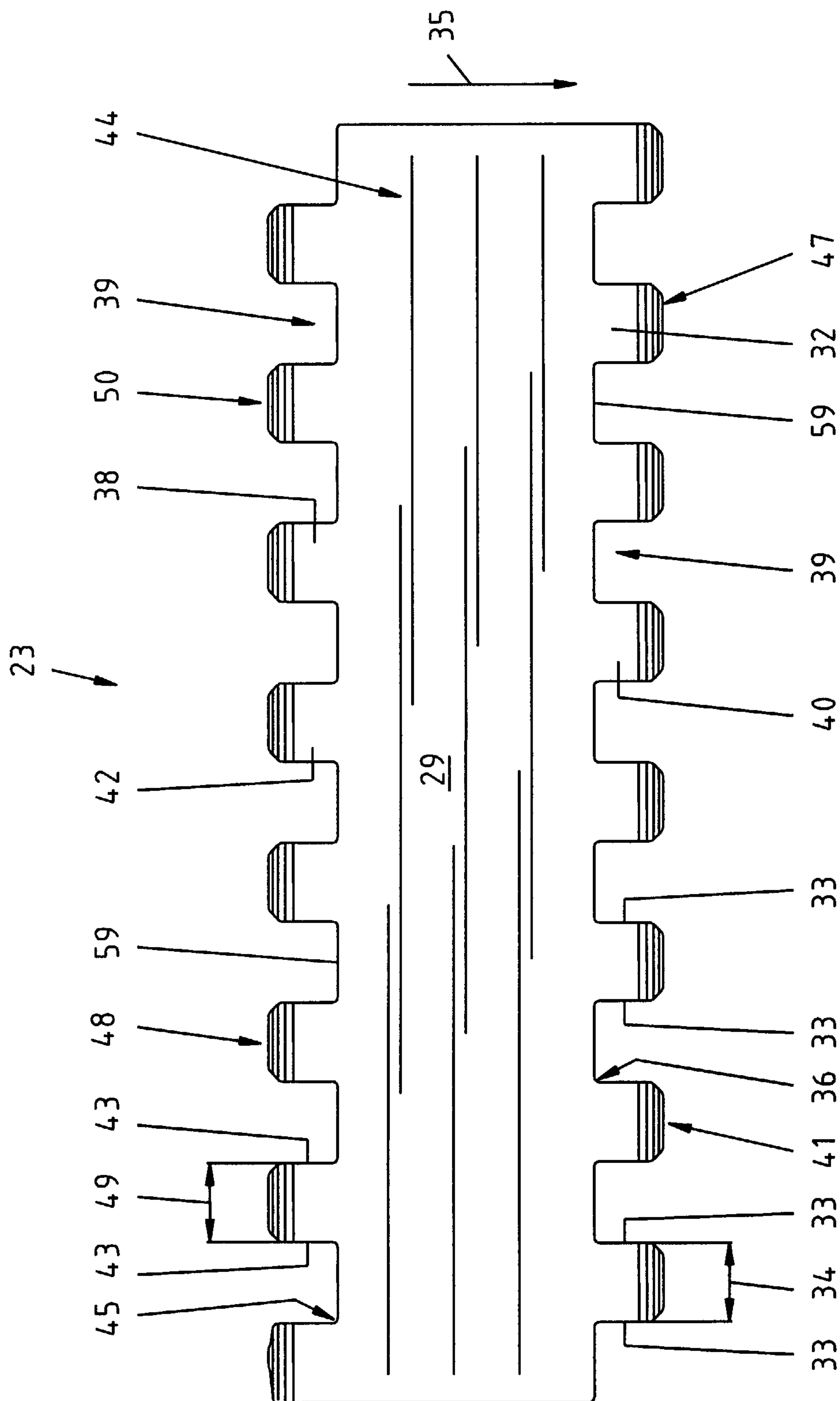


FIG. 2

ERSATZBLATT (REGEL 26)

