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SUPERINDUSTRIA Y COMERCIO

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DIVISION DE NUEVAS CREACIONES

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

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COD:01

RE.:

EXPEDIENTE N° 00091343 ✓

TITULO: COMPONENTES CERÁMICOS PARA POZOS

PETROLEROS A ALTA PRESIÓN

SOLICITANTE: CARPENTER ADVANCED CERAMICS, INC.

FECHA SOLICITUD: NOVIEMBRE 29, 2000

ASUNTO: PRESENTACIÓN DE PRIORIDAD

DILIA RODRIGUEZ D'ALEMAN, en mi condición de apoderada de la sociedad solicitante, en esta oportunidad por el presente escrito me permito presentar:

- **Copia certificada de la prioridad Estadounidense reivindicada N°. 09/451,989 de Noviembre 30 de 1999.**
- **Traducción al Español de la mencionada prioridad**

Esta prioridad está siendo presentada dentro del término de 3 meses que exige el Convenio de París, toda vez que la solicitud fué radicada el 29 de Noviembre de 2000.

Ruego a usted continuar con el presente trámite.

Señor Jefe,

DILIA RODRIGUEZ D'ALEMAN
LCDerr

PA 324372

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APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A
FILING DATE UNDER 35 USC 111.**

APPLICATION NUMBER: 09/451,989**FILING DATE: November 30, 1999**

**By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS**

**TRANSLATION OFICIAL No. 01/012
JOSE PABLO PIEDRAHITA AGUILERA
TRADUCTOR E INTERPRETE OFICIAL
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**N. WOODSON
Certifying Officer**

UTILITY PATENT APPLICATION TRANSMITTAL

Attorney Docket No. CA-301 US Total Pages 40

First Named Inventor or Application Identifier MENTESH, Ibrahim M. et al.

Express Mail Label No. EL421484422US Date Mailed November 19, 1999

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20531

1. [X] Fee Transmittal Form (Submit an original, and a duplicate for fee processing)

2. [X] Specification (preferred arrangement set forth below) (Total Pages [14])

3. [X] Drawing(s) (35 USC 113) (Total Sheets [7])

4. [X] Oath or Declaration (Total Pages [1])

5. [X] Incorporation By Reference (useable if Box 4b is checked) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. [] Microfiche Computer Program (Appendix)

7. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)

8. [] Computer Readable Copy

9. [] Paper Copy (identical to computer copy)

ACCOMPANYING APPLICATION PARTS

1. [] Assignment Papers (cover sheet & document(s))

2. [] 37 CFR 3.73(b) Statement (when there is an assignee) [] Power of Attorney

3. [] English Translation Document (if applicable)

4. [] Information Disclosure Statement (IDS)/PTO-1449 [] Copies of IDS Citations

5. [] Preliminary Amendment

6. [X] Return Receipt Postcard (MPEP 503) (Should be specifically itemized)

7. [] Small Entity Statement(s) [] Statement Filed in prior application, Status still proper and desired

8. [] Certified Copy of Priority Document(s) (if foreign priority is claimed)

9. [] Other

10. If a CONTINUING APPLICATION, check appropriate box and supply requisite information.

11. [] Continuation [] Divisional [] Continuation-in-part (CIP) of the following application(s), each of which is hereby incorporated herein by reference:

12. Priority Applications In addition to any applications listed in 17a, the present application also claims priority to the following application(s), each of which is hereby incorporated herein by reference.

18. CORRESPONDENCE ADDRESS

[X] Customer Number 000110 or DANN, DORFMAN, HERRELL AND SKILLMAN, P.C. 1801 Market Street, Suite 720 Philadelphia, PA 19103-2307 Phone (215) 583-4100 Facsimile (215) 583-4044 to the attention of the individual identified below.

BRUCE D. GEORGE PTO Registration No. 43,831

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CERAMIC COMPONENTS FOR HIGH PRESSURE OIL WELLS

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FIELD OF THE INVENTION

This invention relates generally piping components for high pressure oil wells, and in particular to the use of ceramic material in wear components for a pressure reducer assembly for such wells.

