June 18, 1935. L. E. ZERBE 2,005,123

ROTARY MACHINE

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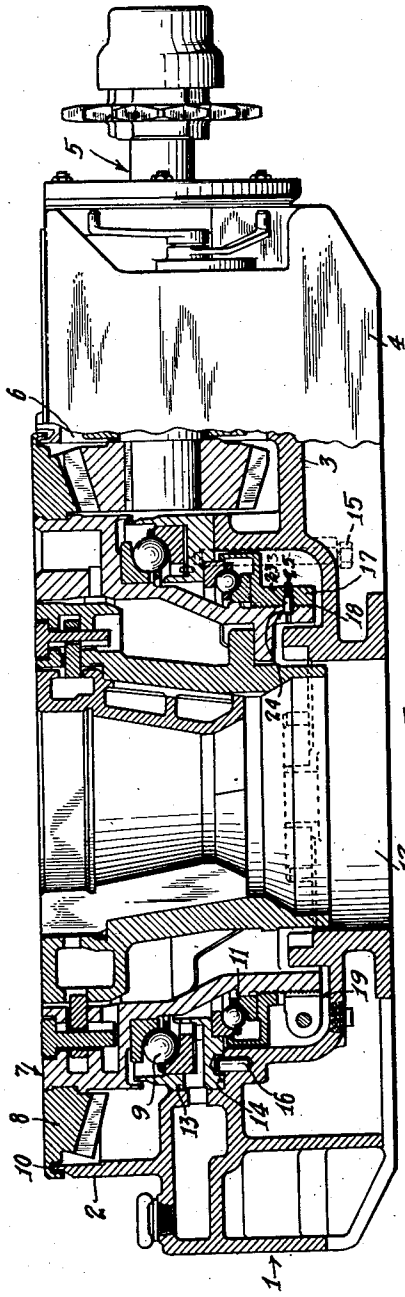

