Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention.)
FIELD OF THE INVENTION

[0001] The present invention relates to an adaptor that can be used with rotatable fluid equipment, such as pumps, and which will protect mechanical seals and packing adjacent a seal cavity of the equipment.

BACKGROUND OF THE INVENTION

[0002] Spiral throat bushings are available from EnvirolSeal Engineering Products Ltd. of Waverley, Nova Scotia, Canada under the SpiralTrac™ name. These patented devices (US Patent No. 5,553,868) have a spiral groove formed in a sloping face thereof and are generally positioned at the "bottom" of a seal cavity defined in part by a rotating shaft, a shaft housing, and a throat structure. The seal cavity typically, as well, may be filled with conventional packing or it may include a mechanical seal adjacent the end opposite the throat structure. These spiral bushings are intended to remove particulate material that may accumulate within the seal cavity during operation of the equipment, and may be augmented by flush fluids to help in material removal. The result of using these "internal" spiral throat bushings has been increased seal or packing life due to a significant reduction in wear.

[0003] Mechanical seals are designed to prevent leakage of process fluid to atmosphere, and are typically offered in a split or solid cartridge design. Typically, the seal is fastened to the face of the seal cavity housing by some mechanical means, such as threaded bolts or rods. The operation of the rotating equipment could be enhanced further if there was less particulate material entering the seal cavity from the vicinity of the mechanical seal. Packing material is typically provided in annular rings and one or more such packing rings can be placed in a seal cavity and surrounding the rotating shaft. Again, operation of rotating equipment could be enhanced further if there were less particulate material entering the seal cavity past or from the vicinity of such packing material.

[0004] A particular throat bushing that is usable with packing material is the SpiralTrac™ Version P, as shown at the website of EnvirolSeal Engineering Products Ltd. That bushing is positionable within the seal cavity, at the bottom thereof and it has a radial face at the outboard end thereof that is adapted for abutment against the innermost packing ring. The bushing includes a central bore therethrough with the innermost, or bottom, end portion of the bore defining an annular gap with the outer circumferential surface of the shaft. A second portion of the bore flares outwardly from the first bore portion towards a radially inwardly tapering central portion. Each bore portion includes a spiral groove as discussed above for particle removal.

SUMMARY OF THE INVENTION

[0005] This need for reduction of particulate or contaminant material from the exterior of the seal cavity has led to the development of an "external" spiral adaptor or bushing that is positioned between the mechanical seal or packing and the end face of the seal cavity housing and which serves to increase the cleanliness of the environment in which the sealing mechanism, whether mechanical seal or packing, functions.

[0006] The advantage to this arrangement is that with the spiral adaptor being located closer to the sealing mechanism the existing patented technology of the bushing or adaptor will protect the sealing mechanism from particulate material entering at or near the sealing area. By doing this, the intent is to allow the sealing mechanism to operate in a cleaner environment with the result being extended operating life. The externally mounted design is available in a split and non-split (solid) design. The advantage of the split design is that the equipment does not have to be disassembled and the benefit of the spiral adaptor technology can be utilized. There are enormous savings for the customer if this can be avoided. The advantage of the solid design resides in the spiral adaptor technology and the benefit of a cleaner operating environment.

[0007] The externally designed spiral adaptor of this invention will create an enclosed cavity for the rotating component of a mechanical seal. Furthermore, it is possible to dimension the outboard side of the device to accept virtually any mechanical seal or packing material that is available on the market. The mechanical seal or packing being utilized will determine the cavity depth of the externally mountable spiral adaptor of the invention.

[0008] In summary of the foregoing, and in one embodiment, the present invention may be broadly set forth as a spiral adaptor for positioning in an annular seal cavity of rotating equipment, such seal cavity being defined by an outer cylindrical surface of a rotatable shaft of such equipment and a shaft housing surrounding at least a portion of the shaft, the cavity having a bottom end, an entrance end and an outer cylindrical surface, the equipment including a mechanical seal positioned outboard of the shaft housing adjacent the entrance to the seal cavity. The adaptor comprises: an annular adaptor body receivable within the seal cavity and having a central bore therethrough, the adaptor body including an outboard radial surface. The bore includes a first portion defining an annular gap with the shaft outer cylindrical surface when the adaptor is in its operating position and a second portion which flares outwardly from the first bore portion, the first and second bore portions each including a spiral groove formed therein, the hand thereof being in the same direction as the rotation of the shaft, the groove serving to redirect contaminant material contained in fluids surrounding the shaft away from said cavity. The adaptor is receivable in the seal cavity for location at the entrance thereto; the outboard radial surface is adapted...
for contact with a complementary face of the mechanical seal; and the second bore portion flares outwardly to the outboard radial surface.

[0009] In one particularly useful embodiment the annular body includes a first annular portion receivable within the seal cavity at the entrance thereto and a second annular portion of greater diameter than the first annular portion. The second annular portion has an inboard radial surface adapted for contact with a complementary face of the shaft housing and it also includes the outboard radial face adapted for contact with the complementary face of the mechanical seal.