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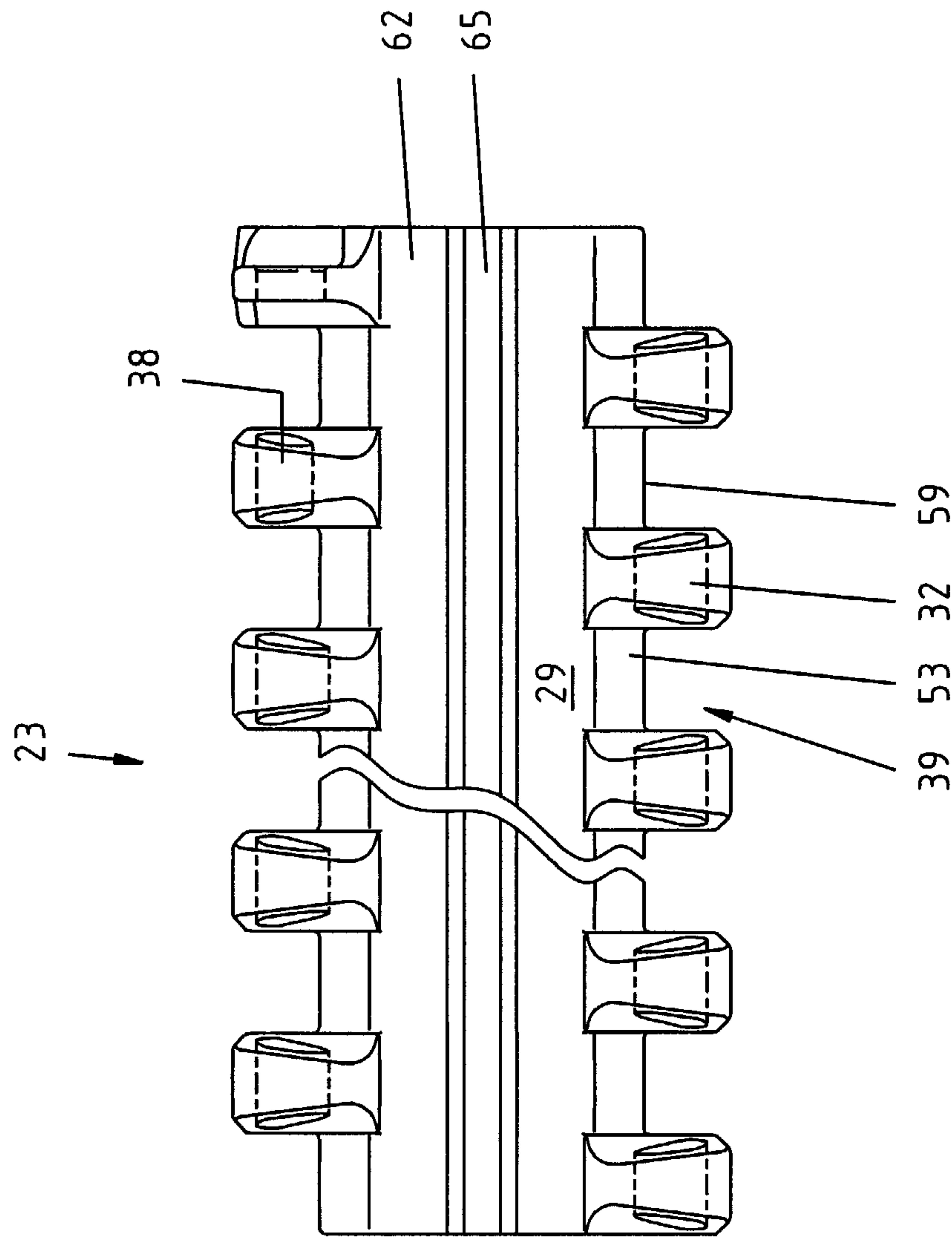


FIG. 3

ERSATZBLATT (REGEL 26)

