

Description

The present invention relates to an improved structure for supporting and sealing a tubing string or a portion of a tubing string in a well and electrically insulating the tubing string or the portion of the tubing string from the remainder of the support structure or the tubing string.

In the production of oil and gas from wells, paraffin problems often appear. In treating such problems so that the paraffin does not build up sufficiently to create a restriction to the production the heating of the production string has commonly been attempted.

U.S. -A- 2,982,354 discloses the removal of congealed paraffin and asphaltic bodies in oil wells and suggests the electrical heating of the wells. In this structure the tubing string hanger is insulated from the housing in which it lands by an annulus of electrically insulating material preventing electric contact between the hanger and the housing.

U.S.-A-2,597,261 discloses another similar structure in which an insulating bushing is provided between the cap at the upper end of the casing and the pipe line with additional insulating collars on the pipe line within the casing. This allows the use of an electric current passing through the pipe line to heat the paraffinic and sulphatic substances to maintain them in a free-flowing condition.

U.S. -A- 2,728,396, U.S. -A- 2,244,256, U.S. -A- 2,812,818, U.S. -A- 4,487,257 and U.S. -A- 4,716,960 all disclose similar insulating structures for the use of an electric current to maintain the well fluids in a free-flowing condition to allow maximum production.

US-A-2,667,626 discloses a telemetering system in which an insulating sleeve is used to provide the electrical insulation.

US-A-4,154,302 disclose an electric cable feed-through structure and US-A-2,896,972 discloses an insulating structure for insulating the tubular support of a hanging fixture from the electric splice box.

The present invention provided a wellhead structure comprising a housing having an internal landing seat, a hanger, having an external landing shoulder adapted to be landed on the housing landing seat to support the hanger within the housing, the hanger having an upper bore and a lower counterbore, with a downwardly facing shoulder between the bore and the counterbore, a hanger mandrel having a tubular body and a flange extending outwardly therefrom near the upper end thereof, a first annular bushing of electrically insulating material positioned around the upper end of the mandrel and between the hanger counterbore shoulder and the upper surface of the mandrel flange, a second annular bushing of electrically insulating material positioned around the mandrel and below the mandrel flange within the counterbore, means secured to the hanger and providing supporting engagement of the second annular bush-

ing, the bushings being sized to maintain the mandrel in spaced relationship to the hanger to prevent electrical contact therebetween.

In the accompanying drawings:-

Figure 1 is a transverse sectional view of the improved wellhead structure of the present invention;

Figure 2 is a similar sectional view of a modified form of the present invention;

Figure 2A is an enlarged sectional view of the bushing and its seals used in the form of the invention shown in Figure 2.

Figure 3 is another similar sectional view of another modified form of the present invention;

Figure 4 is a sectional view of a section of a tubing string which is insulated from the remainder of the string.

The wellhead 10 as shown in Figure 1 includes the housing 12, which is in the form of a spool with flanges 14 and 16 at its upper and lower ends for connection into the wellhead stack. Internal landing seat 18 is formed on the interior of housing 12 and is adapted to receive landing shoulder 20 of hanger 22 as can be seen in the drawing. Locking pins 24 thread radially inward in upper flange 14 and are positioned to engage within groove 26 around the upper exterior of hanger 22. Suitable sealing is provided above and below groove 26 as shown. Ports 28 extend through housing 12 into the space between hanger 22 and the interior of housing 12 below landing seat 18. The exterior of housing 12 around port 28 is formed to receive a suitable fitting to provide the communication through ports 28.

Hanger 22 includes upper bore 30 and lower counterbore 32 with downwardly facing shoulder 34 therebetween. The upper portion of bore 30 is threaded at 36 to receive tubular member (not shown). The lower end of counterbore 32 is threaded at 40 to receive support sleeve 42 and locking pins 44 thread through hanger 22 to engage within outer groove 46 in the upper portion of support sleeve 42.

Hanger mandrel 48 is generally tubular in shape and includes radially extending annular flange 50 around its upper portion a short distance below upper end 52. As can be seen from the drawings, the outer diameter of flange 50 is less than the inner diameter of hanger counterbore 32 so that when mandrel 48 is centered within counterbore 32 the outer surface of flange 50 is spaced from the inner surface of counterbore 32.