[0010] The present invention will now be described with reference to the drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0011] Figure 1 illustrates in partial cross-section a typical environment for a spiral adaptor of the present invention, as located at the entrance to the seal cavity of rotating fluid equipment.

Figure 2 illustrates in enlarged cross-section a first embodiment of the spiral adaptor of the present invention.

Figure 3 illustrates in enlarged cross-section a second embodiment of the spiral adaptor of the present invention.

Figure 4 illustrates in enlarged cross-section a third embodiment of the spiral adaptor of the present invention.

Figure 5 illustrates in enlarged cross-section a fourth embodiment of the spiral adaptor of the present invention.

Figure 6 illustrates in enlarged cross-section a fifth embodiment of the spiral adaptor of the present invention.

Figure 7 illustrates in enlarged cross-section a sixth embodiment of the spiral adaptor of the present invention.

Figure 8 illustrates in enlarged cross-section a seventh embodiment of the spiral adaptor of the present invention.

Figure 9 illustrates in enlarged cross-section an eighth embodiment of the spiral adaptor of the present invention.

Figure 10 illustrates in enlarged cross-section a ninth embodiment of the spiral adaptor of the present invention.

Figure 11 illustrates in enlarged cross-section an embodiment of the spiral adaptor that is not part of the present invention.

Figure 12 illustrates in enlarged cross-section the spiral adaptor as utilized in the arrangement of Figure 11.

Figure 13 illustrates in enlarged cross-section an embodiment of the spiral adaptor that is not part of the present invention.

Figure 14 illustrates in enlarged cross-section the spiral adaptor as utilized in the arrangement of Figure 13.

**DESCRIPTION OF THE PREFERRED AND OTHER EMBODIMENTS**

[0012] Figure 1 of the drawings illustrates a typical environment in which a spiral adaptor of the present invention will be useful. Such environment is found in rotating fluid equipment, which equipment 10 will include a rotatable shaft 12, bearingly mounted on an axis A, and surrounded at least in part by a shaft housing 14. The housing 14 defines with an outer cylindrical surface 16 of the shaft 12 an annular seal cavity 18 having a bottom end defined by radial flange 20, an entrance end 22 and an outer cylindrical surface 24. A mechanical seal 26 is typically positioned outboard of the seal cavity adjacent the shaft housing at the entrance to the seal cavity. The details of the mechanical seal are not germane to the present invention and will not be described herein.

[0013] As seen in Figure 1 there is an external spiral adaptor 28 of the present invention located at the entrance to the seal cavity, positioned so as to be between the housing 14 and the mechanical seal 26. The adaptor 28 is described in greater detail with reference to Figure 2.

[0014] Turning now to Figure 2 a spiral adaptor 28 in accordance with the present invention will now be described. It is expected that this embodiment will be the one most commonly used in existing and new rotary equipment and it is the one depicted in position in Figure 1. As with all of the embodiments to the described herein the spiral adaptor 28 can be machined from a single billet of suitable material, such as stainless steel, PTFE, or PEEK. A composite such as PTFE or PEEK is preferred since the machining time thereof is much less than with a metal. As is common in the adaptor art the spiral adaptor of the present invention may be formed as a solid (unitary) ring or it may be split into two or more sections or segments, typically along a vertical or a horizontal axis. If a split adaptor is used then the sections or segments thereof will have suitable mating pins and holes to align the sections or segments together, as well as appropriate fastening means, such as machine screws, to hold them together.

[0015] The adaptor 28 has an annular adaptor body 30 having a central bore 32 extending therethrough. The adaptor body includes a first annular portion 34 which is adapted for a tight fit within the seal cavity 18 at the entrance 22 thereto. The annular portion 34 may include a circumferential groove 36 therein for reception of an annular sealing member 38 (Figure 1) such as an O-ring which will have sealing engagement with the outer cylindrical surface 24 of the seal cavity 18 when the spiral adaptor is in position. The adaptor body includes a second annular portion 40 of diameter greater than that of the first annular portion 34. The second annular portion...
40 has an inboard radial surface 42 adapted for contact with a complementary face surface 44 of the shaft housing 14 and an outboard radial surface 46 adapted for contact with a complementary face surface 48 of the mechanical seal 26. The inboard radial surface 42 may be provided with a ribbed gasket surface 50 for sealing engagement with the complementary surface 44 of the housing 14.

[0016] It will be seen that the adaptor body bore 32 includes two portions, a first portion 52 which defines an annular gap G (Figure 1) with the outer cylindrical surface 16 of the shaft 12 and a second portion 54 which flares outwardly from the outboard end of the first portion 52 towards the outboard radial surface 46 of the second annular body portion 40. Each of the bore portions 52, 54 is provided with its own spiral groove 56, 58 respectively therein, the hand of the spiral grooves 56, 58 being in the same direction of the rotation of the shaft 12. The grooves 56, 58 serve to redirect any contaminant-containing fluids away from the seal cavity such that damaging particulate material or other contaminants contained within operating fluids will not enter the seal cavity.

