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(54) **Title**: TRACK ASSEMBLY HAVING WEAR INHIBITING CONTACT MEMBERS

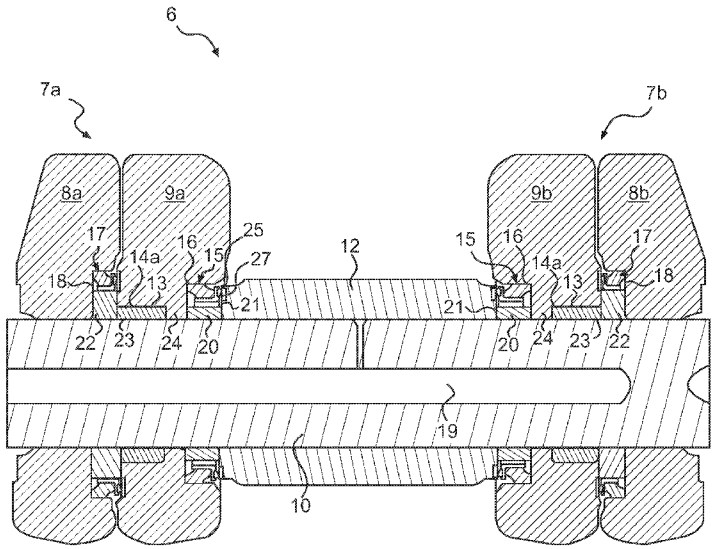

FIG. 2

(57) **Abstract**: A track assembly for a track-type machine is disclosed. The track assembly includes inner and outer track links. A rotatable bushing is positioned about a track pin and a sleeve bearing is positioned about the track pin. A first seal member is disposed between an inner track link and the rotatable bushing and a second seal member is disposed between inner and outer track links. A first thrust ring is engaged with the rotatable bushing and a second thrust ring is engaged with the sleeve bearing. A first contact member is engaged with the first seal member and a second contact member is engaged with the second seal member. The first and second contact members are configured to inhibit wear of the first and second seal members.

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Description

TRACK ASSEMBLY HAVING WEAR INHIBITING CONTACT MEMBERS

Technical Field

The present disclosure is directed to a track assembly, and more particularly, to a track assembly having wear inhibiting contact members.

Background

Track-type or crawler-type machines may be employed in construction, mining, oil, gas, and forestry operations, and in other rugged operating environments. These machines employ tracks which engage the ground and enable the machine to move about and over relatively rough terrain. Typical track designs include a track pin, either rotatably engaged or fixed to a pair of track chain assemblies, and a bushing rotatably positioned between the track chain assemblies. The tracks may operate in adverse environments in which track joints may be exposed to various abrasive mixtures of water, dirt, sand, rock, and/or chemical elements and to wide temperature ranges varying from high heat in deserts to extreme cold in arctic regions. Seals may be placed in the track joints in a variety of configurations and positions to ensure that contaminants are effectively excluded and lubrication effectively retained.

Over the course of many hours of operation, the constant contact among the moving track components may result in significant wear, even where bearings and lubricating oil are used to reduce friction among the components. Galling and other wear related problems tend to be particularly prevalent with relatively large track-type machines, which may subject the track components to substantial loads. In particular, wear and galling of the seals and the track pins are problematic.

One method for improving the component life of track components is described in U.S. Patent No. 6,206,491 (the '491 patent) to Hisamatsu, issued on 27 March 2001. The '491 patent describes a crawler device comprising a pin and a stationary bush for connecting a right row of crawler links and a left row of crawler links, and a rotating bush outwardly fitted to the stationary bush in a freely rotatable manner. Support members are inserted to the right and left rows of the crawler links, a first seal is inserted between an outer end portion of each of the support members and the opposing crawler links, and a second seal is inserted between an inner end portion of each of the support members and both end portions of the opposing rotating bushes. A clearance of the first and second seals can maintain the initial value at assembly against an external force during an operation. The lubricating oil is sealed in the pin and does not leak from the first and second seals, so that the durability of the seals and crawler device are improved.

Although the crawler device of the '491 patent may improve the durability of some components of the crawler device, it may have limitations. For example, the first and second seals may still undergo wear even in the presence of lubricating oil. Contact between the seals and the crawler links may eventually wear down the seals, resulting in costly repairs and replacements.

The track assembly of the present disclosure is directed towards improvements to the existing technology.

Summary of the Disclosure

One aspect of the present disclosure is directed to a track assembly for a machine. The track assembly may include a track having a first chain assembly and a second chain assembly coupled with the first chain assembly via a track pin, the first and second chain assemblies including an inner track link and an outer track link. The track assembly may also include a rotatable bushing positioned about the track pin, a sleeve bearing disposed within a first bore of the inner track link and positioned about the track pin, a first seal member disposed

between the inner track link and the rotatable bushing, a second seal member disposed between the inner and outer track links, a first thrust ring positioned about the track pin and engaged with the rotatable bushing, a second thrust ring disposed about the track pin and engaged with the sleeve bearing, a first contact member engaged with the first seal member, and a second contact member engaged with the second seal member, the first and second contact members configured to inhibit wear of the first and second seal members.