Annular insulating bushings 54 and 56 are positioned around the exterior of mandrel 48 immediately above and below flange 50. Upper bushing 54 is against the upper surface of flange 50 and has a greater thickness so that its upper surface 58 when engaged with shoulder 34 in hanger 22, upper end 52 of mandrel 48 is spaced below shoulder 34 of hanger 22. Lower bushing 56 is positioned between the lower

surface of flange 50 and against the upper support surface 60 of support sleeve 42. Bushings 54 and 56 are preferably of a material which is both electrically insulating and has sufficient strength to transfer the tubing loading to support sleeve 42 and thus to hanger 22. Also, upper bushing 54 is sufficiently strong to maintain the upper end of hanger mandrel 48 centered with the upper portion of counterbore 32 under conditions of bending and vibration. It has been determined that certain ceramic materials are suitable and readily available for use for bushings 54 and 56. Other materials may be used provided it includes the physical and electrical characteristics specified above. Both bushings 54 and 56 include inner grooves 62 and outer grooves 64 in which suitable sealing means, such as elastomeric seal rings 66 and 68, are positioned to prevent leakage between hanger mandrel 48 and hanger 22. Both bushings 54 and 56 are positioned tightly around the exterior of mandrel 48 and have sufficient radial dimension to prevent engagement of mandrel 48 with the surface of counterbore 32. The exterior of mandrel 48 is reduced in diameter immediately below bushing 56 to further ensure that it does not come into contact with support sleeve 42. Thus mandrel 48 is completely electrically insulated from wellhead 10 and the other components of the assembly.

In a modified form of the invention illustrated in FIGURE 2, wellhead 70 is similar to wellhead 10 and includes spool housing 72 with upper and lower flanges 74 and 76 at the upper and lower ends of housing 72 for connection into the wellhead stack. Internal landing seat 78 is formed on the interior of housing 72 and is adapted to receive landing shoulder 80 of hanger 82. Locking pins 84 thread radially inward in upper flange 74 and are positioned to engage within groove 86 around the upper exterior of hanger 82. Suitable sealing is provided above and below groove 86. Ports 88 extend through housing 72 and are similar to ports 28.

Hanger 82 is generally tubular in shape and includes central bore 90 threaded at the upper end thereof at 92 and threaded at the lower end thereof at 94 for receiving tubing sub 96. Tubing sub 96 extends downward from the lower end of hanger bore 90 and engages within the upper threaded bore 98 of hanger mandrel 100.

Hanger mandrel 100 includes intermediate bore 102 below bore 98 with shoulder 104 therebetween and lower threaded bore 106. Tubing mandrel 108 is generally tubular in shape having a central bore 110 and an outer flange 112 spaced below upper end 114 of tubing mandrel 108. The lower exterior end 116 of tubing mandrel 108 is threaded to receive the upper end of a tubing string (not shown) which is to be supported thereon. Support sleeve 118 is threaded in lower threaded bore 106 of mandrel 100 and is secured in position by locking pins 120 which thread

through the lower portion of hanger mandrel 100 and engage within outer groove 117 in the upper exterior of the support sleeve 118.

Annular insulating bushings 122 and 124 are positioned around the exterior of mandrel 108 immediately above and below flange 112. Upper bushing 122 is against the upper surface of flange 112 and has a greater thickness than the height of the upper end 114 of tubing mandrel 108 above flange 112 so that its upper surface 126 when engaged with shoulder 104 in hanger mandrel 100, upper end 114 of tubing mandrel 108 is spaced below shoulder 103 of hanger mandrel 100. Lower bushing 124 is positioned between the lower surface of flange 112 and against the upper support surface 128 of support sleeve 118. Bushings 122 and 124 are similar in material and strength characteristics to bushings 54 and 56 as previously discussed and include suitable seals as hereinafter discussed. Seal 130 is provided around the upper exterior of bushing 122 and seal 132 is provided around the lower interior of bushing 122. Seal 134 is provided around the upper interior of bushing 124 and seal 136 is provided around the lower exterior of bushing 124 as shown in figure 2A. Each of the seals 130, 132, 134 and 136 include a metallic spacer ring 138 at the corners of the bushings and a cup shaped ring 139 near the mid points of the bushings with the open end of the cups of bushing 122 facing upwardly and the open end of the cups of bushing 124 facing downwardly.

Both bushings 122 and 124 fit closely around the exterior of tubing mandrel 108 and extend outwardly beyond the exterior of flange 112 to ensure that tubing mandrel flange 112 does not come into contact with the interior of intermediate bore 102 of hanger mandrel 100. In this manner bushings 122 and 124 completely insulate tubing mandrel 108 and the tubing suspended therefrom from being in contact with the wellhead 70 or other components which would interfere with the electrical insulation provided. The exterior of tubing mandrel 108 is reduced in diameter immediately below bushing 124 to further ensure that it does not come into contact with support sleeve 118.

In the modified form of the invention illustrated in FIGURE 3, wellhead 150 is similar to wellhead 70 and includes a spool housing 152 with upper and lower flanges 154 and 156 for connection into the wellhead stack. Internal landing seat 158 is formed on the interior of housing 152 and is adapted to receive landing shoulder 160 of hanger 162 landed thereon as shown in FIGURE 3. Locking pins 164 thread radially inward in upper flange 154 and are positioned to engage within groove 166 around the upper exterior of hanger 162. Suitable sealing is provided above and below groove 166 as shown. Ports 168 extend through housing 152 into the space between hanger 162 and the interior of housing 152 below landing seat 158.

