A stuffing box isolation apparatus and method for use with a stuffing box at a wellhead. The stuffing apparatus includes an anchor component that secures the apparatus within the stuffing box, when inserted into an open bore of a stuffing box. The apparatus
(57) **Abstract (continued):**

further includes a sealing element that is expandable to sealingly engage an inner surface of the stuffing box. The expansion of the sealing element effectively seals the open bore of the stuffing box, preventing release of wellbore fluids and / or back-flow of the produced fluids.
ABSTRACT

A stuffing box isolation apparatus and method for use with a stuffing box at a wellhead. The stuffing apparatus includes an anchor component that secures the apparatus within the stuffing box, when inserted into an open bore of a stuffing box. The apparatus further includes a sealing element that is expandable to sealingly engage an inner surface of the stuffing box. The expansion of the sealing element effectively seals the open bore of the stuffing box, preventing release of wellbore fluids and/or back-flow of the produced fluids.
STUFFING BOX ISOLATION APPARATUS AND METHODS OF USING

Field of the Invention

[0001] One or more embodiments relate to, for example, an isolation apparatus and for insertion into a stuffing box and a method of installing the isolation apparatus into the stuffing box.

Background

[0002] A stuffing box is an assembly used to house a gland seal, which prevents release of fluids between sliding or turning parts of machine elements. For example, a stuffing box and polish rod (or sucker rod) combination may be used to maintain an adequate liquid seal at the surface of a reciprocating piston pumping unit installed in an oil well.

[0003] If the polish rod of a pumping unit fails (breaks), the stuffing box is left open possibly creating a situation where wellbore fluids may be released and/or back flow of the produced fluids from the flow line and gathering lines may occur. Oftentimes, individuals may use wooden handles or pipe pieces to close off the open stuffing box. Otherwise, wellbore fluid release or backflow may occur unless a flow line valve is shut.

[0004] There is a need for a stuffing box isolation apparatus which, when inserted into the open stuffing box, will lock in place preventing fluid release due to wellbore pressure.

Summary of the Invention

[0005] In one aspect, embodiments disclosed herein relate to an isolation apparatus, the apparatus including a central rod having at least an anchor component that secures the apparatus within the stuffing box and a sealing element concentrically to sealingly engage an inner surface of an open bore of the stuffing box, wherein the isolation apparatus is for insertion into the open bore of a stuffing box at a well head and wherein the sealing element upon being axially compressed, expands to seal the open bore.

[0006] In other aspects, embodiments disclosed herein relate to a stuffing box isolation apparatus including a threaded rod, an anchor component disposed at a lower end of the threaded rod that secures the tool within the stuffing box, a sealing element disposed longitudinally along a portion of the threaded rod, the sealing element configured to engage an inner bore of the stuffing box, and at least one rigid surface abutting the sealing element, wherein the sealing element includes a material which when axially compressed against the at
least one rigid surface, radially expands for the sealing element to seal the inner bore of the stuffing box.

[0007] In yet other aspects, embodiments disclosed herein relate to a method of installing an isolation apparatus within an open bore of a stuffing box, the method including providing an isolation apparatus including an anchor component and a sealing element, inserting the isolation apparatus within the open bore of the stuffing box, anchoring the isolation apparatus within the stuffing box, and axially compressing the sealing element for the sealing member to expand and engage the open bore of the stuffing box.

Brief Description of the Figures

[0008] Figure 1 illustrates an embodiment of a stuffing box isolation apparatus.

[0009] Figure 2 illustrates an embodiment for inserting a stuffing box isolation apparatus into a stuffing box.

[0010] Figure 3 illustrates an embodiment for anchoring and scaling the stuffing box isolation apparatus of Figure 2 within the stuffing box.

[0011] Figure 4 illustrates a cross-section view of Figure 3.

[0012] Figure 5 illustrates an embodiment for removing the stuffing box isolation apparatus of Figure 3 from the stuffing box.

Detailed Description of the Invention

[0013] A stuffing box isolation apparatus for inserting into a stuffing box at a wellhead is disclosed. The isolation apparatus includes a central rod having at least an anchor component to secure the apparatus within the stuffing box, and a sealing element that sealingly engages an inner surface of the stuffing box. In one embodiment, the sealing element includes a compressible material that expands when axially compressed at one or both ends (vertical axis). The expansion of the sealing element effectively seals the open bore of the stuffing box, preventing release/leakage of wellbore fluids and/or back-flow of the produced fluids.