Another aspect of the present disclosure is directed to a method of protecting components of a machine track assembly during operation, the machine track assembly including an outer track link, an inner track link, a track pin, a rotatable bushing positioned about the track pin, a first seal member disposed between the inner track link and the rotatable bushing, and a second seal member disposed between the inner and outer track links. The method may include disposing a sleeve bearing about the track pin. The method may also include protecting the first and second seal members at least in part by assembling a first thrust ring about the track pin and engaging the first thrust ring with the rotatable bushing, assembling a second thrust ring about the track pin and engaging the second thrust ring with the sleeve bearing, engaging a first contact member with the first seal member, and engaging a second contact member with the second seal member.

Brief Description of the Drawings

Fig. 1 is a side diagrammatic view of a portion of a track-type machine according to an exemplary disclosed embodiment;

Fig. 2 is a diagrammatic cross-section of a track assembly for a track-type machine according to an exemplary disclosed embodiment;

Fig. 3 is a diagrammatic cross-section of another embodiment of a track assembly for a track-type machine according to an exemplary disclosed embodiment;

Fig. 4 is a partial diagrammatic cross-section of a track assembly for a track-type machine according to an exemplary disclosed embodiment; and

Fig. 5 is a partial diagrammatic cross-section of another embodiment of a track assembly for a track-type machine according to an exemplary disclosed embodiment.

Detailed Description

A portion of machine 1 according to the present disclosure is shown in Fig. 1. Machine 1 is shown in the context of a track-type machine having a ground engaging track 2, mounted at a first side of a frame 3, and also including a second ground engaging track identical to track 2 and positioned at a second side of frame 3 but not shown in Fig. 1. Track 2 extends about a plurality of rotatable track engaging elements, including an idler 4 having an axis of rotation A, a drive sprocket 11 having an axis of rotation B, and a plurality of track rollers 5. Machine 1 may also include other rotatable track engaging elements coupled with each of its one or more tracks, such as an additional idler. While only a single track is shown in Fig. 1, the present description of track 2 and track assembly 6 of which it is a part should be understood to refer also to a second track and associated track assembly 6 of machine 1. While machine 1 may be a track-type machine such as a track loader, an excavator, a tractor, or another mobile machine, the present disclose is not thereby limited. In other embodiments, track assembly 6 may include a portion of a machine such as a conveyor. In all embodiments contemplated herein, track assembly 6 will be configured such that certain types of wear, for example, wear affecting track seals and track pins as described herein, will be reduced or eliminated as compared with current technology.

Track 2 will typically comprise two parallel track chain assemblies, one of which is shown in Fig. 1 and identified with reference numeral 7a, extending in parallel and coupled together via a plurality of track pins 10. In

the illustrated embodiment, chain assembly 7a may include a plurality of outer track links 8a alternating with a plurality of inner track links 9a.

Fig. 2 and Fig. 3 illustrate a sectioned portion of track assembly 6. A first chain assembly 7a, including inner track link 9a and outer track link 8a, may be positioned on track pin 10, as is a second chain assembly 7b, also including an inner track link 9b and an outer track link 8b. A rotatable bushing 12 may be positioned and rotate about track pin 10 and between inner track links 9a, 9b. A sleeve bearing 13 may be disposed within a first bore 14a (shown in Fig. 2) or a first bore 14b (shown in Fig. 3) of inner track link 9a, 9b. Sleeve bearing 13 may be positioned about track pin 10 so as to prevent galling of track pin 10 by frictional contact from inner track links 9a, 9b. Furthermore, sleeve bearing 13 may enable inner track links 9a, 9b to oscillate about track pin 10. It is contemplated that each of sleeve bearings 13 may be formed from a relatively hard metallic material, such as nitrided steel.

First seal members 15 may be positioned between inner track links 9a, 9b and rotatable bushing 12. A second bore 16 axially aligned with first bore 14a (shown in Fig. 2) and first bore 14b (shown in Fig. 3) of inner track links 9a, 9b may house first seal member 15. A second seal member 17 may be positioned between inner track link 9a and outer track link 8a as well as inner track link 9b and outer track link 8b. As shown in Fig. 2, second seal member 17 may be housed within a bore 18 of outer track links 8a, 8b. In another embodiment, shown in Fig. 3, second seal member 17 may be housed within first bore 14b of inner track links 9a, 9b. First bore 14b may be a two-part bore, wherein an outer portion of first bore 14b may house sleeve bearing 13 and an inner portion may house second seal member 17. Lubricating fluid from cavity 19 may be distributed to various components of track chain assemblies 7a and 7b and to rotatable bushing 12. First and second seal members 15, 17 may be annular elastomeric seals and may be configured to fluidly seal the lubricating fluid from

escaping track chain assemblies 7a and 7b and exclude contaminants from entering track chain assemblies 7a and 7b.