Hanger 162 is generally tubular in shape and in-

cludes central bore 170 threaded at the upper end thereof at 172 for receiving at tubular member therein and threaded at the lower end thereof at 174 for receiving tubing sub 176. Tubing sub 176 extends downward from the lower end of hanger bore 170 and engages within the upper threaded bore 178 of hanger mandrel 180. Hanger mandrel 180 includes intermediate bore 182 below bore 178 with shoulder 184 therebetween and lower threaded bore 186. Tubing mandrel 188 is generally tubular in shape having a central bore 190 and an outer flange 192 spaced below upper end 196 of tubing mandrel 188. The lower exterior end 196 of tubing mandrel 188 is threaded to receive the upper end of a tubing string (not shown) which is to be supported thereon. Support sleeve 198 is threaded in lower threaded bore 186 of mandrel 180 and is secured in position by locking pins 200 which are threaded through the lower portion of hanger mandrel 180 and engage support sleeve 198. Annular insulating bushings 202 and 204 are positioned around the exterior of mandrel 180 immediately above and below flange 192. Upper bushing 202 is against the upper surface of flange 192 and has a greater thickness than the height of the upper end 194 of tubing mandrel 180 above flange 192 so that its upper surface 206 when engaged with shoulder 184 in hanger mandrel 180, upper end 194 of tubing mandrel 188 is spaced below shoulder 184 of hanger mandrel 180. Lower bushing 204 is positioned between the lower surface of flange 192 and against the upper support surface 206 of support sleeve 198. Bushings 202 and 204 are similar in material and strength characteristics to bushings 54, 56, 122 and 124 as previously discussed and include suitable seals as hereinafter discussed.

Both bushings 202 and 204 are positioned tightly around the exterior of mandrel 188 and have sufficient radial dimension to prevent engagement of mandrel 188 with the surface of counterbore 182. The exterior of mandrel 188 below surface 207 is reduced in diameter to ensure that there is no incidental contact therebetween.

The sealing means used with bushings 202 and 204 are identical with the sealing means used with bushings 54 and 56. Both bushings 202 and 204 include inner grooves 208 and outer grooves 210 in which suitable sealing means, such as elastomeric seal rings 212 and 214, are positioned to prevent leakage between the interior of hanger mandrel 180 and tubing mandrel 188. The structure of the wellhead 150 shown in Figure 3 is similar to the structure of wellhead 70 shown in Figure 2 except that the sealing means used in wellhead 150 is similar to the sealing means used in wellhead 10.

The structure illustrated in Figure 4 is a sectional view of the electrical insulation of section 220 of tubing string from the remainder of string 222 through the use of two insulating couplings 224 and 226 which

connect section 220 at its upper and lower end respectively to tubing string 222. Couplings 224 and 226 are identical and are given the same component numerical identification. Couplings 224 and 226 include coupling body 228 which has upper internal threads 230, first counterbore 232 below threads 230 with shoulder 234 formed therebetween and second counterbore 236 which is threaded to receive support sleeve 238. The portions 220a and 220b of tubing string 222 and section 220 include an external flange 240 immediately below upper end 242 thereof with upwardly facing shoulder 244 spaced below upper end 242 by a distance which is less than the thickness of insulating ring 246 and downwardly facing shoulder 248. The lower exterior surface 250 below shoulder 248 is maintained substantial cylindrical for the distance approximating the thickness of insulating ring 252 which engages shoulder 248 and is reduced in diameter below surface 250 to avoid incidental contact with support sleeve 238. Pins 254 are threaded through body 228 and engage in the outer grooves 255 in the support sleeve 238 to secure it in position once it has been properly tightened against insulating ring 252.

As can be seen, this structure allows section 220 to be completely electrically insulated from the remainder of string 222 so that any electrical operation can be completed without fear of the electrical connections being shorted into tubing string 222. Insulating rings 246 and 252 are of a suitable construction and material to provide the desired electrical insulation and to have sufficient strength to maintain the portions within the coupling bodies 224 and 226 in their desired position and to transfer the load of the weight of the tubing string 222 to the upper string so that it can be supported from above with the string in tension. Insulating rings 246 and 252 are shown to have the same design as that of insulating bushings 122 and 124 but may be similar to insulating bushings 54 and 56.