[0017] The grooves 56, 58 are similar to those described in aforementioned US Patent No. 5,553,868 in that they include both radial and non-radial portions. The non-radial portions 60 extend non-radially into the body of the adaptor from the respective bore portion and the radial portions 62 extend radially from the inner end of the respective non-radial portion back towards the bore. The groove 56 of the first bore portion 52 will lead smoothly into the groove 58 of the second or flared bore portion 54.

[0018] Although not shown specifically within the drawings there could be one or more additional grooves formed within the adaptor body and located between the first and second grooves 56, 58 also as described in US Patent No. 5,553,868.

[0019] Figure 3 illustrates a variation on the embodiment of Figure 2 which is intended to accommodate a situation in which there are restrictions on available axial space in which the spiral adaptor can be received. In this situation the adaptor 64 of Figure 3 could be utilized, it being noted that the first annular body portion 66 is considerably shorter in axial length than the second annular body portion 68. In this embodiment the first body portion 66 acts only as a locating boss to hold the spiral adaptor in position while the equipment is being assembled, such that the adaptor is self-centring with respect to the seal cavity. With this embodiment the first annular body portion 66 is not long enough to include a circumferential groove and sealing member as is found in the embodiment of Figure 2.

[0020] There may be situations in which there is a need to extend the first annular body portion of the spiral adaptor deeply into the seal cavity, perhaps all the way to the bottom 18 thereof. The spiral adaptor 70 of Figure 4 will accomplish this need in that the first annular portion 72 thereof is considerably longer than the second annular portion 74. The first annular portion 72 is preferably provided with at least two circumferential grooves 76, each of which can receive a suitable sealing member, such as an O-ring as described for the first embodiment, to effect sealing engagement with the outer cylindrical surface 24 of the seal cavity 18.

[0021] There may be situations in which there has been substantial wear on the shaft 12 in the vicinity of the mechanical seal 26 and it becomes desirable to reposition the seal 26 further away from the shaft housing 14 than before. The spiral adaptor 80 of Figure 5 can be used in these situations, it being noted that the second annular body portion 84 thereof is considerably greater in axial length than the first annular portion 82 thereof. With this embodiment the mechanical seal 26 can be moved outwardly on the shaft 12 to a smoother area of the shaft or seal, with the greater length of the second annular body portion bridging the distance from the housing 14 to the mechanical seal 26. Another advantage to this embodiment is that the mechanical seal is positioned closer to the main bearing support of the equipment where there is less chance of vibration affecting the performance of the seal.

[0022] It will be appreciated that there are many designs of seal cavities and that not all such designs will conform generally to the typical design illustrated in Figure 1. One such non-conforming design is the so-called "big bore" design where a larger more expensive mechanical seal is required. By using the spiral adaptor 90 of Figure 6 it is possible to reduce the radial cross-section of the adaptor, allowing for a smaller, less expensive, mechanical seal to be used. In this case the adaptor body 92 does not include a second annular body portion of diameter greater than that of the first annular body portion, i.e. the body has a single outer diameter over its entire length. Otherwise the features of the adaptor are the same as those of the first embodiment. This arrangement can substantially reduce costs for the customer.

[0023] Figure 7 illustrates a spiral adaptor 100 that is advantageous in those situations where the complementary face surface 44 of the shaft housing 14 is eroded or damaged and the ribbed gasket surface 50 will not provide sufficient sealing contact with the face surface 44. In this embodiment an annular groove 102 is machined in the inboard radial surface 42 of the second annular portion 40 and a soft, flexible gasket 104 is positioned in the groove, which gasket will effect suitable sealing contact with the complementary face surface 44. Should the face surface 44 be eroded to the point where neither the ribbed gasket surface 50 nor the separate gasket member 104 is acceptable, the customer may have to machine the face surface 44 back to its original condition before the spiral adaptor is assembled thereto.

[0024] Depending on the nature of the mechanical seals with which the present invention will be used it may become necessary to use a spiral adaptor in which the bore opens to the seal closer to the inboard end thereof than in the other embodiments previously described.
Thus there could be one or more intermediate bore portions between the first and second bore portions. Such spiral adaptor 110 is illustrated in Figure 8, where a single intermediate portion 112 is located between the first portion 114 and the second, flared portion 116. The intermediate portion 112 is provided with a spiral groove 118 which leads smoothly into the spiral groove 120 of the flared bore portion 116. The transition 122 between the first bore portion 114 and the intermediate portion 112 is also flared and includes a spiral groove 124, smoothly extending the groove 126 of the first portion 114 to the spiral groove 118 of the intermediate portion. Such an embodiment can be used with mechanical seal arrangements that are axially long, including both single and double mechanical seals. The length of the intermediate portion will be selected to accommodate the physical parameters of the equipment. If more than one intermediate portion becomes necessary such could easily be provided with each such intermediate portion having an increasingly greater diameter as they lead from the first bore portion to the second bore portion of the adaptor.