First thrust ring 20 may be disposed about track pin 10 and engaged with rotatable bushing 12. As shown in Fig. 2 and Fig. 3, first thrust ring 20 may be housed within second bore 16 of inner track links 9a, 9b. First thrust ring 20 may be configured to push against an end face 21 of rotatable bushing 12 and shoulder 24 formed by first bore 14a and second bore 16 (shown in Fig. 2) or first bore 14b and second bore 16 (shown in Fig. 3) so as to limit relative movement in the axial direction of rotatable bushing 12 and reduce compression on first seal member 15. Second thrust ring 22 may be disposed about track pin 10 and engaged with sleeve bearing 13. As shown in Fig. 2, second thrust ring 22 may be housed within bore 18 of outer track links 8a, 8b and configured to push against an end face 23 of sleeve bearing 13 and an end face of bore 18 so as to reduce compression on second seal member 17. In another embodiment, shown in Fig. 3, second thrust ring 22 may be housed within first bore 14b of inner track links 9a, 9b and configured to push against end face 23 of sleeve bearing 13 and outer track links 8a, 8b so as to reduce compression on second seal member 17. As shown in Fig. 5, second thrust ring 22 may solely be engaged with sleeve bearing 13; however, and as shown in Fig. 2, Fig. 3, and Fig. 4, second thrust ring 22 may be engaged with both sleeve bearing 13 and inner track link 9a, 9b. Alternatively, second thrust ring 22 may solely be engaged with inner track link 9a, 9b.

In the exemplary disclosed embodiments of Fig. 4 and Fig. 5, a first contact member 25 may be engaged with first seal member 15 to inhibit wear of first seal member 15, and a second contact member 26 may be engaged with second seal member 17 to inhibit wear of second seal member 17. First and second contact members 25, 26 may be annular members formed of or having surfaces coated or clad with a hardened material configured to be highly corrosion and abrasion resistant, such as, metallic washers.

First contact member 25 may be fastened to end face 21 of rotatable bushing 12, inhibiting direct contact between first seal member 15 and rotatable bushing 12. It should be appreciated that a variety of known means for fastening the first contact member 25 to end face 21 of rotatable bushing 12 may be employed, such as, for example, adhesive sealants, press fittings, and adhesive rubber compounds, and that the particular fastening means employed is beyond the scope of this disclosure. Alternatively, end face 21 may be laser clad, physical vapor deposition coated, or arc welded with an corrosion and abrasion resistant surface. In a compressibly loaded state, a slidable sealing interface 27 may form between first contact member 25 and first seal member 15. The hardened material forming first contact member 25 may maintain the integrity of sealing interface 27. Furthermore, because first contact member 25 may be composed of the extremely hard and abrasion resistant material, contact between first seal member 15 and first contact member 25 may significantly decrease wear of first seal member 15 during operation of track assembly 6, thereby increasing the durability of first seal member 15.

As shown in Fig. 4, second contact member 26 may be fastened to inner track link 9a, inhibiting direct contact between second seal member 17 and inner track link 9a. It should be appreciated that a variety of known means for fastening the second contact member 26 to inner track link 9a may be employed, such as, for example, adhesive sealants, press fittings, and adhesive rubber compounds, and that the particular fastening means employed is beyond the scope of this disclosure. In a compressibly loaded state, a slidable sealing interface 28 may form between second contact member 26 and second seal member 17. The hardened material forming second contact member 26 may also maintain the integrity of sealing interface 28. In the same manner as mentioned above, the extremely hard and abrasion resistant material forming second contact member 26 may significantly decrease wear of second seal member 17 as second seal member 17 and second contact member 26 come into contact during

operation of track assembly 6, thereby increasing its durability. Although not shown in Fig. 4, it will be understood that a similar sealing arrangement may be associated with inner track link 9b and outer track link 8b.

In another embodiment shown in Fig. 3, second contact member 26 may be fastened to outer track link 8a, inhibiting direct contact between second seal member 17 and outer track link 8a. Alternatively, as shown in Fig. 5, second contact member 26 may be fastened to a collar 29, inhibiting direct contact between second seal member 17 and collar 29. Collar 29 may be fastened to track pin 10 and configured to axially position thrust rings 22, 20, sleeve bearing 13, inner track link 9a, and rotatable bushing 12. Outer track link 8a may be positioned about collar 29. In the same manner as mentioned above, the extremely hard and abrasion resistant material forming second contact member 26 may significantly decrease wear of second seal member 17 as second seal member 17 and second contact member 26 come into contact during operation of track assembly 6, while also maintaining the integrity of sealing interface 28 between second contact member 26 and second seal member 17. Although not shown in Fig. 5, it will be understood that a similar sealing and collar arrangement may be associated with inner and outer track links 9b, 8b.