Claims

1. A wellhead structure comprising a housing (12,72,152) having an internal landing seat (18,78,158), a hanger (22,82,162) having an external landing shoulder (20,80,160) adapted to be landed on the housing landing seat to support the hanger within the housing, the hanger having an upper bore (30,90,170) and a lower counterbore (32,102,182), with a downwardly facing shoulder (34,104,184) between the bore and the counterbore, a hanger mandrel (48,100,180) having a tubular body and a flange (50,112,192) extending outwardly therefrom near the upper end thereof, a first annular bushing (54,122,202) of electrically insulating material positioned around the upper



cludes central bore 170 threaded at the upper end thereof at 172 for receiving at tubular member therein and threaded at the lower end thereof at 174 for receiving tubing sub 176. Tubing sub 176 extends downward from the lower end of hanger bore 170 and engages within the upper threaded bore 178 of hanger mandrel 180. Hanger mandrel 180 includes intermediate bore 182 below bore 178 with shoulder 184 therebetween and lower threaded bore 186. Tubing mandrel 188 is generally tubular in shape having a central bore 190 and an outer flange 192 spaced below upper end 196 of tubing mandrel 188. The lower exterior end 196 of tubing mandrel 188 is threaded to receive the upper end of a tubing string (not shown) which is to be supported thereon. Support sleeve 198 is threaded in lower threaded bore 186 of mandrel 180 and is secured in position by locking pins 200 which are threaded through the lower portion of hanger mandrel 180 and engage support sleeve 198. Annular insulating bushings 202 and 204 are positioned around the exterior of mandrel 180 immediately above and below flange 192. Upper bushing 202 is against the upper surface of flange 192 and has a greater thickness than the height of the upper end 194 of tubing mandrel 180 above flange 192 so that its upper surface 206 when engaged with shoulder 184 in hanger mandrel 180, upper end 194 of tubing mandrel 188 is spaced below shoulder 184 of hanger mandrel 180. Lower bushing 204 is positioned between the lower surface of flange 192 and against the upper support surface 206 of support sleeve 198. Bushings 202 and 204 are similar in material and strength characteristics to bushings 54, 56, 122 and 124 as previously discussed and include suitable seals as hereinafter discussed.

Both bushings 202 and 204 are positioned tightly around the exterior of mandrel 188 and have sufficient radial dimension to prevent engagement of mandrel 188 with the surface of counterbore 182. The exterior of mandrel 188 below surface 207 is reduced in diameter to ensure that there is no incidental contact therebetween.

The sealing means used with bushings 202 and 204 are identical with the sealing means used with bushings 54 and 56. Both bushings 202 and 204 include inner grooves 208 and outer grooves 210 in which suitable sealing means, such as elastomeric seal rings 212 and 214, are positioned to prevent leakage between the interior of hanger mandrel 180 and tubing mandrel 188. The structure of the wellhead 150 shown in Figure 3 is similar to the structure of wellhead 70 shown in Figure 2 except that the sealing means used in wellhead 150 is similar to the sealing means used in wellhead 10.

The structure illustrated in Figure 4 is a sectional view of the electrical insulation of section 220 of tubing string from the remainder of string 222 through the use of two insulating couplings 224 and 226 which

connect section 220 at its upper and lower end respectively to tubing string 222. Couplings 224 and 226 are identical and are given the same component numerical identification. Couplings 224 and 226 include coupling body 228 which has upper internal threads 230, first counterbore 232 below threads 230 with shoulder 234 formed therebetween and second counterbore 236 which is threaded to receive support sleeve 238. The portions 220a and 220b of tubing string 222 and section 220 include an external flange 240 immediately below upper end 242 thereof with upwardly facing shoulder 244 spaced below upper end 242 by a distance which is less than the thickness of insulating ring 246 and downwardly facing shoulder 248. The lower exterior surface 250 below shoulder 248 is maintained substantial cylindrical for the distance approximating the thickness of insulating ring 252 which engages shoulder 248 and is reduced in diameter below surface 250 to avoid incidental contact with support sleeve 238. Pins 254 are threaded through body 228 and engage in the outer grooves 255 in the support sleeve 238 to secure it in position once it has been properly tightened against insulating ring 252.

As can be seen, this structure allows section 220 to be completely electrically insulated from the remainder of string 222 so that any electrical operation can be completed without fear of the electrical connections being shorted into tubing string 222. Insulating rings 246 and 252 are of a suitable construction and material to provide the desired electrical insulation and to have sufficient strength to maintain the portions within the coupling bodies 224 and 226 in their desired position and to transfer the load of the weight of the tubing string 222 to the upper string so that it can be supported from above with the string in tension. Insulating rings 246 and 252 are shown to have the same design as that of insulating bushings 122 and 124 but may be similar to insulating bushings 54 and 56.