Fig. 1

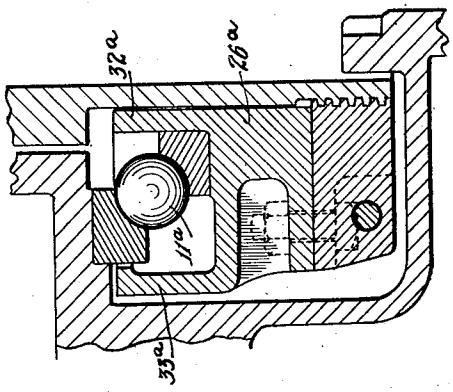

Fig. 6

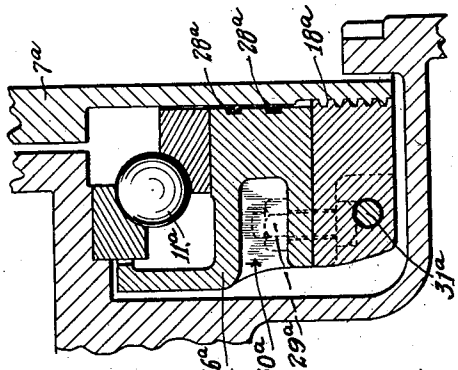

Fig. 4

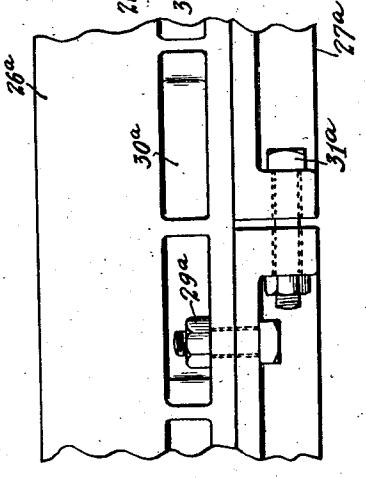

Fig. 5

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Fig. 2

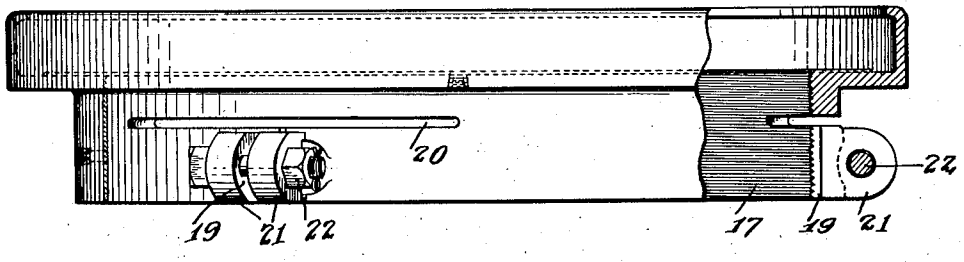
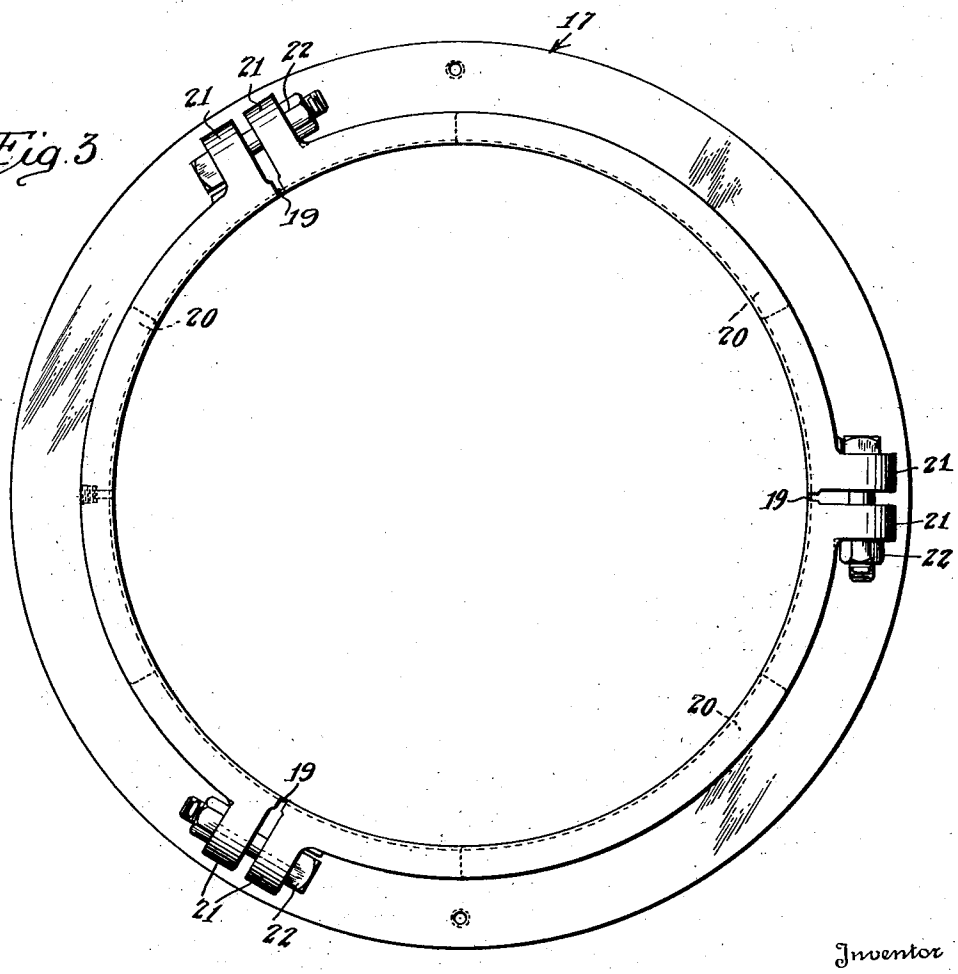


Fig. 3



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Patented June 18, 1935 2,005,123

UNITED STATES PATENT OFFICE

2,005,123

ROTARY MACHINE

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Application December 19, 1933, Serial No. 703,074

11 Claims. (Cl. 308—230)

This invention relates to rotary machines as used in a rotary drilling rig for drilling oil or other wells, and is more particularly related to a rotary machine of the fully enclosed type provided with a novel bearing means by which the rotary table is supported with relation to the base of the rotary machine and by which the table is held from being thrust upwardly away from the base.

This invention is directed particularly to an improvement over the enclosed type of rotary machine as illustrated in the copending application of David S. Faulkner, Allen Erwin Rice, and Lewis E. Zerbe, Serial No. 504,758, filed December 26, 1930. This application is a continuation in part of my copending application for Rotary machine, Serial No. 655,212, filed February 4, 1933, (Letters Patent No. 1,976,207, issued October 9, 1934).

An object of this invention is to provide a rotary machine with an improved upthrust bearing ring on the rotary table which is rigidly clamped on the rotary table to prevent wear on the engaging threads and at the same time maintain a seal to retain lubricant in the upthrust bearing positioned between the base and the rotary table.

Other objects and advantages of this invention it is believed will be apparent from the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a side elevation principally in vertical midsection of the rotary machine embodying my invention.

Figure 2 is a side elevation partly in vertical section showing an upthrust bearing adjusting ring embodied in my invention.

Figure 3 is a bottom plan view of the upthrust bearing adjusting ring embodied in my invention.

