CLAIMS

What is claimed is:

1. A bearing assembly for an electric submersible pump (ESP), the bearing assembly comprising:

a bearing sleeve configured to be disposed about a shaft of the ESP;

a bushing configured to be disposed about the bearing sleeve, an outer surface of the bushing comprising a key, the key configured to engage a corresponding keyway in a diffuser of the ESP; and

a retaining ring engaged with the key.

2. The bearing assembly of claim 1, wherein the key is a projection projecting radially outwardly from the outer surface of the bushing.

3. The bearing assembly of claim 2, wherein the key is an elongated projection extending along at least a portion of an axial length of the bushing, and the keyway to be engaged is an elongated groove extending along at least a portion of an axial length of a wall of the diffuser surrounding a central bore of the diffuser.

4. An electric submersible pump (ESP) comprising:

a plurality of stages, each stage comprising an impeller and a diffuser disposed about a shaft, the diffuser having a central bore through which the shaft extends; and

at least one of the plurality of stages comprising a bearing assembly comprising:

a bearing sleeve disposed about the shaft and configured to rotate with the shaft in use;

a bushing disposed radially between the bearing sleeve and a wall surrounding the central bore of the diffuser;

a key coupled to the bushing, the key configured to prevent or inhibit rotation of the bushing in operation; and

a retaining ring engaged with the key.

5. The ESP of claim 4, wherein the key comprises a projection projecting radially outwardly from an outer surface of the bushing, the bearing assembly further comprising a recessed keyway in the wall surrounding the central bore, the recessed keyway configured to receive the key.

6. The ESP of claim 5, wherein the recessed keyway is a groove in the wall extending axially along at least a portion of a length of the wall.

7. The ESP of claim 4, the bearing assembly further comprising a keyway in an outer surface of the bushing, and wherein the keyway projects radially inward from the wall into the central bore, the keyway configured to receive the key.

8. The ESP of claim 7, wherein the keyway is a groove in the outer surface of the bushing extending axially along at least a portion of a length of the bushing.

9. An electric submersible pump (ESP) comprising:

a plurality of stages, each stage comprising an impeller and a diffuser disposed about a shaft, at least one diffuser comprising a central bore therethrough and a keyway in a wall surrounding the central bore; and

at least one of the plurality of stages comprising a bearing assembly comprising:

a bearing sleeve disposed about the shaft and configured to rotate with the shaft in use;

a bushing disposed radially between the bearing sleeve and the wall surrounding the central bore of the at least one diffuser, an outer surface of the bushing comprising a key configured to engage the keyway of the at least one diffuser when the ESP is assembled; and

a retaining ring engaged with the key.

10. The ESP of claim 9, wherein the key is a projection projecting radially outwardly from the outer surface of the bushing, and the keyway of the at least one diffuser is recessed radially outward from the central bore into the wall.

11. The ESP of claim 10, wherein the keyway of the at least one diffuser is an elongated groove, and the key is an elongated projection.

12. The bearing assembly of claim 1, wherein the retaining ring is at least one of a press-fit lock ring or a threaded ring.

13. The bearing assembly of claim 1, wherein the retaining ring is at least one of a spiral ring, a constant section ring, a single turn ring, or a nested wave spring.

14. The ESP of claim 4, wherein the retaining ring is at least one of a press-fit lock ring or a threaded ring.

15. The ESP of claim 4, wherein the retaining ring is at least one of a spiral ring, a constant section ring, a single turn ring, or a nested wave spring.

16. The ESP of claim 9, wherein the retaining ring is at least one of a press-fit lock ring or a threaded ring.

17. The ESP of claim 9, wherein the retaining ring is at least one of a spiral ring, a constant section ring, a single turn ring, or a nested wave spring.