Claims

1. A wellhead structure comprising a housing (12,72,152) having an internal landing seat (18,78,158), a hanger (22,82,162) having an external landing shoulder (20,80,160) adapted to be landed on the housing landing seat to support the hanger within the housing, the hanger having an upper bore (30,90,170) and a lower counterbore (32,102,182), with a downwardly facing shoulder (34,104,184) between the bore and the counterbore, a hanger mandrel (48,100,180) having a tubular body and a flange (50,112,192) extending outwardly therefrom near the upper end thereof, a first annular bushing (54,122,202) of electrically insulating material positioned around the upper



- end of the mandrel and between the hanger counterbore shoulder and the upper surface of the mandrel flange, a second annular bushing (56,124,204) of electrically insulating material positioned around the mandrel and below the mandrel flange within the counterbore, means secured to the hanger and providing supporting engagement of the second annular bushing, the bushings being sized to maintain the mandrel in spaced relationship to the hanger to prevent electrical contact therebetween.
2. A wellhead structure according to claim 1, wherein the bushing (54,122,202;56,124,204) are ceramic bushings.
 3. A wellhead structure according to claim 1 or claim 2, wherein the bushings (54,122,202;56,124,204) have sufficient strength to maintain the spacing between the mandrel (48,100,180) and the hanger (22,82,162) to transfer the tubing load from the mandrel to the hanger.
 4. A wellhead structure according to any one of the preceding claims, including sealing means (66,68,130,132,134,136,212,214) associated with each of the bushings for sealing between the exterior of the mandrel (48,100,180) and the interior of the hanger (22,82,162).
 5. A wellhead structure according to claim 4, wherein the sealing means includes inner (66,132,134,212) and outer (68,130,136,214) sealing rings positioned in grooves (62,208,64,210) in the interior and exterior surfaces of the first (54,122,202) and second (56,124,202) bushings.
 6. A wellhead structure according to claim 5, wherein the sealing rings are elastomeric sealing rings.
 7. A wellhead structure according to claim 4, wherein the sealing means includes a recess around the upper exterior of the first bushing (122) and a recess around the lower interior of the first bushing, a recess around the upper interior of the second bushing (124) and a recess around the lower exterior of the second bushing, a seal (130,132,134,136) positioned in each of the recesses including a metallic spacer ring (138) positioned at the corners of the bushings, and a cup-shaped metal ring (139) positioned in the recesses with the metal cup rings in the first bushing recess facing upwardly and the metal cup rings in the second bushing recess facing downwardly.
 8. A wellhead structure according to claim 1, wherein the supporting means includes a support sleeve (42,118,198) threaded into the lower interior of the hanger counterbore (32,102,182).
 9. A wellhead structure according to claim 1, including a tubing sub secured to the hanger, the hanger mandrel (48,100,180) being secured to the lower end of the tubing sub, and wherein the hanger mandrel has bore, counterbore and shoulder therebetween and the tubing mandrel is positioned therein.
 10. A wellhead structure according to any one of the preceding claims, wherein the first annular insulating bushing (54,122,202) is positioned within the hanger counter bore (32,102,82) and against a hanger downwardly facing shoulder and on the upwardly facing shoulder of the hanger mandrel flange, the first annular bushing having a thickness which is greater than the projection of the hanger mandrel body above the upwardly facing flange shoulder, and the second bushing (56,124,204) has an outer diameter allowing it to be positioned within the hanger counterbore and an inner diameter to fit closely around the exterior of the hanger mandrel (48,100,180) immediately below the flange (50,112,192).
 11. A well structure comprising a wellhead according to any one of the preceding claims and further comprising a any one of the preceding claims and further comprising a tubing string (222) fixed to the mandrel of the wellhead, a first coupling (224) connecting to the tubing string, a section of tubing (220) connected to the first coupling, a second coupling (226) connecting to the section of tubing and to the tubing string, each of the couplings including a body (228) having an internal bore and a counterbore (232) with a downwardly facing shoulder (234) at the upper end of such counterbore, a section of tubing having an external flange (240) immediately below the upper end of such tubing to provide an external upwardly facing shoulder (244) and an external downwardly facing shoulder (248), an upper insulating ring (246) and a lower insulating ring (252), the insulating rings being of a material providing electrical insulation and support strength, and a support sleeve (238) secured within the body to support the lower insulating ring in engagement with the lower external downwardly facing shoulder and with the upper insulating ring engaged between the body internal shoulder and with the upwardly facing flange shoulder, the upper insulating ring being of sufficient axial dimension to space the upper end of the tubing portion below the downwardly facing body shoulder.
 12. A well structure according to claim 11, wherein



the insulating rings (246,252) are ceramic.

13. A well structure according to claim 11 or claim 12, wherein the insulating rings (246,252) have sufficient strength to maintain the spacing between the tubing portions (220,222) and the bodies (228) and to transfer the load of the weight of the tubing strings to the upper end of the tubing string.

