CLAIMS:

1. A system, comprising:

a plain bearing assembly configured to enable rotation of a shaft about a bearing system axis of the shaft, wherein the plain bearing assembly comprises the shaft, a cylindrical intermediate bearing disposed about the shaft, and an external bearing disposed about the intermediate bearing;

wherein the plain bearing assembly is configured to facilitate oscillatory motion of the shaft relative to the external bearing such that, when the shaft rotates in a first direction about the bearing system axis, the intermediate bearing rotates about the bearing system axis in the first direction, and when the shaft rotates in a second direction opposite the first direction about the bearing system axis, rotation of the intermediate bearing about the bearing system axis is resisted or prevented.

2. The system of claim 1, wherein the plain bearing assembly comprises a first sprag configured to engage with a first contact surface to facilitate rotation of the intermediate bearing about the bearing system axis when the shaft is rotating in the first direction and to prevent rotation of the intermediate bearing about the bearing system axis in the second direction when the shaft is rotating in the second direction.

3. The system of claim 2, wherein the first sprag is coupled to the shaft via a collar disposed about and coupled to the shaft, and wherein the first contact surface is disposed on the intermediate bearing.

4. The system of claim 2, wherein the first sprag is coupled to the intermediate bearing and wherein the first contact surface comprises a surface of a collar disposed about and coupled to the shaft.

5. The system of claim 2, wherein the first sprag and the first contact surface are configured such that a frictional force between the first sprag and the first contact surface holds the first sprag and the first contact surface in engagement.

6. The system of claim 2, wherein the first contact surface comprises ratchet teeth for interlocking with the first sprag.

7. The system of claim 2, wherein the plain bearing assembly comprises a second sprag configured to engage with a second contact surface to prevent rotation of the intermediate bearing about the bearing system axis in the second direction, wherein the second sprag extends from the intermediate bearing and the second contact surface is on the external bearing.

8. The system of claim 7, wherein the first sprag is oriented in a first direction to index with the first contact surface, and wherein the second sprag is oriented in a second direction opposite the first direction to index with the second contact surface.

9. The system of claim 1, wherein the external bearing comprises a cylindrical bearing.

10. The system of claim 1, wherein the external bearing comprises a spherical bearing.

11. A bearing system, comprising:

a shaft axially aligned with a bearing system axis;

a first collar disposed about and coupled to the shaft;

a cylindrical intermediate bearing disposed about the shaft;

a first sprag comprising a first end rotatably coupled to the first collar and a second end in contact with a contact surface of the intermediate bearing;

a stationary external bearing disposed about the intermediate bearing;

wherein the first sprag is configured to engage the contact surface of the intermediate bearing in a manner that encourages rotation of the intermediate bearing in a first direction about the bearing system axis when the shaft is rotating in the first direction, and wherein the first sprag is configured to slide relative to the contact surface of the intermediate bearing to prevent or resist rotation of the intermediate bearing in a second direction about the bearing system axis when the shaft is rotating in the second direction opposite the first direction.

12. The bearing system of claim 11, wherein a frictional force between the second end of the first sprag and the contact surface of the intermediate bearing facilitates rotation of the intermediate bearing in the first direction when the shaft is rotating in the first direction.

13. The bearing system of claim 11, wherein the contact surface of the intermediate bearing comprises ratchet teeth, and wherein the first sprag is spring-loaded to interlock with the teeth when the shaft is rotating in the first direction.

14. The bearing system of claim 11, comprising a second collar disposed about and coupled to the intermediate bearing, and a second sprag comprising a first end rotatably coupled to the second collar and a second end in contact with a contact surface of the external bearing, wherein the second sprag is configured to engage the contact surface of the external bearing to prevent the intermediate bearing from rotating in the second direction about the bearing system axis when the shaft is rotating in the second direction.

15. The bearing system of claim 11, wherein the intermediate bearing comprises distribution features configured to facilitate distribution of lubricant between

the intermediate bearing and the external bearing, between the intermediate bearing and the shaft, or both.