Turning now to Figure 9 there is shown an embodiment which can be used to fill in a seal cavity if it is deemed necessary to do so, or if the cavity has a deep axial length and only a small first obstruction space. The first obstruction space is the physical space that is available for installation of the adaptor when the equipment is completely assembled. For example, the depth of the seal cavity might be 5 inches and the physical space between the end of the seal cavity and the bearing housing of the equipment might be only 3 inches. If the adaptor is provided in two pieces, each being 2.5 inches long then one piece can fit easily within the cavity, in the available 3 inch space for installation. The second piece can then be installed, for a total length of 5 inches.

In this embodiment a spiral adaptor 28 as depicted in Figure 2 is illustrated in conjunction with a cavity insert 130. The insert 130 has an outer circumferential surface 132 sized for a sliding, tight fit within the cavity, the surface 132 being preferably, but not essentially, provided with at least two circumferential seal member-receiving grooves 134. The inner bore 136 of the insert is provided with a spiral groove 138 having a hand the same as the direction of rotation of the shaft, which groove will merge smoothly with the groove 56 found in the first annular portion of the adaptor 28. With this arrangement particulate material will be prevented from building up within the seal cavity; as particulate material enters the seal cavity they are rejected by the spiral groove 138. The insert 130 will be the first of the pieces mentioned above, the one that is inserted initially into the cavity while an adaptor 28 will be the second piece, the one that is inserted after the first piece to meet the cavity dimensional requirements.

Figure 10 illustrates a spiral adaptor which is especially adapted for use with an "agitator" type of rotary equipment. An agitator is a rotary component that has a large blade assembly that rests inside a larger tank, and rotates to "agitare" or mix the product within the tank. These tanks are common in the pulp and paper industry, the tanks being typically filled with a slurry of paper stock.

The rotary equipment used to effect agitation is prone to breakdown. Whenever there is a problem it is necessary to drain the tank before repairs can be effected to the mechanical seals. By utilizing the embodiment of Figure 10 it is possible to avoid having to empty the tank before repairs can be effected. The spiral adaptor 140 of Figure 10 includes all of the standard features as described with respect to the other embodiments and, in addition, it is provided with a shutoff mechanism 142 which when activated will seal itself against the shaft when the shaft has been brought to a halt. The shutoff mechanism 142 could entail a flexible sealant ring 144 held within a circumferential groove 145 in the bore 146 of the adaptor. A radially directed passage or bore 148 would be connected to a source of hydraulic or pneumatic pressure (not shown) which, when activated would force the ring 144 into sealing contact with the shaft. When such a shutoff mechanism is activated with the tank full of product it would not be necessary to drain the tank in order to effect repairs to the mechanical seal.

In some applications the seal cavity might contain packing, with or without a separate mechanical seal, and it could be desirable to continue with such a configuration even when utilizing an externally mountable spiral adaptor of the present invention. Figures 11 and 12 illustrate a situation in which packing can be used in conjunction with a spiral adaptor especially adapted for use therewith.

Figure 11 shows a shaft 12, shaft housing 14 and a seal cavity 18, much as is shown in Figure 1. The housing 14 includes a passage 150 for feeding flushing fluid to the seal cavity. An annular spiral adaptor 152 is positioned deep within the cavity from the entrance of the cavity and one or more packing rings 154 are forced into an annular cavity 156 defined between the adaptor 152 and the shaft 12, as will be seen from Figure 12, which shows the adaptor in greater detail. An annular gland plate 157 applies an axial force against the outermost packing ring to hold the rings in position. The gland plate 157 is secured to the housing 14 by threaded bolts 158.

Turning now to Figure 12, the adaptor 152 is described in greater detail. The annular body 160 of the adaptor 152 has a first annular portion 162 having, preferably, an external circumferential groove 164 for reception of a sealing ring (not shown). The annular portion 162 has a first bore 166 and a spiral groove 168 therein as with the other embodiments. A second annular portion 170 has an outer circumferential groove 172 which communicates with the passage 150 as well as one or more through bores 174 communicating the groove 172 with the interior of the adaptor. An outwardly flaring, spiral grooved section 176 leads from the bore 166 to a radially inwardly tapering bore section 178, which in turn leads to a short straight bore section 180, also provided with a
A spiral adaptor (28, 64, 70, 80, 90, 100, 110, 140)

1. Claims to be afforded this invention is to be determined from the date a particular application without departing from the adaptors illustrated and described herein to accommodate a particular application without departing from the scope of the present invention. Accordingly the protection to be afforded this invention is to be determined from the claims appended hereto.