Patentansprüche

1. Bohrlochkopfstruktur, **gekennzeichnet** durch ein Gehäuse (12, 72, 152), das eine interne Setzschulter (18, 78, 158) eine Aufhängung (22, 82, 162) mit einer äußeren Setzschulter (20, 80, 160), die so beschaffen ist, daß sie auf der Setzschulter des Gehäuses aufsetzen kann, um die Aufhängung im Gehäuse abzustützen, wobei die Aufhängung eine obere Bohrung (30, 90, 170) und eine untere Gegenbohrung (32, 102, 182) mit nach unten weisender Schulter (34, 104, 184) zwischen der Bohrung und der Gegenbohrung aufweist, eine Aufhängespindel (48, 100, 180) mit einem rohrförmigen Körper und einem Flansch (50, 112, 192), der in der Nähe von deren oberem Ende nach außen vorsteht, eine erste ringförmige Buchse (54, 122, 202) aus elektrisch isolierendem Material, die um das obere Ende der Spindel zwischen der Schulter an der Gegenbohrung der Aufhängung und der oberen Fläche des Spindelflansches angeordnet ist, einer zweiten ringförmigen Buchse aus elektrisch isolierendem Material, die um die Spindel unterhalb des Spindelflansches innerhalb der Gegenbohrung angeordnet ist, einer Vorrichtung, die an der Aufhängung befestigt ist und eine Abstützung der zweiten ringförmigen Buchse bewirkt, wobei die Buchsen so bemessen sind, daß sie die Spindel gegenüber der Aufhängung auf Abstand halten, um einen elektrischen Kontakt zwischen diesen Teilen zu verhindern.
2. Bohrlochkopfstruktur nach Anspruch 1, **dadurch gekennzeichnet**, daß die Buchsen (54, 122, 202; 56, 124, 204) keramische Buchsen sind.
3. Bohrlochkopfstruktur nach Anspruch 1 oder 2, **dadurch gekennzeichnet**, daß die Buchsen (54, 122, 202; 56, 124, 204) genügende Festigkeit besitzen, um den Abstand zwischen der Spindel (48, 100, 180) und der Aufhängung (22, 82, 162) einzuhalten und die Rohrlast von der Spindel auf die Aufhängung zu übertragen.
4. Bohrlochkopfstruktur nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch ge-**

kennzeichnet, daß Dichtelemente (66, 68, 130, 132, 134, 136, 212, 214) enthalten sind, die mit jeder der Buchsen verbunden sind und eine Dichtung zwischen der Außenfläche der Spindel (48, 100, 180) und der Innenfläche der Aufhängung (22, 82, 162) bewirken.

5. Bohrlochkopfstruktur nach Anspruch 4, **dadurch gekennzeichnet**, daß die Dichtelemente aus inneren (66, 132, 134, 212) und äußeren (68, 130, 136, 214) Dichtringen bestehen, die in Nuten (62, 208, 64, 210), in den inneren und äußeren Flächen der ersten (54, 122, 202) und zweiten (56, 124, 202) Buchsen angeordnet sind.
6. Bohrlochkopfstruktur nach Anspruch 5, **dadurch gekennzeichnet**, daß die Dichtringe aus Elastomeren bestehen.
7. Bohrlochkopfstruktur nach Anspruch 4, **dadurch gekennzeichnet**, daß die Dichtelemente umfassen: einen Absatz um die obere Außenseite der ersten Buchse (122) und einen Absatz um die untere Innenseite der ersten Buchse, einen Absatz um die obere Innenseite der zweiten Buchse (124) und einen Absatz um die untere Außenseite der zweiten Buchse, eine Dichtung (130, 132, 134, 136), die in jedem der Absätze angeordnet ist, bestehend aus einem metallischen Abstandsring (138), der im Eckbereich der Buchsen angeordnet ist, und einen im Schnitt becherförmigen Metallring (139), der in den Absätzen angeordnet ist, wobei die becherförmigen Metallringe im ersten Buchsenabsatz nach oben und im zweiten Buchsenabsatz nach unten weisen.
8. Bohrlochkopfstruktur nach Anspruch 1, **dadurch gekennzeichnet**, daß die Stützvorrichtung eine Stützmuße (42, 118, 198) enthält, die in die untere Innenseite der Gegenbohrung (32, 102, 182) eingeschraubt ist.
9. Bohrlochkopfstruktur nach Anspruch 1, **gekennzeichnet** durch einen zusätzlichen Rohrverbinder, der an der Aufhängung befestigt ist, wobei die Aufhängespindel (48, 100, 180) am unteren Ende des Rohrverbinders befestigt ist und eine Bohrung, eine Gegenbohrung und eine sich dazwischen befindliche Schulter besitzt und die Aufhängespindel darin angeordnet ist.
10. Bohrlochkopfstruktur nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, daß die erste ringförmige Isolierbuchse (54, 122, 202) innerhalb der Gegenbohrung der Aufhängung (32, 102, 82) und gegen eine der Aufhängung nach unten entgegenweisende Schulter und an der nach unten weisenden

Schulter des Flansches der Aufhängespindel angeordnet ist, wobei die erste ringförmige Buchse eine Dicke aufweist, welche größer ist als der Vorsprung des Körpers der Aufhängespindel über der nach unten weisenden Schulter des Flansches, und die zweite Buchse (56, 124, 204) einen Außendurchmesser hat, der es ermöglicht, sie innerhalb der Gegenbohrung der Aufhängung anzuordnen, sowie einen inneren Durchmesser, der dicht um die Außenseite der Aufhängespindel (48, 100, 180) unmittelbar unterhalb des Flansches (50, 112, 192) sitzt.