[0014] In one embodiment, the sealing element includes a material having a coefficient of thermal expansion that is greater than the coefficient of thermal expansion of the central rod, providing a liquid-tight seal preventing fluid release through the stuffing box. In one embodiment, the sealing element is constructed out of an elastomeric material, e.g., natural rubber, synthetic rubber, fluoro- elastomer, thermost set elastomer, thermoplastic elastomer, elastomeric copolymers, thermoplastic polymers, elastomeric terpolymers, elastomeric
polymer blends and elastomeric alloys. In one embodiment, the sealing element includes an elastomeric material having a linear temperature expansion coefficients greater than $40 \times 10^{-6}$ m/m K.

[0015] In one embodiment, the isolation apparatus includes at least an anchor component which, when installed in the stuffing box, engages a surface or a component within the stuffing box to secure the apparatus within the stuffing box, e.g., restricting the longitudinal movement of the apparatus relative to the stuffing box. In one embodiment, the anchor component is any of a toggle bolt, a butterfly anchor, or a clip that engages a surface within the stuffing box. In another embodiment, the anchor component has radially expandable/collapsible portions that engage a shoulder or lip within the stuffing box to secure the apparatus within the stuffing box.

[0016] As the stuffing box is sized according to the size of the well head, the central rod is also sized according to the stuffing box dimensions as it is concentrically positioned within the stuffing box. In one embodiment, the central rod has a size proportional to the open bore of the stuffing box such that it is not too small that it can easily break, or too stubby to be easily handled. The central rod is circular in one embodiment, although other geometries can also be employed. The central rod in one embodiment has a length that runs the entire length of the stuffing box and extends at least 3” above the stuffing box. The sealing element in one embodiment is of sufficient length that when inserted into an open borehole, is of at least 1/10 the length of the open borehole of the stuffing box. In another embodiment, the sealing element has a length of at least 75% the length of the open borehole. Depending on the material of construction (and the length of the sealing element), the sealing element has a diameter that is at least 5% greater than the diameter of the central rod and less than 98% of the diameter of the open bore.

[0017] In one embodiment, the central rod has a radius ranging from 1/10 to 1/2 the radius of the open bore. In another embodiment, the central rod has a diameter of at least about 1/4 inch, at least about 3/8 inch, at least about 1/2 inch, or at least about 3/4 inch up to about 1 inch, or up to 2 inches, or up to 3 inches, or greater. The central rod may have a length of at least about 12 inches, or at least about 20 inches, or at least about 3 feet, up to about 4 feet, or up to about 5 feet, or up to about 6 feet, or greater. In one embodiment, the central rod has a length of at least about 12 inches, or at least about 20 inches, or at least about 3 feet, up to about 4 feet, or up to about 5 feet, or up to about 6 feet, or greater. In one embodiment, the sealing element has a diameter of at least about 1/2 inch, or at least about 3/4 inch, or at least about 1 inch, and up to about 1-1/2 inch, or up to 2 inches, or up to 3 inches. The sealing
element may have a length of at least about 4 inches, or at least about 6 inches, or at least about 8 inches, up to about 12 inches, or up to about 18 inches, or greater.

[0018] Figure 1 illustrates a side view of a stuffing box isolation apparatus 100 in accordance with one or more embodiments. The apparatus 100 includes a central rod 102 having a particular length and diameter. The central rod 102 may be medium carbon steel quenched and tempered, e.g., Grade 5 steel meeting ASTM A449 requirements. Alternatively, the central rod 102 may be alloy steel, or other suitable materials. In certain embodiments, the central rod 102 may be threaded either along an entire length or only along certain portions thereof. For example, the threads may be standard threads.

[0019] The stuffing box isolation apparatus 100 further includes a sealing element 104 that is disposed longitudinally along a portion of the central rod 102. The sealing element 104 may be disposed between rigid surfaces 106 on either end thereof. For example, the rigid surfaces may be flat washers that are disposed at either end of the sealing element 104. Still further, nuts 108 that engage threaded portions of the central rod 102 may abut against the flat washers 106 on one or both ends of the sealing element 104. The threaded nuts 108 may be barrel nuts or other threaded nuts. As the threaded nuts 108 are rotated in a clockwise manner, the sealing element 104 is longitudinally compressed between the flat washers 106, causing the sealing element 104 to be expanded radially outward, which is described in greater detail below. In certain embodiments, a second larger flat washer 107 may be disposed between one or more of the flat washers 106 and threaded nuts 108 at ends of the sealing element 104.