Industrial Applicability

In general, a track assembly may have applicability with track-type machines. During operation of a track-type machine, inner track links and outer track links may rotate relative to one another about a track pin. A rotatable bushing may rotate against an idler and about the track pin as the track links travels about its path during operation. As the rotatable bushing and inner track links rotate, a first contact member fastened to the end faces of the rotatable bushing may slidably contact a first seal member in a rotating manner. Similarly, as inner track links and outer track links rotate relative to one another, a second contact member, fastened directly to either inner track links, outer track links, or fastened to collars supporting outer track links, may slidably contact a second

seal member in a rotating manner. The hardened and abrasion resistant material of first and second contact members may prevent wear and corrosion of first and second seal members. Furthermore, assembling sleeve bearing within a first bore and first bore of inner track links may transmit radial loads from inner track links to the track pin, preventing galling of track pin resulting from frictional contact between the rotation of inner track links and track pin.

When the track encounters a side load, e.g. when outer track links are axially urged toward inner track links, the thrust rings may axially transmit loads across track assembly and further prevent wear of first and second seal members. For example, when outer track links are urged to the left, the rightmost thrust ring may transmit load to the adjacent sleeve bearing and inner track link. The adjacent sleeve bearing may transmit the load to the shoulder, which in turn may transmit the load to the adjacent thrust ring, and so on in an axial direction, and ultimately to the outer track link a on the opposite side. Axial loads may be transmitted through thrust rings, preventing compressive loads on first and second seal members. Excessive pressure and stress exerted onto first and second seal members may be avoided, thereby, preventing deformation and ultimately crushing of first and second seal members.

Assembling first and second contact members to track assembly may improve component life and durability of first and second seal members. Abrasion and wear of first and second seal members due to constant frictional contact with track links, bushings, and other components of track assembly 6 may be prevented. Therefore, costly repairs and replacements attributed to the failure of first and second seal members may ultimately be avoided.

Claims

1. A track assembly (6) for a machine (1) comprising:

a track (2) having a first chain assembly (7a) and a second chain assembly (7b) coupled with the first chain assembly via a track pin (10), the first and second chain assemblies including an inner track link (9a, 9b) and an outer track link (8a, 8b);

a rotatable bushing (12) positioned about the track pin;

a sleeve bearing (13) disposed within a first bore (14a, 14b) of the inner track link and positioned about the track pin;

a first seal member (15) disposed between the inner track link and the rotatable bushing;

a second seal member (17) disposed between the inner and outer track links;

a first thrust ring (20) positioned about the track pin and engaged with the rotatable bushing;

a second thrust ring (22) disposed about the track pin and engaged with the sleeve bearing; and

a first contact member (25) engaged with the first seal member and a second contact member (26) engaged with the second seal member, the first and second contact members configured to inhibit wear of the first and second seal members.

2. The track assembly of claim 1, wherein the first contact member is fastened to an end face (21) of the rotatable bushing.

3. The track assembly of claim 1, wherein the second contact member is fastened to the inner track link.

4. The track assembly of claim 1, wherein the second contact member is fastened to the outer track link.

5. The track assembly of claim 1, wherein the second seal member is disposed within the first bore of the inner track link.

6. The track assembly of claim 1, wherein the first seal member is disposed within a second bore (16) of the inner track link, the second bore axially aligned with the first bore.

7. A method of protecting components of a machine track assembly (6) during operation, the machine track assembly including an outer track link (8a, 8b), an inner track link (9a, 9b), a track pin (10), a rotatable bushing (12) positioned about the track pin, a first seal member (15) disposed between the inner track link and the rotatable bushing, and a second seal member (17) disposed between the inner and outer track links, the method comprising:

disposing a sleeve bearing (13) about the track pin; and

protecting the first and second seal members at least in part by:

assembling a first thrust ring (20) about the track pin and engaging the first thrust ring with the rotatable bushing;

assembling a second thrust ring (22) about the track pin and engaging the second thrust ring with the sleeve bearing;

engaging a first contact member (25) with the first seal member; and

engaging a second contact member (26) with the second seal member.

8. The method of claim 7, wherein engaging a first contact member with the first seal member includes fastening the first contact member to an end face (21) of the rotatable bushing.

9. The method of claim 7, wherein engaging a second contact member with the second seal member includes fastening the second contact member to the inner track link.