11. Bohrlochkopfstruktur mit einem Bohrlochkopf nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie weiterhin umfaßt: einen Rohrstrang (222), der an der Spindel des Bohrlochkopfes befestigt ist, eine erste Kupplung (224), die die Verbindung zum Rohrstrang herstellt, einen Rohrabschnitt (220), der mit der ersten Kupplung verbunden ist, eine zweite Kupplung (226), die die Verbindung zu dem Rohrabschnitt und zum Rohrstrang herstellt, wobei jede der Kupplungen einen Körper (228) besitzt, der eine innere Bohrung und eine Gegenbohrung (232) mit einer nach unten weisenden Schulter (234) am oberen Ende der Gegenbohrung aufweist, einen Rohrabschnitt mit einem äußeren Flansch (240) unmittelbar unterhalb des oberen Endes eines solchen Rohres, um eine äußere nach oben gerichtete Schulter (244) und eine äußere nach unten gerichtete Schulter (248) bereitzustellen, einen oberen Isolerring (246) und einen unteren Isolerring (252), die beide aus einem elektrisch nichtleitenden und stützfesten Material bestehen, und einer Stützmuffe (238), die innerhalb des Körpers befestigt ist, um den unteren Isolerring in Verbindung mit der unteren äußeren, nach unten weisenden Schulter und mit dem oberen Isolerring, der zwischen der inneren Schulter des Körpers und der aufwärts weisenden Schulter des Flansches angeordnet ist, zu bringen, wobei der obere Isolerring eine geeignete axiale Dimensionierung aufweist, um das obere Ende des Rohrteiles unterhalb der abwärts weisenden Schulter des Körpers auf Abstand zu halten.

12. Bohrlochkopfstruktur nach Anspruch 11, dadurch gekennzeichnet, daß die Isolerringe (246, 252) aus Keramik bestehen.

13. Bohrlochkopfstruktur nach Anspruch 11 oder 12, dadurch gekennzeichnet, daß die Isolerringe (246, 252), genügend Festigkeit aufweisen, um den Abstand zwischen den Rohrteilen (220, 222) und den Körpern (228) zu halten und die Gewichtslast der Rohrstränge auf deren oberes En-

de zu übertragen.



Revendications

1. Structure de tête de puits comportant un boîtier (12, 72, 152) ayant un siège (18, 78, 158) d'appui intérieur, un dispositif de suspension (22, 82, 162), ayant un épaulement (20, 80, 160) d'appui extérieur adapté pour être en appui sur le siège d'appui du boîtier pour supporter le dispositif de suspension à l'intérieur du boîtier, le dispositif de suspension ayant un alésage supérieur (30, 90, 170) et un contre-alésage inférieur (32, 102, 182), un épaulement (34, 104, 184) dirigé vers le bas existant entre l'alésage et le contre-alésage, un mandrin (48, 100, 180) de dispositif de suspension ayant un corps tubulaire et une collerette (50, 112, 152) s'étendant vers l'extérieur à partir de celui-ci à proximité de l'extrémité supérieure de ce dernier, une première bague (54, 122, 202) annulaire de matériau électriquement isolant positionnée autour de l'extrémité supérieure du mandrin et entre l'épaulement du contre-alésage du dispositif de suspension et la surface supérieure de la collerette du mandrin, une seconde bague (56, 124, 204) annulaire de matériau électriquement isolant positionnée autour du mandrin et en dessous de la collerette du mandrin à l'intérieur du contre-alésage, des moyens fixés au dispositif de suspension et fournissant un contact de support de la seconde bague annulaire, les bagues étant dimensionnées pour maintenir le mandrin écarté par rapport au dispositif de suspension pour empêcher un contact électrique entre ces derniers.
2. Structure de tête de puits selon la revendication 1, dans laquelle les bagues (54, 122, 202; 56, 104, 204) sont des bagues en céramique.
3. Structure de tête de puits selon la revendication 1 ou 2, dans laquelle les bagues (54, 122, 202; 56, 124, 204) ont une résistance suffisante pour maintenir l'écartement existant entre le mandrin (48, 100, 180) et le dispositif de suspension (22, 82, 162) pour transférer la charge du tubage à partir du mandrin vers le dispositif de suspension.
4. Structure de tête de puits selon l'une quelconque des revendications précédentes, comportant des moyens d'étanchéité (66, 68, 130, 132, 134, 136, 212, 214) associés à chacune des bagues pour assurer l'étanchéité entre la partie extérieure du mandrin (48, 100, 180) et la partie intérieure du dispositif de suspension (22, 82, 162).
5. Structure de tête de puits selon la revendication