Claims

1. A spiral adaptor (28, 64, 70, 80, 90, 100, 110, 140) for positioning in an annular seal cavity (18) of rotating equipment (10), such seal cavity (18) being defined by a outer cylindrical surface (16) of a rotatable shaft (12) of such equipment and a shaft housing (14) surrounding at least a portion of said shaft (12), said cavity (18) having a bottom end, an entrance end (22) and an outer cylindrical surface (24), said equipment including a mechanical seal (26) positioned outboard of said shaft housing (14) adjacent said entrance to said seal cavity (18); said adaptor comprising: an annular adaptor body (30, 66, 72, 82, 92) receivable within said seal cavity (18) and having a central bore (32) therethrough; said adaptor body including an outboard radial surface (46); said bore (32) including a first portion (52, 114, 146) defining an annular gap (G) with said shaft outer cylindrical surface (16) when said adaptor is in its operating position and a second portion (54, 116) which flares outwardly from said first bore portion (52, 114, 146), said first (52, 114, 146) and second (54, 116) bore portions each including a spiral groove (56, 126, and 58, 120) formed therein, the hand thereof being in the same direction as the rotation of said shaft (12), said groove serving to redirect contaminant material contained in fluids surrounding said shaft away from said seal cavity, characterized in that said adaptor is receivable in said seal cavity for location at said entrance thereto, that said outboard radial surface (46) is adapted for contact with a complementary face (48) of said mechanical seal (26); and that said second bore portion (54, 116) flares outwardly to said outboard radial surface (46).

2. The spiral adaptor (28, 64, 70, 80, 100, 110, 140) of claim 1 characterized in that said adaptor body includes a first annular portion (34, 66, 72, 82) receivable within said seal cavity (18) at said entrance thereto and a second annular portion (40, 68, 74, 84) of greater diameter than said first annular portion, said second annular portion having an inboard radial surface (42) adapted for contact with a complementary face (44) of said shaft housing (14) and also having said outboard radial surface (46) adapted for contact with the complementary face (48) of said mechanical seal (26).

3. The spiral adaptor (28, 70, 80, 90, 100, 110, 140) of claim 1 characterized in that said adaptor body has an outer cylindrical surface adapted for a tight fit within said seal cavity (18), said outer cylindrical surface including at least one circumferential groove (34, 76) therein for reception of an annular seal member (38) adapted for sealing engagement with said outer cylindrical surface (24) of said seal cavity (180).

4. The spiral adaptor (28, 64, 70, 80, 110, 140) of claim 2 characterized in that said inboard radial surface (42) of said adaptor body second annular portion (40, 68, 74, 84) has a ribbed gasket surface (50) formed integrally therewith for sealing engagement with said complementary face (44) of said shaft housing (14).

5. The spiral adaptor (100) of claim 2 characterized in that said inboard radial surface (42) of said adaptor body second annular portion (40) has an annular groove (102) formed therein for reception of an annular sealing member (104) for sealing engagement with said complementary face (44) of said shaft...
The spiral adaptor (28, 70, 100) of any one of claims 2, 4 or 5 characterized in that the axial extent of said adaptor body first portion (34, 72) is greater than the axial extent of said adaptor body second portion (40, 74).

7. The spiral adaptor (80, 110) of any one of claims 2, 4 or 5 characterized in that the axial extent of said adaptor body first portion (82) is lesser than the axial extent of said adaptor body second portion (84).

8. The spiral adaptor of any one of claims 2, 4 or 5 characterized in that the axial extent of said adaptor body first portion is equal to the axial extent of said adaptor body second portion.

9. The spiral adaptor (140) of any one of claims 1 to 8 characterized in that a shutoff mechanism (142) is contained therein, said shutoff mechanism (142) comprising a circumferential groove (145) formed in said first bore portion (146), a flexible sealing ring (144) contained within said circumferential groove (145), and a passage (148) in said annular body communicating a source of pressurized fluid with said circumferential groove (145) for pressing said flexible ring (144) against said shaft (12).

10. The spiral adaptor (110) of any one of claims 1 to 9 characterized in that said adaptor body bore includes an intermediate portion (112) between said first (114) and second (120) portions and of diameter greater than that of said first portion (114), there being a flared transition section (122) between said first (114) and intermediate (112) portions, said intermediate (112) and flared transition (122) portions each having a spiral groove (118, 124) formed therein.

11. The spiral adaptor (28, 64, 70, 80, 90, 100, 110, 140) of any one of claims 1 to 10 characterized in that each said spiral groove (56, 58, 118, 120, 126) has radial (62) and non-radial (60) surface portions, the non-radial portion (60) extending into the adaptor body from the adaptor body bore and the radial portion (62) extending generally radially from the inner end of the non-radial portion (60) back towards the adaptor body bore.

12. The spiral adaptor (28, 64, 70, 80, 90, 100, 110, 140) of any one of claims 1 to 11 in combination with an insert (130) positionable within said seal cavity (18) adjacent the bottom end thereof, said insert comprising an annular insert body (132) receivable within said seal cavity and having a central bore (136) thereby; said central bore including a first portion defining an annular gap with said shaft outer cylindrical surface when said insert is in its operating position and a second portion which flares outwardly from said first bore portion towards an outboard end of said insert, said first and second bore portions each including a spiral groove (138) formed therein, the hand thereof being in the same direction as the rotation of said shaft, said groove (138) serving to redirect contaminant material contained in fluids within said seal cavity towards said spiral adaptor.