10. A track-type machine (1) including a frame (3) and the track assembly of claims 1-6.

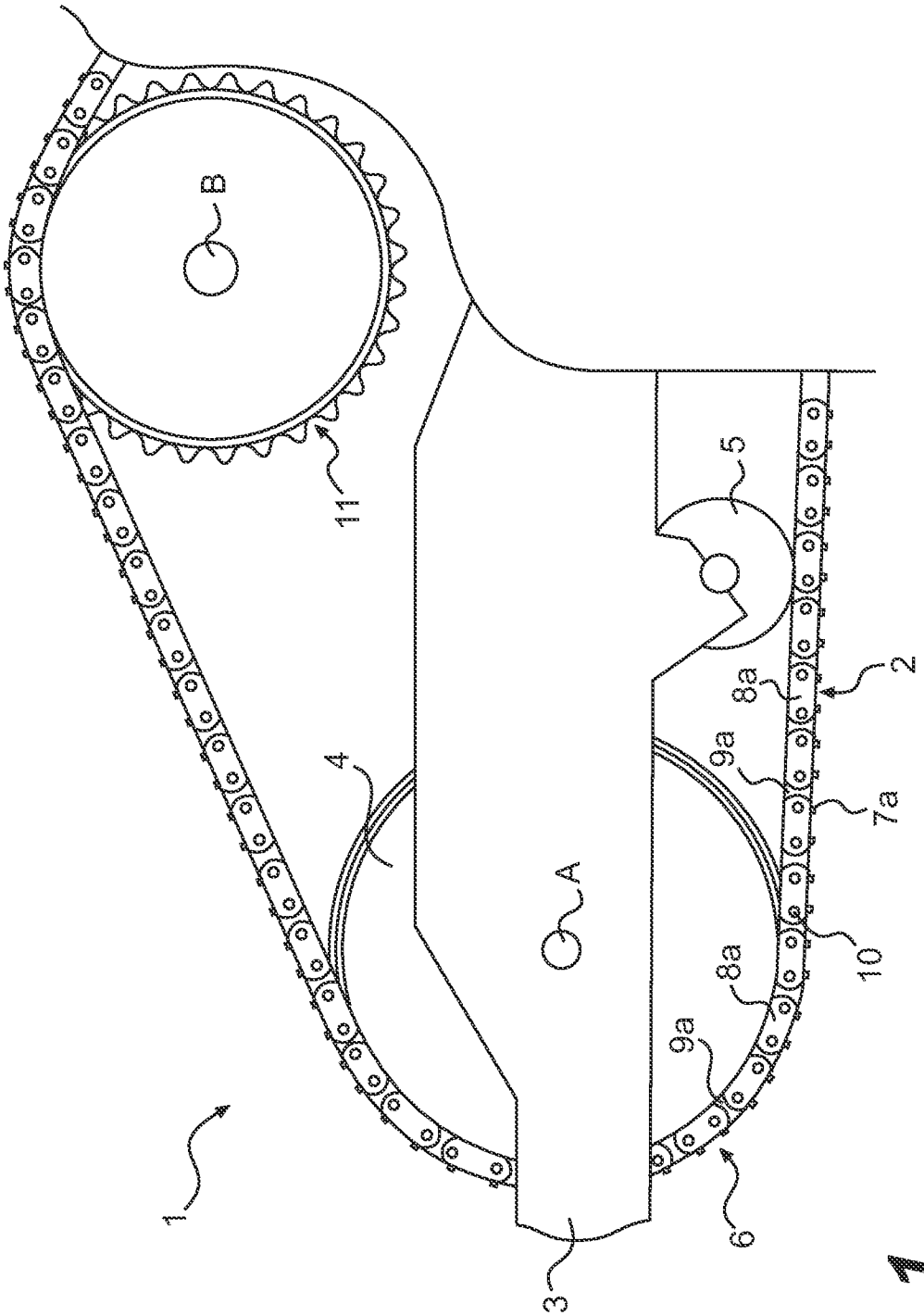

FIG. 1

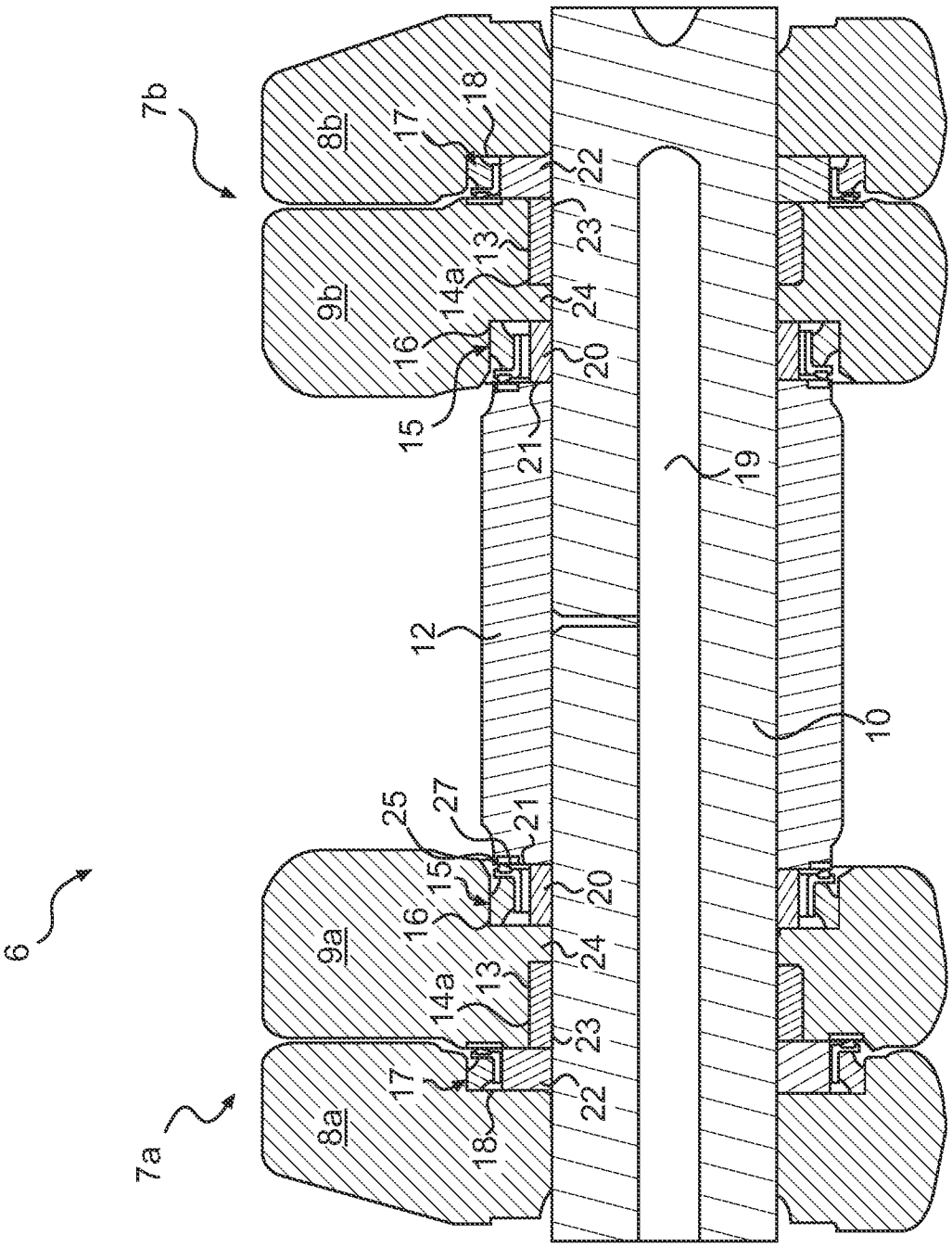