Figure 4 is a fragmentary sectional view showing a modified form of construction embodying my invention.

Figure 5 is a fragmentary elevation of the holddown ring illustrated in Figure 4 detached from the other parts of the rotary machine, except as illustrated as detachably secured to the main bearing supporting ring.

Figure 6 is a fragmentary sectional view similar to Figure 4 illustrating a further modification of my invention.

In the preferred embodiment of my invention as illustrated in the accompanying drawings, 1 indicates the base of a rotary machine which includes an annular upstanding wall 2 and outwardly extending pinion shaft supporting portion 3 which is preferably so formed as to provide an integral housing 4 for the unitary pinion shaft assembly 5. The upstanding wall 2 of the rotary machine is formed with an opening 6 which aligns with the chamber formed within the housing 4 and provides an opening through which the pinion 36 of the unitary pinion shaft assembly 5 may be passed to mesh with the ring gear 8 of the rotary gear table 7.

The rotary gear table 7 is rotatably mounted upon the base 1 on main bearings 9 mounted within the chamber formed by the upstanding wall 2 of the base 1.

A groove 10 is formed within ring gear 8 which cooperates with the upper end of the annular wall 2 to form a complete enclosure for the gears and bearings within the rotary machine base 1. An upthrust bearing 11 is mounted below the main bearing 9 to take the upthrust that may be applied to the rotary table 7.

The main and upthrust bearings 9 and 11 cooperate to provide a radial bearing for the gear table and maintain its axial alignment with the opening 12 at the base 1. The stationary portions of bearings 9 and 11 are mounted upon a removable bearing ring 13 positioned within the base 1 on a shoulder 14. The ring 13 is secured within the body by means of a plurality of bolts 15, only one of which is illustrated. The bolts are positioned radially around the structure of the base of the rotary machine. The ring 13 is held in erect position and prevented from rotation by means of a dowel 16 by which it is aligned in position so that the bolts 15 may be positioned to secure the ring 13.

An upthrust bearing ring 17 is threadedly secured to the lower portion of the table skirt at 18 and is adjusted to maintain the desired bearing clearance between the bearings 9 and 11. By this construction as thus set forth, the entire bearing assembly consisting of the table 7, bearings 9 and 11, and rings 13 and 17, are removable as a unit from the rotary machine when the bolts 15 are removed.

In order to prevent wear between the engaging threads of the adjusting ring 17 and the table 7, I split the ring 17 from a portion of its thread length as indicated at 19. In order to provide the necessary flexibility to obtain the necessary clamping action, I provide circumferential slots 20 which extend laterally to each side of the slots 19. Lugs 21 are provided on each side of the slots 19 through which bolts 22 are passed for clamping the lugs and consequently clamping the lower

portion of the threaded ring 17 in tight engagement with the lower complementary threaded section on the rotary table 7. The threaded portion of the ring 17 above the slotted portion provides a complete annular seal between the ring 17 and the table 7 which prevents any loss of lubricant contained in the reservoir formed between the ring and table.

A dowel 23 fits within a hole 24 in the ring 17 and table 7 to provide an additional means to prevent any relative rotation between the table 7 and the ring 17. A threaded plug 25 is threaded in the hole 24 to prevent dislodgement of the dowel 23.

While in the drawings I have illustrated the rotary machine as of the make-and-break type constructed substantially in accordance with Letters Patent Nos. 1,596,569 and 1,782,769, it is to be understood that my invention is not in any way limited to this particular type or construction of rotary machine, but may be applied with equal advantage to all of the well known types of rotary well drilling machines.

In the modification of the construction as illustrated in Figures 4 and 5, similar parts are referred to by similar numerals with the addition of an exponent "a". In this modification of my invention the upthrust bearing ring is formed in two sections, 26a and 27a. The upper section 26a forms an oil enclosure for the upthrust bearing 11a. Packing is mounted in grooves 28a formed on the inner periphery of the upper section 26a to form a seal with the table 7a.

The lower section 27a is formed by a plurality of segments which are bolted to the upper section by means of bolts 29a. The upper section 26a is provided with recesses 30a within which nuts of the bolts 29a are concealed. The lower section 27a is threadedly secured to the lower section of the table skirt at 18a. When the upthrust bearing 11a is adjusted to the desired amount, bolts 31a are tightened to clamp the segments of the lower section 27a into tight engagement with the table thread at 18a.