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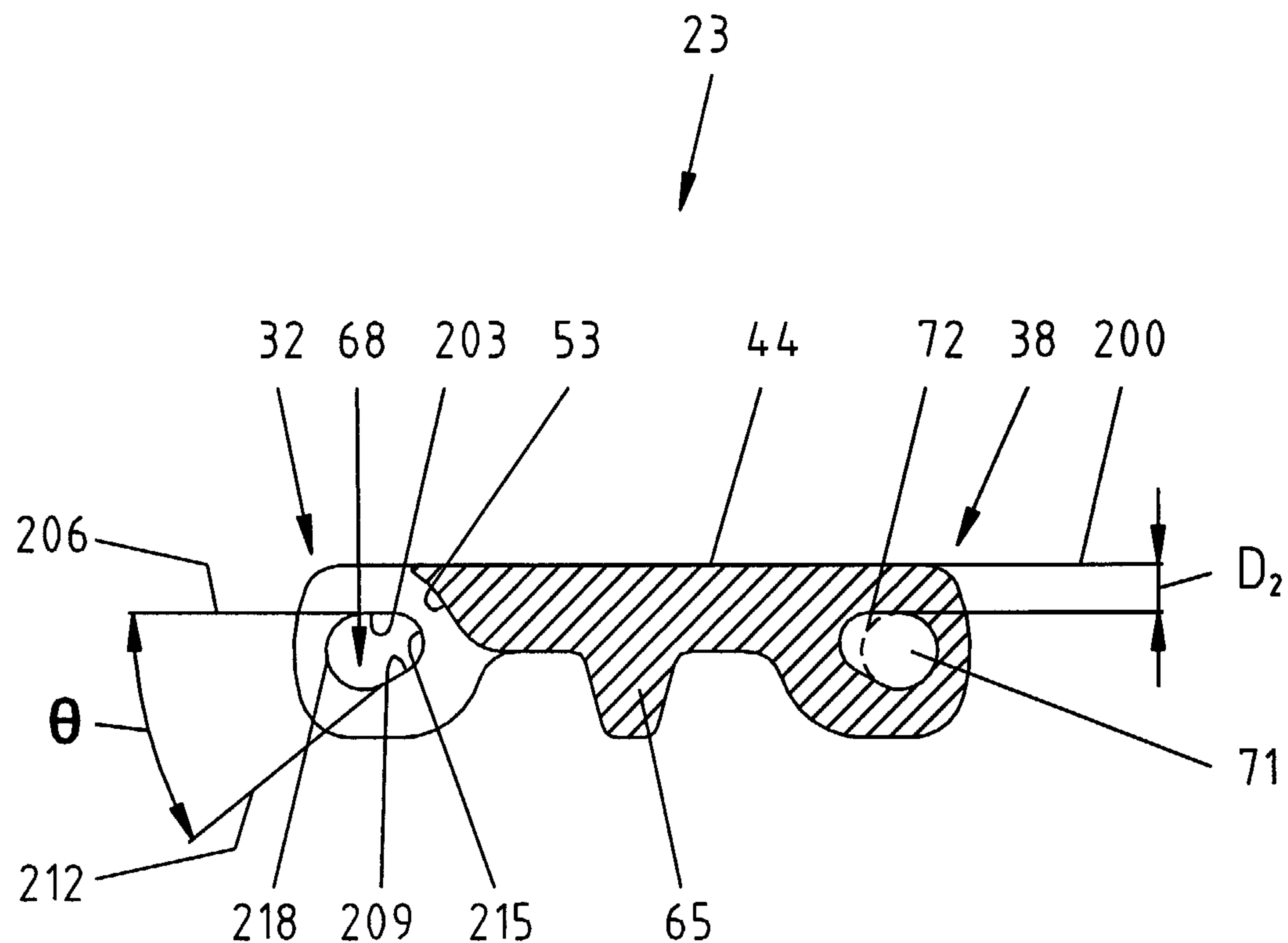