FIG. 2

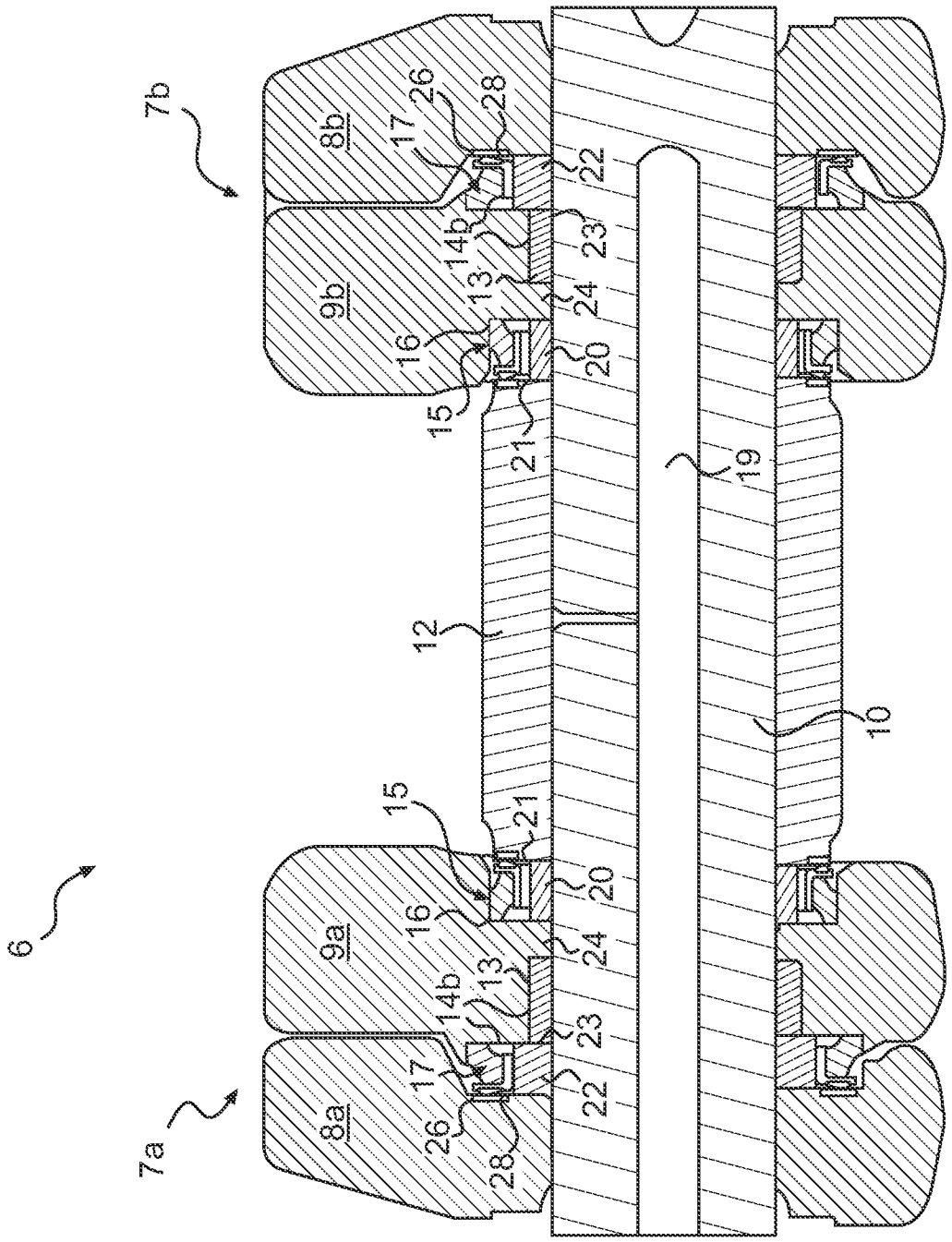

FIG. 3