16. The bearing system of claim 15, wherein the distribution features comprise grooves formed in the intermediate bearing.

17. The bearing system of claim 16, wherein the grooves extend through the intermediate bearing between the shaft and the external bearing.

18. The bearing system of claim 16, wherein each of the grooves comprise a curved profile, wherein a concave side of the curved profile faces the first direction.

19. A method, comprising:

facilitating oscillatory rotation of a shaft about a bearing system axis of the shaft, wherein the shaft is configured to rotate relative to a stationary element via a plain bearing assembly, wherein the plain bearing assembly comprises a collar disposed on the shaft, a cylindrical intermediate bearing disposed about the shaft, and an external bearing disposed about the intermediate bearing;

allowing the intermediate bearing to rotate about the bearing system axis in a first direction when the shaft rotates in the first direction about the bearing system axis; and

resisting rotation of the intermediate bearing about the bearing system axis in a second direction opposite the first direction when the shaft rotates in the second direction about the bearing system axis.

20. The method of claim 19, comprising picking up and redistributing lubricant between the intermediate bearing and the external bearing via grooves formed in the intermediate bearing, when the intermediate bearing is rotating in the first direction.

21. The method of claim 19, wherein allowing the intermediate bearing to rotate about the bearing system axis in the first direction comprises engaging a sprag coupled to the collar with a contact surface coupled to the intermediate bearing when the shaft rotates in the first direction, and wherein resisting rotation of the intermediate bearing comprises sliding the contact surface of the intermediate bearing relative to the sprag when the shaft rotates in the second direction.

CLAIMS

1. A system, comprising:

a plain bearing assembly configured to enable rotation of a shaft about a bearing system axis of the shaft, wherein the plain bearing assembly comprises the shaft, a cylindrical intermediate bearing disposed about the shaft, and an external bearing disposed about the cylindrical intermediate bearing;

wherein the plain bearing assembly is configured to facilitate oscillatory motion of the shaft relative to the external bearing such that, when the shaft rotates in a first direction about the bearing system axis, the cylindrical intermediate bearing rotates about the bearing system axis in the first direction, and when the shaft rotates in a second direction opposite the first direction about the bearing system axis, rotation of the cylindrical intermediate bearing about the bearing system axis is resisted or prevented, wherein the plain bearing assembly comprises a first sprag configured to engage with a first contact surface to facilitate rotation of the cylindrical intermediate bearing about the bearing system axis when the shaft is rotating in the first direction and to prevent rotation of the cylindrical intermediate bearing about the bearing system axis in the second direction when the shaft is rotating in the second direction, wherein the first contact surface comprises a wall oriented transverse to the bearing system axis.

2. The system of claim 1, wherein the first sprag is coupled to the shaft via a collar disposed about and coupled to the shaft, and wherein the first contact surface is disposed on the cylindrical intermediate bearing.

3. The system of claim 1, wherein the first sprag is coupled to the cylindrical intermediate bearing.

4. The system of claim 1, wherein the first sprag and the first contact surface are configured such that a biasing force between the first sprag and the first contact surface holds the first sprag and the first contact surface in engagement.

5. The system of claim 1, wherein the first contact surface comprises ratchet teeth along the wall for interlocking with the first sprag.

6. The system of claim 1, wherein the plain bearing assembly comprises a second sprag configured to engage with a second contact surface to prevent rotation of the cylindrical intermediate bearing about the bearing system axis in the second direction, wherein the second sprag extends from the cylindrical intermediate bearing and the second contact surface is on the external bearing, and wherein the second contact surface comprises a second wall oriented transverse to the bearing system axis.

7. The system of claim 6, wherein the first sprag is oriented in a first direction to index with the first contact surface, and wherein the second sprag is oriented in a second direction opposite the first direction to index with the second contact surface.