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BACKGROUND OF THE INVENTION

Many oil well facilities around the world operate under high pressure. In other words, the pressure within the well is sufficiently high (e.g., 3000 to 5000 psi) to carry the crude oil to the surface without pumping. Unless restricted, the crude oil flows to the surface at a high velocity and contains sand and other debris which erodes the interior surfaces of the oil well piping components. In order to limit the amount of sand and debris that is carried with the extracted oil, the high well pressure is maintained in the exit piping by using a pressure reducer at the head end of the well. For instance, a six inch inner diameter well pipe is reduced to three inches through a series of narrow channel pipe components. The flow channel is then further reduced to less than one inch, or even less than one-half inch, in the pressure reducer assembly.

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The known pressure reducing devices are made of carbon steel and have tungsten carbide inserts to line the inside surfaces of the flow channels. The abrasive oil-and-sand mixture not only wears away the inside wall of the flow channels, but also backwashes around the outside diameter of the flow reducer and wears away the steel body of the flow reducer, resulting in gross failure of the reducer itself. Often, the metal housing surrounding the flow reducer is severely worn as well. Continuous erosion of the pressure reducer over time results in a

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slow and continuous loss of desired operating pressure until gross failure requires replacement. This loss in operating pressure causes an ever-increasing sand content, resulting in less efficient oil production. The average life of the known flow reducers is about 4 to 12 weeks. Oil well downtime to replace a pressure
5 reducer and/or other components, is usually four to eight hours. High pressure oil wells typically produce about 5,000 to 12,000 barrels of oil a day. It is readily apparent that the present construction of the oil well pressure reducing assemblies leaves something to be desired with respect to wear resistance and useful life.

10 **SUMMARY OF THE INVENTION**

Accordingly, it is a principal object of this invention to extend the operating life of high pressure oil well components, resulting in more efficient oil production.

Another object of this invention is to minimize abrasive wear of the steel
15 surfaces of high pressure oil well components.

Another object of this invention is to minimize erosive channeling (backflow) between a pressure reducer and the reducing valve body by sealing any voids between the reducing valve and the pressure reducer.

Another object of this invention is to increase the wear resistance of flow
20 channel surfaces that are susceptible to erosion wear.

A still further object of this invention is to minimize turbulent flow to lessen the likelihood of channeling and erosion.

The above and other objects are achieved in a pressure reducer made entirely of solid ceramic material, in a ceramic-lined reducing valve, and in
25 ceramic-lined narrow bore piping components, with all ceramic elements susceptible to flow containing modified flow channel designs. The ceramic material may be any one selected from the class of technical ceramics, referring to ceramic materials exhibiting superior mechanical properties.

The ceramic pressure reducer lessens both the interior and exterior erosion

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that occurs with a steel pressure reducer. The ceramic pressure reducer is fitted into the downstream end of a ceramic-lined reducing valve. The replaceable ceramic linings of the reducing valve are more wear resistant than steel, thus protecting the interior steel surfaces of the reducing valve flow channels. The ceramic liners also provide better sealing of the area between the pressure reducer and the reducing valve channel wall. The ceramic liners in the narrow bore components, and in the reducing valve, not only wear better than steel or carbide materials, but also allow for a more precise flow channel design, thus lessening the deteriorating affects of turbulent vortex flow.

BRIEF DESCRIPTION OF DRAWINGS

The foregoing summary, as well as the following detailed description of a preferred embodiment of the present invention, will be better understood when read in conjunction with the drawings, in which:

Figure 1 is a side elevation view of a pressure reducing assembly for a high pressure oil well;

Figure 2 is a side elevation view in partial cross section showing the interior of the pressure reducing valve of Figure 1 as viewed along line 2-2 thereof;

Figure 3 is a cross-sectional side-view of a ceramic liner used in the upstream channel of the pressure reducing valve of Figure 2, as viewed along line 3-3 thereof;

Figure 4 is a cross-sectional side view of an alternative embodiment of the ceramic liner shown in Figure 3;