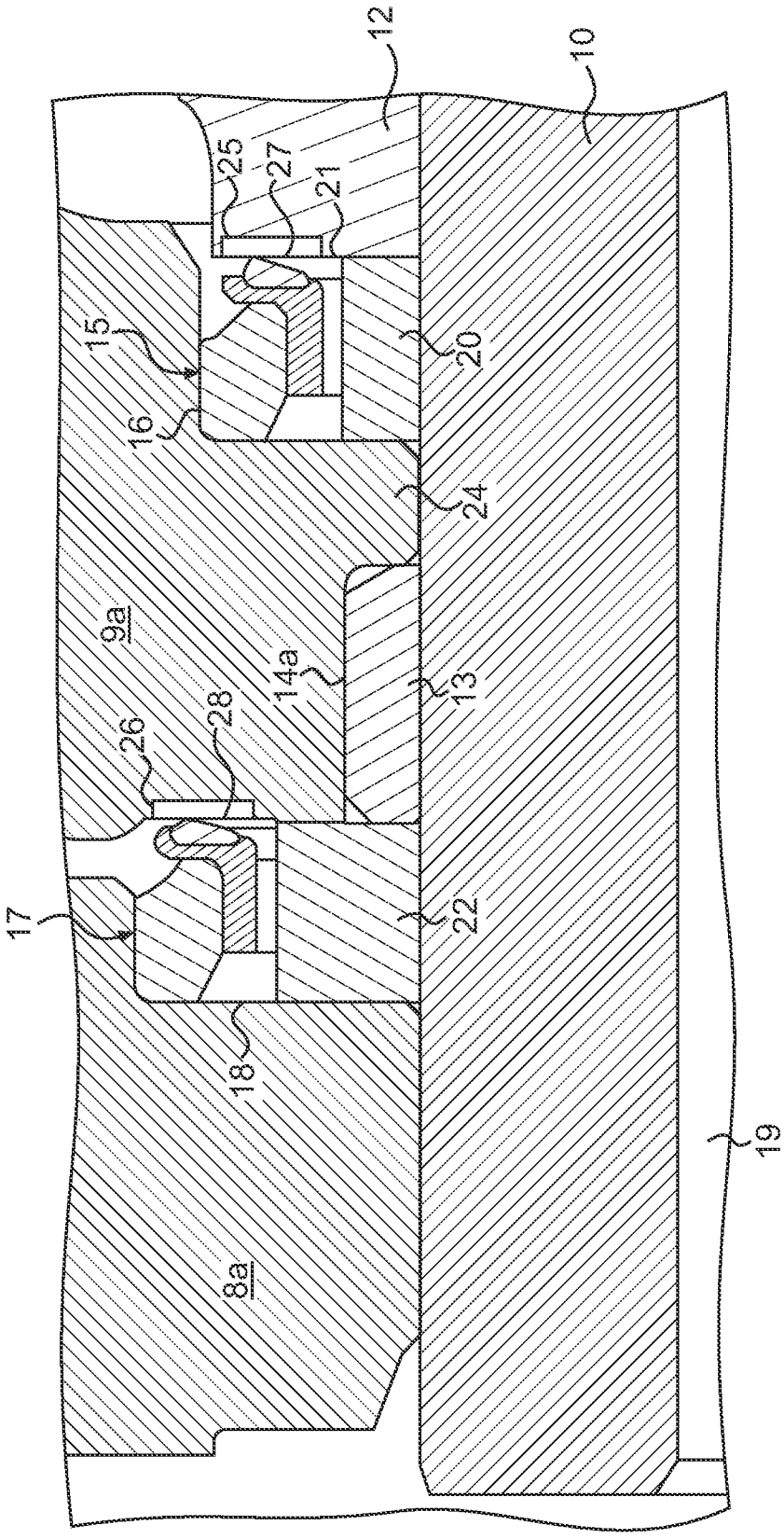

FIG. 4

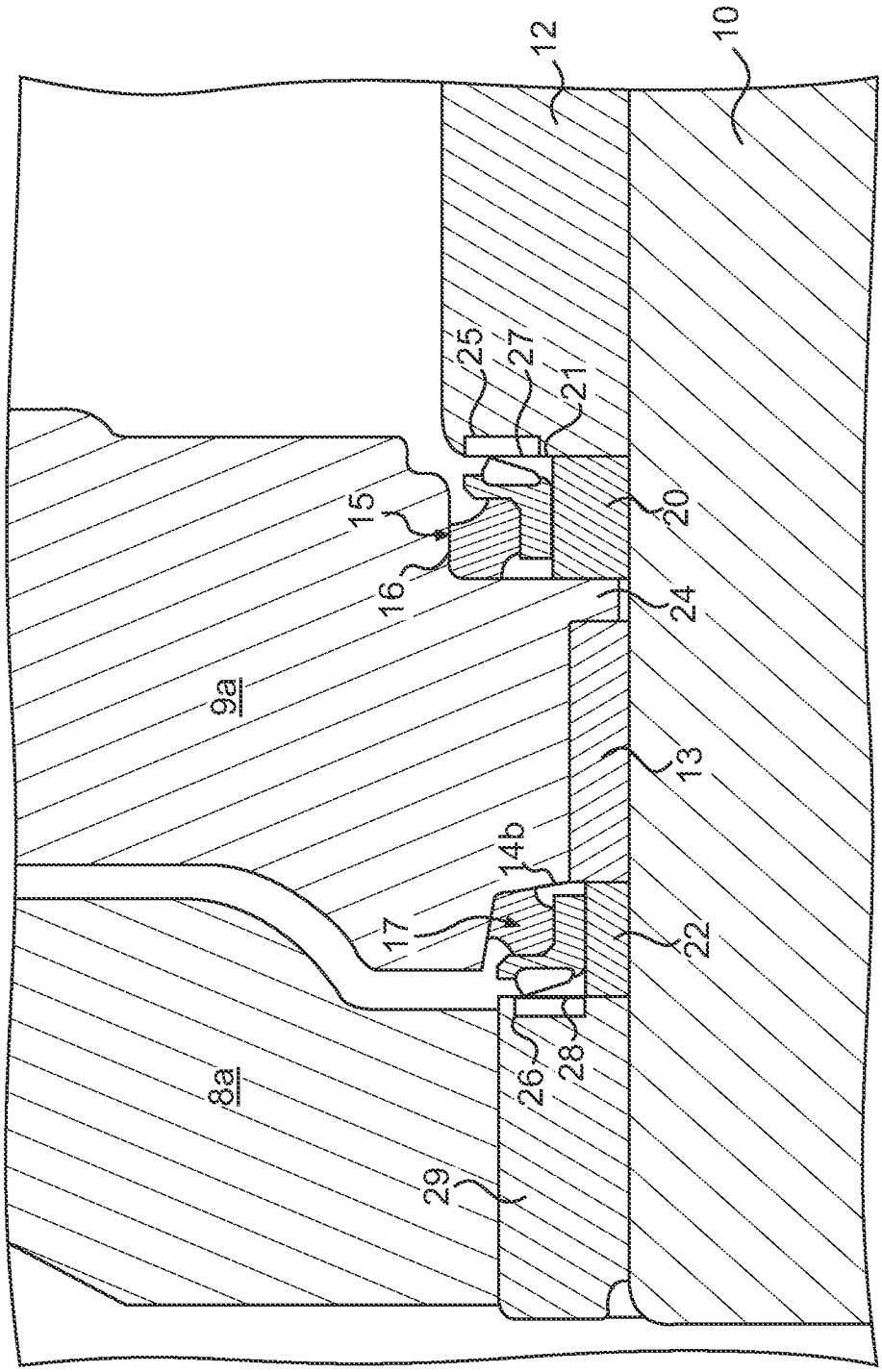

FIG. 5