- 4, dans laquelle les moyens d'étanchéité comportent des anneaux d'étanchéité intérieurs (66, 132, 134, 212) et extérieurs (68, 130, 136, 214) positionnés dans des gorges (62, 208, 64, 210) situées dans les surfaces intérieure et extérieure des premières (54, 122, 202) et secondes (56, 124, 202) bagues. 5
6. Structure de tête de puits selon la revendication 5, dans laquelle les anneaux d'étanchéité sont des anneaux d'étanchéité en élastomère. 10
7. Structure de tête de puits selon la revendication 4, dans laquelle les moyens d'étanchéité comportent une cavité située autour de la partie extérieure supérieure de la première bague (122) et une cavité située autour de la partie intérieure inférieure de la première bague, une cavité située autour de la partie intérieure supérieure de la seconde bague (124) et une cavité située autour de la partie extérieure inférieure de la seconde bague, un joint (130, 132, 134, 136) positionné dans chacune des cavités comportant un anneau métallique (138) formant écarteur positionné au niveau des angles des bagues, et un anneau métallique (139) en forme de coupelle positionné dans les cavités, les anneaux métalliques en forme de coupelle situés dans la cavité de la première bague étant dirigés vers le haut et les anneaux métalliques en forme de coupelle situés dans la cavité de la seconde bague étant dirigés vers le bas. 15 20 25 30
8. Structure de tête de puits selon la revendication 1, dans laquelle les moyens de support comportent un manchon de support (42, 118, 198) fileté dans la partie intérieure inférieure du contre-alésage (32, 102, 182) du dispositif de suspension. 35 40
9. Structure de tête de puits selon la revendication 1, comportant un sous-ensemble de tubage fixé au dispositif de suspension, le mandrin (48, 100, 180) du dispositif de suspension étant fixé à l'extrémité inférieure du sous-ensemble de tubage et dans lequel le mandrin du dispositif de suspension comporte un alésage, un contre-alésage et un épaulement situé entre eux et le mandrin de tubage étant positionné à l'intérieur. 45
10. Structure de tête de puits selon l'une quelconque des revendications précédentes, dans laquelle la première bague (54, 122, 202) annulaire isolante est positionnée à l'intérieur du contre-alésage (32, 102, 82) du dispositif de suspension et contre un épaulement dirigé vers le bas du dispositif de suspension et sur l'épaulement dirigé vers le haut de la collerette du mandrin du dispositif de suspension, la première bague annulaire ayant une épaisseur qui est plus grande que le prolongement du corps du mandrin du dispositif de suspension au-dessus de l'épaulement dirigé vers le haut de la collerette, et la seconde bague (56, 124, 204) a un diamètre extérieur lui permettant d'être positionnée à l'intérieur du contre-alésage du dispositif de suspension et un diamètre intérieur qui s'adapte de manière serrée autour de la partie extérieure du mandrin (48, 100, 180) du dispositif de suspension immédiatement au-dessous de la collerette (50, 112, 192). 50
11. Structure de puits comportant une tête de puits selon l'une quelconque des revendications précédentes et comportant en outre une ligne de tubage (222) fixée au mandrin de la tête de puits, un premier raccord (224) reliant la ligne de tubage, un tronçon de tubage (220) relié au premier raccord, un second raccord (226) reliant le tronçon de tubage à la ligne de tubage, chacun des raccords comportant un corps (228) ayant un alésage intérieur et un contre-alésage (232), un épaulement (234) dirigé vers le bas étant situé au niveau de l'extrémité supérieure du contre-alésage, un tronçon de tubage ayant une collerette extérieure (240) située immédiatement en dessous de l'extrémité supérieure dudit tubage pour fournir un épaulement (244) extérieur dirigé vers le haut et un épaulement (248) extérieur dirigé vers le bas, un anneau isolant supérieur (246) et un anneau isolant inférieur (252), les anneaux isolants étant constitués d'un matériau assurant l'isolation électrique et la résistance de support, et un manchon de support (238) fixé à l'intérieur du corps pour supporter l'anneau isolant inférieur en contact avec l'épaulement extérieur inférieur dirigé vers le bas et l'anneau isolant supérieur étant en contact entre l'épaulement intérieur du corps et l'épaulement dirigé vers le haut de la collerette, l'anneau isolant supérieur ayant une dimension axiale suffisante pour écarter l'extrémité supérieure de la partie de tubage en dessous de l'épaulement dirigé vers le bas du corps. 55
12. Structure de puits selon la revendication 11, dans laquelle les anneaux isolants (246, 252) sont en céramique.
13. Structure de puits selon la revendication 11 ou 12, dans laquelle les anneaux isolants (246, 252) ont une résistance suffisante pour maintenir l'écartement entre les parties de tubage (220, 222) et les corps (228) et pour transférer la charge du poids des lignes de tubage vers l'extrémité supérieure de la ligne de tubage.