In the modified form of my invention as illustrated in Figure 6, there is illustrated a structure which differs in construction from that shown in Figure 4 in the provision of an upperly formed inner rim 32a formed on the upper section 26a of the upthrust ring. The rim 32a and the outer rim 33a are of substantially the same height and define the recess within which the upthrust bearing 11a is positioned. The inner rim obviates the necessity for packing which is required in the type of ring as illustrated in Figure 4.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, a supporting bearing between said rotary member and base for rotatably supporting said rotary member, an adjustable upthrust ring threaded to said rotary member, said ring having longitudinal slots through the lower portion of the threaded length, circumferential slots in said ring communicating with the longitudinal slots, and means to circumferentially clamp the adjacent slotted portions of the ring together to bind the ring on the threaded portion of the rotary member.

2. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, supporting bearings between said rotary member and base for rotatably supporting said rotary member on said base, an adjustable closure ring threaded to said rotary member, an upthrust bearing between said base and closure ring, said closure ring being formed to provide a lubricant chamber in which the upthrust bearing operates, longitudinal slots in said ring through the lower portion of its threaded length, circumferential slots in said ring communicating with the longitudinal slots, and means to contract the ring in the longitudinal slots to bind the ring to the rotary member.

3. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, supporting bearings between the rotary member and the base for rotatably supporting the rotary member on the base, an adjustable closure ring adjustably secured to the rotary member, an upthrust bearing between the base and the closure ring, longitudinal slots in said ring through the lower portion thereof, and means to contract the ring in the longitudinal slots to bind the ring to the rotary member.

4. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, a supporting bearing between said rotary member and base for rotatably supporting said rotary member, an adjustable upthrust ring adjustably secured to said rotary member, said ring having longitudinal slots through the lower portion thereof, circumferential slots in said ring communicating with the longitudinal slots, and means to circumferentially clamp the adjacent slotted portions of the ring together to bind the ring to the rotary member.

5. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, a supporting bearing between said rotary member and base for rotatably supporting said rotary member, an adjustable upthrust ring adjustably secured to said rotary member, said ring having longitudinal slots through the lower portion thereof, circumferential slots in said ring communicating with the longitudinal slots, means to circumferentially clamp the adjacent slotted portions of the ring together to bind the ring to the rotary member, and means defining a lubricant chamber within which the upthrust bearing operates.

6. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, a supporting bearing between said rotary member and base for rotatably supporting said rotary member, an adjustable upthrust ring adjustably secured to said rotary member, said ring having longitudinal slots through the lower portion thereof, circumferential slots in said ring communicating with the longitudinal slots, means to circumferentially clamp the adjacent slotted portions of the ring together to bind the ring to the rotary member, means defining a lubricant chamber within which the upthrust bearing operates, and means to prevent the passage of lubricant between the closure ring and the lower portion of the rotary member.

7. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, supporting bearing means between the rotary

member and the base for rotatably supporting the rotary member, an adjustable upthrust closure ring adjustably secured to the rotary member, upthrust bearing means between the base and closure ring, slot and clamp means for adjustably clamping the closure ring to the rotary member, and means supported by the closure ring to define an annular lubricant chamber in which the upthrust bearing operates.

8. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, supporting bearing means between the rotary member and the base for rotatably supporting the rotary member, an enclosure ring mounted on said rotary member, means to secure said ring against relative axial movement on said member, an upthrust bearing carried by said ring, said ring including an upper portion and a lower portion, the upper portion of said ring including means cooperating with the rotary member to define an annular lubricant chamber for the upthrust bearing, and means to contract the lower portion of the ring into frictional contact with the rotary member.

9. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, supporting bearing means between the rotary member and the base for rotatably supporting the rotary member, an enclosure ring mounted on said rotary member, means to secure said ring against relative axial movement on said member, an upthrust bearing carried by said ring, said ring including an upper portion and a lower portion, the upper portion of said ring defining an annular lubricant chamber for the upthrust bearing, and means to contract the lower portion of the ring into frictional contact with the rotary member.

10. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, upthrust and downthrust bearing means for rotatably supporting said table, said bearing means including a thrust bearing positioned between said base and rotary member, a thrust ring on said rotary member to transmit the thrust load on said table to the base through said thrust bearing, said thrust ring including a continuous annular portion and an interrupted annular portion, and means to contract the interrupted annular portion into frictional contact with the rotary member.

11. In a rotary machine, the combination of a base having a vertically extending opening therein, a rotary member mounted in the opening, upthrust and downthrust bearing means for rotatably supporting said table, said bearing means including a thrust bearing positioned between said base and rotary member, a thrust ring on said rotary member to transmit the thrust load on said table to the base through said thrust bearing, said thrust ring including a continuous annular portion and an interrupted annular portion, one of said portions screw-threaded and engaging the complementary thread on said rotary member, and means mounted on the thrust ring to contract the interrupted annular portion into frictional contact with the rotary member.

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