8. The system of claim 1, wherein the external bearing comprises a cylindrical bearing.

9. The system of claim 1, wherein the external bearing comprises a spherical bearing.

10. A bearing system, comprising:

a shaft axially aligned with a bearing system axis;

a first collar disposed about and directly coupled to the shaft;

a cylindrical intermediate bearing disposed about the shaft;

a first sprag comprising a first end rotatably coupled to the first collar and a second end in contact with a contact surface of the cylindrical intermediate bearing, wherein the contact surface comprises a wall oriented transverse to the bearing system axis;

a stationary external bearing disposed about the cylindrical intermediate bearing;

wherein the first sprag is configured to engage the contact surface of the cylindrical intermediate bearing in a manner that encourages rotation of the cylindrical intermediate bearing in a first direction about the bearing system axis when the shaft is rotating in the first direction, and wherein the first sprag is configured to slide relative to the contact surface of the cylindrical intermediate bearing to prevent or resist rotation of the cylindrical intermediate bearing in a second direction about the bearing system axis when the shaft is rotating in the second direction opposite the first direction.

11. The bearing system of claim 10, wherein the contact surface of the cylindrical intermediate bearing comprises ratchet teeth, and wherein the first sprag is spring-loaded to interlock with the teeth when the shaft is rotating in the first direction.

12. The bearing system of claim 10, comprising a second collar disposed about and coupled to the cylindrical intermediate bearing, and a second sprag comprising a first end rotatably coupled to the second collar and a second end in contact with a contact surface of the external bearing, wherein the second sprag is configured to engage the contact surface of the external bearing to prevent the cylindrical intermediate bearing from rotating in the second direction about the bearing system axis when the shaft is rotating in the second direction.

13. The bearing system of claim 10, wherein the cylindrical intermediate bearing comprises distribution features configured to facilitate distribution of lubricant between the cylindrical intermediate bearing and the external bearing, between the cylindrical intermediate bearing and the shaft, or both.

14. The bearing system of claim 13, wherein the distribution features comprise grooves formed in the cylindrical intermediate bearing.

15. The bearing system of claim 14, wherein the grooves extend through the cylindrical intermediate bearing between the shaft and the external bearing.

16. The bearing system of claim 14, wherein each of the grooves comprise a curved profile, wherein a concave side of the curved profile faces the first direction.

17. The bearing system of claim 10, wherein the contact surface of the cylindrical intermediate bearing includes grooves or teeth.

18. A method, comprising:

rotating a shaft about a bearing system axis of the shaft, wherein the plain bearing assembly comprises a collar disposed on the shaft, a cylindrical intermediate bearing

disposed about the shaft, and an external bearing disposed about the cylindrical intermediate bearing;

rotating the cylindrical intermediate bearing about the bearing system axis in a first direction when the shaft rotates in the first direction about the bearing system axis; and

causing the cylindrical intermediate bearing to experience resistance to rotation about the bearing system axis in a second direction opposite the first direction when the shaft rotates in the second direction about the bearing system axis, wherein rotating the cylindrical intermediate bearing about the bearing system axis in the first direction comprises engaging a sprag coupled to the collar with a contact surface coupled to the cylindrical intermediate bearing when the shaft rotates in the first direction, wherein the contact surface extends transverse to the bearing system axis, and wherein causing the cylindrical intermediate bearing to experience resistance to rotation comprises sliding the contact surface of the cylindrical intermediate bearing relative to the sprag when the shaft rotates in the second direction.

19. A method, comprising:

a method of lubricating a plain bearing assembly, comprising:

rotating a shaft about a bearing system axis of the shaft, wherein the plain bearing assembly comprises a collar disposed on the shaft, a cylindrical intermediate bearing disposed about the shaft, and an external bearing disposed about the cylindrical intermediate bearing; rotating the cylindrical intermediate bearing about the bearing system axis in a first direction when the shaft rotates in the first direction about the bearing system axis;

causing the cylindrical intermediate bearing to experience resistance to rotation about the bearing system axis in a second direction opposite the first direction when the shaft rotates in the second direction about the bearing system axis; and

distributing lubricant between the cylindrical intermediate bearing and the external bearing via grooves formed in the cylindrical intermediate bearing when the cylindrical intermediate bearing is rotating in the first direction.