Patentansprüche

1. Spiraladapter (28, 64, 70, 80, 90, 100, 110, 140) zum Positionieren in einer ringförmigen Dichtungsausnehmung (18) einer Drehapparatur (10), wobei die Dichtungsausnehmung (18) durch eine äußere zylindrische Oberfläche (16) einer drehbaren Welle (12) der Apparatur und durch ein Wellengehäuse (14) definiert ist, das mindestens einen Abschnitt der Welle (12) umgibt, wobei die Ausnehmung (18) ein Bodenende, ein Eintrittsende (22) und eine äußere zylindrische Oberfläche (24) hat, wobei die Apparatur eine mechanische Dichtung (26) umfasst, die außerhalb des Wellengehäuses (14) angrenzend an den Eintritt zur Dichtungsausnehmung (18) positioniert ist, wobei der Adapter aufweist: einen ringförmigen Adapterkörper (30, 66, 72, 82, 92), der in der Dichtungsausnehmung (18) aufgenommen werden kann und eine hindurchgehende Mittelbohrung (32) aufweist; wobei der Adapterkörper eine äußere radiale Oberfläche (46) umfasst; wobei die Bohrung (32) einen ersten Abschnitt (52, 114, 146) umfasst, der einen Ringspalt (G) mit der äußeren Wellenzylinderoberfläche (16) definiert, wenn der Adapter sich in seiner Betriebsposition befindet, und einen zweiten Abschnitt (54, 116), der sich von dem ersten Bohrungsabschnitt (52, 114, 146) aus aufweitet, wobei der erste (52, 114, 146) und der zweite (54, 116) Bohrungsabschnitt jeweils eine Spiralnut (56, 126, und 58, 120) umfassen, die darin ausgeformt ist und deren Verlauf (hand) in dieselbe Richtung geht wie die Drehung der Welle (12), wobei die Nut dazu dient, Verschmutzungsmaterial, das in Fluiden enthalten ist, welche die Welle umgeben, von der Dichtungsausnehmung weg umzuleiten, dadurch gekennzeichnet, dass der Adapter in der Dichtungsausnehmung zur Anordnung an ihrem Eintritt aufnehmbar ist, dass die äußere radiale Oberfläche (46) für den Kontakt mit einer Komplementärfläche (48) der mechanischen Dichtung (26) angepasst ist, und dadurch, dass der zweite Bohrungsabschnitt (54, 116) sich nach außen zur äußeren radialen Oberfläche (46) aufweitet.

2. Spiraladapter (28, 64, 70, 80, 100, 110, 140) nach Anspruch 1, dadurch gekennzeichnet, dass der Adapterkörper einen ersten ringförmigen Abschnitt (34, 66, 72, 82) aufweist, der in der Dichtungsaus-
5. Spiraladapter (28, 70, 80, 90, 100, 110, 140) nach Anspruch 2, dadurch gekennzeichnet, dass der Adapterkörper eine äußere zylindrische Oberfläche hat, die für einen engen Sitz in der Dichtungsausnehmung (18) angepasst ist, wobei die äußere zylindrische Oberfläche mindestens eine Umfangsnut (34, 76) darin aufweist, die integral mit ihr ausgebildet ist, und zwar für den dichtenden Eingriff mit der Komplementärfläche (44) des Wellengehäuses (14). 15

6. Spiraladapter (100) nach Anspruch 2, dadurch gekennzeichnet, dass die innere radiale Oberfläche (42) des zweiten ringförmigen Abschnitts des Adapterkörpers (40, 68, 74, 84) eine Rippendichtungsoberfläche (50) aufweist, die integral mit ihr ausgebildet ist, und zwar für den dichtenden Eingriff mit der Komplementärfläche (44) des Wellengehäuses (14). 20

7. Spiraladapter (80, 110) nach einem der Ansprüche 2, 4 oder 5, dadurch gekennzeichnet, dass die axiale Erstreckung des ersten Abschnitts des Adapterkörpers (82) kleiner ist als die axiale Erstreckung des zweiten Abschnitts des Adapterkörpers (84). 25

8. Spiraladapter nach einem der Ansprüche 2, 4 oder 5, dadurch gekennzeichnet, dass die axiale Erstreckung des ersten Abschnittes des Adapterkörpers gleich der axialen Erstreckung des zweiten Abschnittes des Adapterkörpers ist. 30

9. Spiraladapter (140) nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, dass ein Absperrmechanismus (142) darin enthalten ist, wobei der Absperrmechanismus (142) eine ringförmige Nut (145) umfasst, die in dem ersten Bohrungsabschnitt (146) ausgebildet ist, einen flexiblen Dichtring (144), der in der Umfangsnut (145) untergebracht ist, und einen Durchgang (148) in dem ringförmigen Körperform, der eine Quelle unter Druck stehenden Fluids mit der Umfangsnut (145) verbindet, um den flexiblen Ring (144) gegen die Welle (12) zu pressen. 35