Figure 5A is side view of a direction changing cavity liner used in the pressure reducing valve shown in Figure 2;

Figure 5B is an end view of the direction changing cavity liner shown in Figure 5A as viewed along line 5B-5B thereof;

Figure 6A is a side view of a key plate liner used in the pressure reducing

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valve shown in Figure 2;

Figure 6B is an end view of the key plate liner shown in Figure 6A as viewed along line 6B-6B thereof;

Fig. 7 is a cross-sectional side view of a downstream cylindrical liner used in the pressure reducing valve of Figure 2, as viewed along line 7-7 thereof;

Figure 8 is a side view of a ceramic flow reducer used in the pressure reducing valve shown in Figure 2;

Figure 9 is a side view of an alternative embodiment of the ceramic flow reducer shown in Figure 8; and

Figure 10 is a side elevational view in cross section showing a spool adapter assembly used in the pressure reducing assembly of Figure 1 as viewed along line 10-10 thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference numerals indicate identical or corresponding parts among the several views and in particular to Fig. 1, there is shown a pressure reducing assembly for a high-pressure well head. For purposes of orientation, the oil flow originating from the well flows through the pressure reducing assembly according to the present invention and toward the oil process piping in the direction shown by the arrows. A pressure reducing valve 10 is connected through an isolation valve 19 to a well head manifold 25. The downstream side of pressure reducing valve 10 is connected to a first spool adapter 20, which is connected to a second spool adapter 30. The second spool adapter 30 is connected to the piping that leads to the oil processing facilities (not shown).

Referring now to Fig. 2, the pressure reducing valve 10 has a metallic body that includes an upstream channel 11, a direction-changing cavity 16, a downstream channel 17, and a key-plate recess 18. A pressure reducer 40 is disposed in the downstream channel 17 and has a hex head 42 and a sealing

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shoulder 43 that extend into the direction-changing cavity 16, adjacent the upstream channel 11. An upstream channel liner 50 is disposed in the upstream channel 11 and a downstream channel liner 80 is disposed in the downstream channel 17. The channel liners 50 and 80 prevent erosion of the inner walls of the channels 11 and 17, respectively, by the oil/sand mixture flowing from the oil well. A direction-changing cavity liner 60 is situated in the direction-changing cavity 16 to prevent erosion and wear of the inner wall of the direction changing cavity 16. A key plate liner 70 is disposed in a key-plate recess 18 situated at an end of the direction-changing cavity 16 adjacent the downstream channel 17. The key plate liner 70 prevents erosion and wear of the metal wall of the key-plate recess 18.

An end cap 15 is provided to close off the direction changing cavity 16. The end cap 15 is removable to permit access to the direction changing cavity 16 for installing and removing the direction changing cavity liner 60 and the key plate liner 70. The end cap 15 can be unthreaded and removed to provide access to direction changing cavity 16. The direction changing cavity liner 60 is removed by sliding it out of the direction changing cavity 16. Once the direction changing cavity liner 60 is removed, the key plate liner 70 can be removed by tilting it out of key plate recess 18 and pulling it through the directional changing cavity 16 and out of the access opening. When the direction changing cavity liner 60 and the key plate liner 70 are removed, the hex head 42 of the pressure reducer 40 is accessible for removal or installation of the pressure reducer 40.

End cap 15 has a port 13 formed therethrough to provide a connection point for a pressure gauge or other pressure sensing device. A second port 14 is formed in the body of pressure reducing valve 10 adjacent to the key-plate recess 18 to provide a connection point for a second pressure gauge or sensing device.