[0020] The stuffing box isolation apparatus 100 further includes an anchor component 110 coupled to the central rod 102. As shown in Figure 1, the anchor component 110 is coupled at a lower end of the central rod 102. Alternatively, the anchor component 110 may be disposed at any location along a length of the central rod 102. While two expandable portions are shown in Figure 1, in certain embodiments, the anchor component may include only a single expandable portion that engages a surface within the stuffing box. In other embodiments, the anchor component may include more than two expandable portions that engage a surface within the stuffing box. Additional anchor components may also be used to secure the apparatus 100 within the stuffing box, including other expandable/retractable spring-loaded mechanisms. In other embodiments, an anchor component configured to engage an outer surface of the stuffing box may be used to secure the isolation apparatus relative to the stuffing box. For example, an anchor component may include a clamping
apparatus that fits over the stuffing box to engage an outer surface and substantially restrict longitudinal movement of the isolation apparatus relative to the stuffing box.

[0021] As shown, on a first end of the central rod 102, one or more threaded nuts 112 may be disposed at an end of the central rod 102. The threaded nuts 112 may be low or medium carbon steel SAE Grade 2. Or, the threaded nuts 112 may also be medium carbon steel SAE Grade 5. As shown, the threaded nuts 112 may be tightened against one another (i.e., “jammed”) and a sealant may be applied between threads of the nuts and the central rod to prevent the threaded nuts 112 from loosening. The threaded nuts 112 may be disposed on an end of the central rod 102 to secure the anchor component 110 on the central rod 102. Further, as shown, on a second end of the central rod 102, threaded nuts 114 and 115 may be disposed at an end of the central rod 102. The threaded nuts 114 and 115 may be any type of threaded nut. In one embodiment, a handle may be disposed on the end of the central rod 102 in place of the nut 115, which when turned compresses against sealing element 104, sealing element 104 being compressed between the handle and anchor component 110.

[0022] In certain embodiments, a stuffing box isolation apparatus may include a threaded rod 102, an anchor component 110 disposed at a lower end of the threaded rod 102 that secures the tool within the stuffing box, a rubber element 104 disposed longitudinally along a portion of the threaded rod 102, the rubber element 104 configured to engage an inner bore of the stuffing box, a first washer 106 disposed at a first end of the rubber element 104, a first threaded nut 108 on the threaded rod 102 and abutting the first washer 106, a second washer 106 disposed at a second end of the rubber element 104, and a second threaded nut 108 on the threaded rod 102 and abutting the second washer 106.

[0023] Referring to Figures 2–5, methods of using or installing the stuffing box isolation apparatus 100 within an open bore 52 of a stuffing box 50 are disclosed. As shown in Figure 2, installing a tool 100 on a wellhead 51 includes (shown in Figure 4) first inserting the isolation apparatus 100 within the open bore 52 of the stuffing box 50. The stuffing box isolation apparatus 100 is inserted downward into the stuffing box 50 where the anchor component 110 is engaged and/or opened to lock and anchor the isolation apparatus 100 within the stuffing box 50 (shown in Figures 3 and 4). Next, the sealing element 104 is radially expanded by longitudinally compressing the sealing element 104 to engage the open bore 52 of the stuffing box 50. Alternatively, the expanded sealing element 104 may engage one or more rubber packing elements 54 present within the stuffing box bore, or any other inner surface within the bore 52 of the stuffing box 50.
For example, longitudinally compressing the sealing element 104 between two rigid surfaces or flat washers 106 may include rotating threaded nuts 108 on the central rod 102 abutting the flat washers 106 in a clockwise rotation, thereby compressing the sealing element 104 between the two flat washers 106. Further, anchoring the isolation apparatus 100 may include radially expanding portions of the anchor component 110 and engaging an open bore 52 surface within the stuffing box 50 to restrict longitudinal movement of the isolation apparatus 100 relative to the stuffing box 50. Finally, to remove the isolation apparatus 100 from the stuffing box 50, the stuffing box 50 may be disassembled (shown in Figure 5).

The claimed subject matter is not to be limited in scope by the specific embodiments described herein. Indeed, various modifications of the invention in addition to those described herein will become apparent to those skilled in the art from the foregoing description. Such modifications are intended to fall within the scope of the appended claims.