10. Spiraladapter (110) nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, dass die Adapterkörper-Bohrung einen Zwischenabschnitt (112) zwischen dem ersten (114) und dem zweiten (120) Abschnitt umfasst, der einen größeren Durchmesser hat als der erste Abschnitt (114), wobei eine sich aufweitende Übergangskörper (122) zwischen dem ersten (114) und dem Zwischenabschnitt (112) vorhanden ist, wobei der Zwischenabschnitt (112) und der sich aufweitende Übergangsabschnitt (122) jeweils eine darin ausgebildete Spiralnut (118, 124) aufweisen. 40

11. Spiraladapter (28, 64, 70, 80, 90, 100, 140) nach einem der Ansprüche 1 bis 10, dadurch gekennzeichnet, dass die spiralformige Nut (56, 58, 118, 120, 126) radiale (62) und nicht radiale (60) Oberflächenabschnitte aufweist, wobei der nicht radiale Abschnitt (60) sich von der Adapterkörper-Bohrung in den Adapterkörper hinein erstreckt und der radiale Abschnitt (62) sich von dem inneren Ende des nicht radialen Abschnittes (60) im Wesentlichen radial zurück hin zur Adapterkörper-Bohrung erstreckt. 45

12. Spiraladapter (28, 64, 70, 80, 90, 100, 110, 140) nach einem der Ansprüche 1 bis 11 in Kombination mit einem Einsatz (130), der in der Dichtungsausnehmung (18) angrenzend an deren Bodenende positionierbar ist, wobei der Einsatz einen ringförmigen Einsatzkörper (132) umfasst, der in der Dichtungsausnehmung aufnehmbar ist und eine durch ihn hindurchgehende Mittelbohrung (136) umfasst; wobei die Mittelbohrung einen ersten Abschnitt aufweist, der einen Ringspalt mit der äußeren zylindrischen Wellenoberfläche definiert, wenn der Einsatz in seiner Betriebsposition ist, und einen zweiten Abschnitt, der sich von dem ersten Bohrungsabschnitt nach außen zu einem äußeren Ende des Einsatzes hin aufweitet, wobei der erste und der zweite Bohrungsabschnitt jeweils eine darin ausgebildete spiralformige Nut (138) aufweisen, deren Verlauf (hand) in dieselbe Richtung geht wie die Drehung der Welle, wobei die Nut (138) dazu dient, Verschmutzungsstoffe, das in Fluiden innerhalb der Dichtungsausnehmung enthalten ist, zum Spiraladapter hin umzulenken.
Revendications

1. Adaptateur en spirale (28, 64, 70, 80, 90, 100, 110, 140) destiné à être placé dans une cavité de joint étanche annulaire (18) d’un équipement rotatif (10), une telle cavité de joint étanche (18) étant définie par une surface cylindrique externe (16) d’un arbre rotatif (12) d’un tel équipement et un boîtier d’arbre (14) entourant au moins une partie dudit arbre (12), ladite cavité (18) ayant une extrémité de fond, une extrémité d’entrée (22) et une surface cylindrique externe (24), ledit équipement incluant un joint mécanique (26) positionné à l’extérieur dudit boîtier d’arbre (14) de façon adjacente à ladite entrée de ladite cavité de joint étanche (18), ledit adaptateur comprenant : un corps d’adaptateur annulaire (30, 66, 72, 82, 92) pouvant être logé à l’intérieur de ladite cavité de joint étanche (18) et ayant un alésage central (32) qui traverse celui-ci : ledit corps d’adaptateur incluant une surface radiale à l’extérieur (46) ; ledit alésage (32) incluant une première partie (52, 114, 146) définissant un espace annulaire (G) avec ledit alésage (32) incluant une première partie annulaire faisant communiquer une source de fluide contenue dans des fluides entourant ledit arbre à distance de ladite cavité de joint étanche, caractérisé en ce que ledit adaptateur peut être logé dans ladite cavité de joint étanche pour être placé à ladite entrée de celle-ci, en ce que ladite surface radiale à l’extérieur (46) est adaptée pour entrer en contact avec une face complémentaire (48) dudit joint mécanique (26) ; et en ce que ladite deuxième partie d’alésage (54, 116) s’évase vers l’extérieur de ladite surface radiale à l’extérieur (46).

2. Adaptateur en spirale (28, 64, 70, 80, 100, 110, 140) selon la revendication 1, caractérisé en ce que ledit corps d’adaptateur inclut une première partie annulaire (34, 66, 72, 82) pouvant être logée à l’intérieur de ladite cavité de joint étanche (18) à ladite entrée de celle-ci et une deuxième partie annulaire (40, 68, 74, 84) d’un diamètre plus grand que ladite première partie annulaire, ladite deuxième partie annulaire ayant une surface radiale à l’intérieur (42) adaptée pour entrer en contact avec une face complémentaire (48) dudit boîtier d’arbre (14) et aussi ayant la-dite surface radiale à l’extérieur (46) adaptée pour entrer en contact avec la face complémentaire (48) dudit joint mécanique (26).