The upstream channel 11 is generally cylindrical and has an inlet portion characterized by a first diameter and an outlet portion 52 that is characterized by a second diameter smaller than the first diameter. The inlet portion and the outlet

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portion meet at an upstream channel maintenance point 12 which serves as a stop for the upstream channel liner 50. Referring now to Fig. 3, there is shown an upstream channel liner 50 in accordance with the present invention. The upstream channel liner 50 is generally cylindrical and has an inlet portion and an outlet portion. The inlet portion has a diameter that is essentially commensurate with the inside diameter of the inlet portion of upstream channel 11 and the outlet portion has an outside diameter that is essentially commensurate with the inside diameter of the outlet portion of upstream channel 11. That arrangement provides a shoulder stop 53 on the exterior of the upstream channel liner 50 which abuts the upstream channel maintenance point 12 when inner end 52 is inserted into the upstream channel 11. The abutment of the shoulder stop 53 with the maintenance point 12 prevents the liner from shifting toward the direction changing cavity 16 when oil is flowing. The upstream channel liner 50 has an internal channel that extends from an opening 51 to the outlet portion 52. The opening is preferably flared to lessen flow turbulence as the oil enters the upstream channel liner 50. In the embodiment shown in Fig. 3, the internal channel tapers to a smaller cross section as it traverses the outlet portion 52. The tapered channel portion 54 relieves some of the pressure and turbulent flow of the oil as it flows through the upstream channel 11. The upstream channel liner 50 is formed of a ceramic material.

Shown in Fig. 4 is an alternative embodiment of the upstream channel liner 50. In the embodiment shown in Fig. 4, the internal channel 55 has a uniform cross section to maximize flow.

Referring now to Figs. 2, 5A, and 5B, the direction changing cavity liner 60 is disposed within the directional changing cavity 16 of pressure reducing valve 10. The directional changing cavity liner 60 is formed of a ceramic material. The liner 60 is generally cylindrical and has an outside diameter that is dimensioned to provide a snug fit between the outer surface of the liner 60 and the inner surface of the cavity 16. A recess 64 is formed in one end of the liner

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60. The recess is dimensioned to provide a space around the head 42 and shoulder 43 of the pressure reducer 40 when it is fully threaded into the downstream channel 17. A central through-hole 61 extends along the length of the direction changing cavity liner 60 to provide a path between the recess 64 and the port 13 for pressure indication. The directional changing cavity liner 60 has a key-way 62 formed thereon which extends longitudinally partially along the exterior of direction changing cavity liner 60. The directional changing cavity liner 60 also has a key plate thru-hole 63 formed therein between the recess 64 and the key-way 62 to provide fluid communication between recess 64 and port 14.

Referring now to Figs. 2, 6A, and 6B, the key plate liner 70 is positioned within the key plate recess 18 of reducing valve 10. Key plate liner 70 contains a key plate thru-hole 71 which aligns with the key plate port 14 and the key plate thru-hole 63 to provide fluid communication between the recess 64 and the key plate port 14. Key plate liner 70 also has a key 72 formed thereon which is dimensioned to mate with the key-way 62 in liner 60 to ensure proper alignment of the key plate liner 70 and the cavity liner 60. The key plate liner 70 is formed of a ceramic material.

Referring now to Figs. 2 and 7, the downstream channel liner 80 is disposed within the downstream channel 17. The downstream channel 80 is generally cylindrical in shape and has an outside diameter that is dimensioned to provide a tight fit with the downstream channel 17. Because of that arrangement, the downstream liner 80 prevents the oil from backwashing between the liner and the interior wall of downstream channel 17. The downstream channel 80 extends less than the full length of the downstream channel 17 so that an attachment region is provided where the pressure reducer 40 can be attached to the body of the pressure reducing valve 10. In the embodiment shown, the pressure reducer 40 is attached by threading it into the downstream channel 17. The downstream channel liner 80 is formed of a ceramic material.

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As shown in Fig. 2, pressure reducer 40 is situated in downstream channel 17 and projects into direction changing cavity 16. Referring now to Fig. 8, there is shown a preferred arrangement for the pressure reducer 40. The pressure reducer 40 is generally cylindrical and has an outside diameter that is

5 substantially commensurate with the inside diameter of downstream liner 80. A series of screw threads 44 are formed on the outer surface adjacent the shoulder 43. The pressure reducer 40 is formed of a ceramic material. A central channel 45 extends longitudinally through the body of the pressure reducer 40 from entry port 41 to an outlet port 49. The central channel 45 flares to a larger inside
10 diameter to provide a pressure reducing effect as the oil flows from entry port 41 through the central channel. When the pressure reducer 40 is threaded into the downstream channel 17, sealing shoulder 43 presses against a washer or gasket to provide a fluid-tight seal against the abrasive flow of oil and sand from direction changing cavity 16. The washer or gasket is preferably formed of Buena-N
15 gasket material or an equivalent thereof.