All references cited herein are incorporated herein by reference in their entirety to the extent that they are not inconsistent and for all purposes to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated by reference in its entirety for all purposes.

The citation of any publication is for its disclosure prior to the filing date and should not be construed as an admission that the present invention is not entitled to antedate such publication by virtue of prior invention.
What is claimed is:

1. An isolation apparatus, the apparatus comprising:
   a central rod having at least an anchor component that secures the apparatus to a stuffing box; and
   a sealing element coupled to the central rod concentrically to sealingly engage an inner surface of an open bore of the stuffing box;
wherein the isolation apparatus is for insertion into the open bore of a stuffing box at a well head and wherein the sealing element upon being axially compressed, expands radially to seal the open bore.

2. The apparatus of claim 1, wherein the sealing element comprises a material having a coefficient of thermal expansion that is greater than the coefficient of thermal expansion of the central rod.

3. The apparatus of claim 1, wherein the anchor component and the sealing element are disposed substantially longitudinally adjacent to one another on the central rod.

4. The apparatus of claim 1, further comprising at least a rigid surface at one end of the sealing element, wherein the sealing element is axially compressed against the rigid surface.

5. The apparatus of claim 1, further comprising two rigid surfaces at either end of the sealing element, wherein the sealing element is longitudinally compressible between the two rigid surfaces.

6. The apparatus of claim 5, further comprising a threaded nut on the central rod proximate to at least one of the rigid surfaces, wherein clockwise rotation of the threaded nut axially compresses the sealing element between the two rigid surfaces.

7. The apparatus of claim 1, wherein the central rod has a threaded portion and the anchor component is disposed at an end of the threaded portion.

8. The apparatus of claim 1, wherein the anchor component comprises radially expandable portions that engage an inner surface within the stuffing box.
9. The apparatus of claim 1, wherein the sealing element is configured to sealingly engage a rubber packing element within the open bore of the stuffing box.

10. The apparatus of claim 1, wherein the sealing element comprises a material selected from natural rubber, synthetic rubber, fluoro-elastomer, thermoset elastomer, thermoplastic elastomer, elastomeric copolymers, thermoplastic polymers, elastomeric terpolymers, elastomeric polymer blends, elastomeric alloys, and mixtures thereof.

11. The apparatus of claim 1, wherein the anchor component restricts substantial longitudinal movement of said apparatus within the stuffing box.

12. A method of installing an isolation apparatus within an open bore of a stuffing box, the method comprising:

providing an isolation apparatus comprising an anchor component and a sealing element;

inserting the isolation apparatus within the open bore of the stuffing box;

securing the isolation apparatus to the stuffing box with the anchor component; and

axially compressing the sealing element such that the sealing member expands radially and engages the open bore of the stuffing box.

13. The method of claim 12, further comprising providing a threaded member, wherein the anchor component and the sealing element are disposed substantially adjacent to one another thereon.

14. The method of claim 12, wherein axially compressing the sealing element comprises longitudinally compressing the sealing element against at least one rigid surface.

15. The method of claim 14, further comprising providing a threaded nut on the threaded member and rotating the threaded nut in a clockwise rotation, thereby compressing the sealing element against the at least one rigid surface.
16. The method of claim 14, further comprising compressing the sealing element against the at least one rigid surface, and thereby radially expanding the sealing element to sealingly engage a rubber packing element within the stuffing box bore.

17. The method of claim 12, wherein securing the isolation apparatus further comprises engaging a surface within the stuffing box with radially expanding portions of the anchor component.

18. A stuffing box isolation apparatus comprising:
   a threaded rod;
   an anchor component disposed at a lower end of the threaded rod that secures the tool to a stuffing box;
   a sealing element disposed longitudinally along a portion of the threaded rod, the sealing element configured to engage an inner bore of the stuffing box; and
   at least one rigid surface abutting the sealing element, wherein the sealing element comprises a material which when axially compressed against the at least one rigid surface, radially expands for the sealing element to seal the inner bore of the stuffing box.

19. The isolation apparatus of claim 18, further comprising a threaded nut, wherein rotating the threaded nut in a clockwise direction longitudinally compresses the sealing element against the at least one rigid surface.

20. The isolation apparatus of claim 18, wherein the anchor component comprises radially expandable portions to secure the isolation apparatus to the stuffing box.

21. The isolation apparatus of claim 18, wherein the anchor component engages a surface within the stuffing box and restricts longitudinal movement of the isolation apparatus within the stuffing box.