3. Adaptateur en spirale (28, 70, 80, 100, 110, 140) selon la revendication 1, caractérisé en ce que ledit corps d’adaptateur a une surface cylindrique externe adaptée pour un ajustement serré à l’intérieur de ladite cavité de joint étanche (18), ladite surface cylindrique externe incluant au moins une rainure circonférentielle (34, 76) pour accueillir un élément d’étanchéité annulaire (38) adapté pour une prise avec étanchéité avec ladite surface cylindrique externe (24) de ladite cavité de joint étanche (180).

4. Adaptateur en spirale (28, 64, 70, 80, 100, 110, 140) selon la revendication 3, caractérisé en ce que ladite surface radiale à l’intérieur (42) de ladite deuxième partie annulaire du corps d’adaptateur (40, 68, 74, 84) a une portée de joint canalée (50) formée d’un seul tenant avec celle-ci pour une prise avec étanchéité avec ladite face complémentaire (44) dudit boîtier d’arbre (14).

5. Adaptateur en spirale (100) selon la revendication 2, caractérisé en ce que ladite surface radiale à l’intérieur (42) de ladite deuxième partie annulaire du corps d’adaptateur (40) a une rainure annulaire (102) formée pour accueillir un élément d’étanchéité annulaire (104) pour une prise avec étanchéité avec ladite face complémentaire (44) dudit boîtier d’arbre (14).

6. Adaptateur en spirale (28, 70, 100,) selon l’une quelconque des revendications 2, 4 ou 5 caractérisé en ce que l’étendue axiale de ladite première partie du corps d’adaptateur (34, 72) est plus grande que l’étendue axiale de ladite deuxième partie du corps d’adaptateur (40, 74).

7. Adaptateur en spirale (80, 110) selon l’une quelconque des revendications 2, 4 ou 5 caractérisé en ce que l’étendue axiale de ladite première partie du corps d’adaptateur (82) est moins grande que l’étendue axiale de ladite deuxième partie du corps d’adaptateur (84).

8. Adaptateur en spirale selon l’une quelconque des revendications 2, 4 ou 5 caractérisé en ce que l’étendue axiale de ladite première partie du corps d’adaptateur est égale à l’étendue axiale de ladite deuxième partie du corps d’adaptateur.

9. Adaptateur en spirale (140) selon l’une quelconque des revendications 1 à 8, caractérisé en ce qu’un mécanisme d’arrêt (142) y est contenu, ledit mécanisme d’arrêt (142) comprenant une rainure circonférentielle (145) formée dans ladite première partie d’alésage (146), un anneau d’étanchéité flexible (144) contenu à l’intérieur de ladite rainure circonférentielle (145) et un passage (148) dans ledit corps annulaire faisant communiquer une source de fluide.
soumis à une pression avec ladite rainure circonférentielle (145) pour presser ledit anneau flexible (144) contre ledit arbre (12).

10. Adaptateur en spirale (110) selon l’une quelconque des revendications 1 à 9, caractérisé en ce que ledit alésage de corps d’adaptateur inclut une partie intermédiaire (112) entre lesdites première (114) et deuxième (120) parties et a un diamètre plus grand que celui de ladite première partie (114), une section de transition évasée (122) entre lesdites première partie (114) et partie intermédiaire (112) y étant prévue, et des parties de transition évasées (122) chacune ayant une rainure en spirale (118, 124) y étant formée.

11. Adaptateur en spirale (28, 64, 70, 80, 100, 110, 140) selon l’une quelconque des revendications 1 à 10, caractérisé en ce que chaque dite rainure en spirale (56, 58, 118, 120, 126) a des parties de surfaces radiale (62) et non radiale (60), la partie non radiale (60) s’étendant dans le corps d’adaptateur à partir de l’alésage de corps d’adaptateur et la partie radiale (62) s’étendant généralement de façon radiale à partir de l’extrémité interne de la partie non radiale (60) et retournant vers l’alésage de corps d’adaptateur.

12. Adaptateur en spirale (28, 64, 70, 80, 100, 110, 140) selon l’une quelconque des revendications 1 à 11, en combinaison avec un insert (130) pouvant être placé à l’intérieur de ladite cavité de joint étanche (18) à côté de l’extrémité de fond de celle-ci, ledit insert comprenant un corps d’insert annulaire (132) pouvant être logé à l’intérieur de ladite cavité de joint étanche et ayant un alésage central (136) qui traverse celui-ci ; ledit alésage central incluant une première partie définissant un espace annulaire avec ladite surface cylindrique externe de l’arbre lorsque ledit insert est dans sa position de fonctionnement et une deuxième partie s’évasant vers l’extérieur à partir de ladite première partie d’alésage vers une extrémité à l’extérieur dudit insert, lesdites première et deuxième parties d’alésage incluant chacune une rainure en spirale (138) qui y est formée, le sens de celle-ci étant dans le même sens que la rotation dudit arbre, ladite rainure (138) servant à rediriger du matériau contaminant contenu dans des fluides à l’intérieur de ladite cavité de joint étanche vers ledit adaptateur en spirale.
Figure 3
Figure 6