FIG. 4

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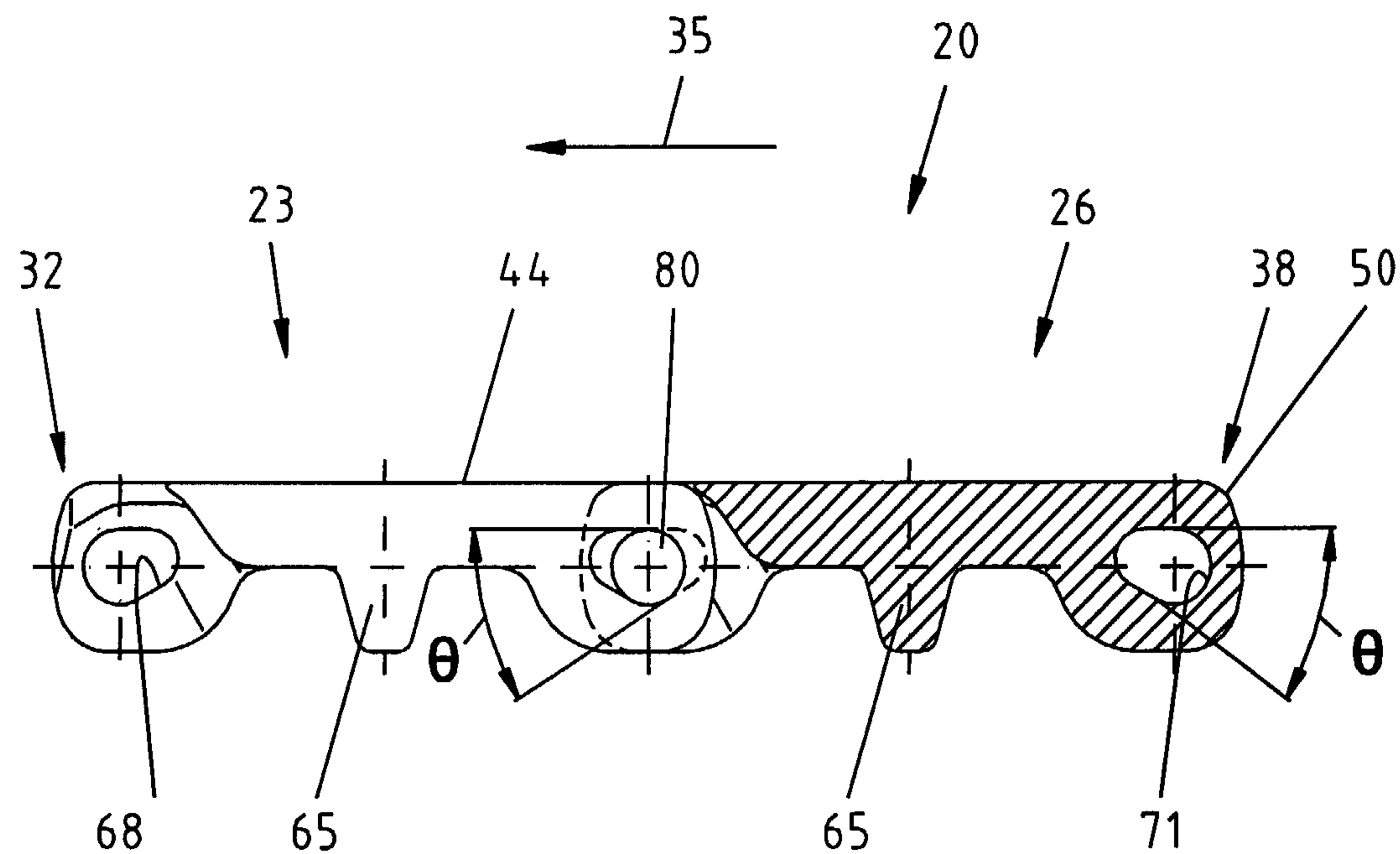


FIG. 5

ERSATZBLATT (REGEL 26)