Fig. 9 shows an alternative embodiment of pressure reducer 40. The embodiment shown in Fig. 9 has a generally cylindrical body including a head portion 92 with a plurality of entry holes 46 formed therein to provide an inlet for the oil. The pressure reducer 40 has a central channel 48 formed longitudinally
20 therethrough. The central channel 48 has a substantially uniform cross section along its length and extends from the head portion 92 to an outlet port 94 in the other end of the pressure reducer 40. The entry holes 46 are in fluid communication with the central channel 48. A hexagonal shoulder 47 is formed about the circumference of the pressure reducer 40 adjacent the head portion 92.
25 The hexagonal shoulder 47 performs the functions of the hex head 42 and shoulder 43 of the embodiment shown in Fig. 8.

Referring back to Fig. 2, upstream cylindrical liner 50 and downstream cylindrical liner 80 are removed by un-bolting flange connections at both ends of reducing valve 10, removing reducing valve 10 from the process piping, and

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sliding upstream cylindrical liner 50 and downstream cylindrical liner 80 out of upstream canal 11 and downstream canal 17, respectively. The liners are installed by reversing this process.

Referring now to Fig. 10, there is shown a spool assembly including a first spool adapter 20 and second spool adapter 30. First spool adapter 20 has a steel body with a central longitudinal channel 21 having a substantially uniform cross section along the length thereof. A ceramic channel liner 22 having a substantially uniform outside diameter 23 that is dimensioned to provide a light press fit in the central channel 21 of first spool adapter 20. The ceramic channel liner 22 extends substantially the entire length of the central channel 21. Channel liner 22 has a flow channel 24 that extends the length of the channel liner 22. The cross section of the flow channel 24 gradually widens in the direction of the oil flow from the inlet of the spool adapter 20 adjacent the pressure reducing valve 10 to its outlet adjacent the second spool adapter 30. The gradual widening or flaring of the flow channel 24 minimizes turbulent, abrasive, flow that would aggravate the wear and erosion caused by the flow of oil and sand therethrough, thus increasing the useful life of the spool adapter 20.

The second spool adapter 30 has a steel body with a central longitudinal channel 31. A ceramic channel liner 32 has a substantially uniform outside diameter 33 that is dimensioned to provide a light press fit in the central channel 31 of second spool adapter 30. Ceramic channel liner 32 has a flow channel 36 that extends from the inlet adjacent the first spool adapter to the outlet adjacent the downstream process piping (not shown). The central channel 36 has a flared portion 34 and a uniform cross section portion 35. The flared portion 34 extends from the inlet along part of the length of ceramic liner 32. The degree of flaring is such as to continue the flaring of the flow channel 24 of the first spool adapter 20. The inside diameter of the uniform cross section portion 35 is dimensioned to be commensurate with the inside diameter of the downstream process piping.

As described above, the pressure reducer 40, upstream channel liner 50,

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direction changing cavity liner 60, key plate liner 70, downstream channel liner 80, and the central longitudinal channel liners 22 and 32, are all formed of a ceramic material. The ceramic material is selected from the class of technical ceramics, particularly technical ceramic materials that exhibit superior wear resistance and strength. Among the preferred ceramic materials are aluminum oxide (alumina), chromium oxide, high alumina, titanium oxide (titania), zirconium oxide (zirconia) ceramics, including fully and partially stabilized zirconia, and combinations of such metal oxides. It is believed that just about any type of metal-oxide ceramic will provide acceptable properties. Excellent results have been achieved using partially stabilized zirconia (PSZ) for making the aforesaid components. Particular species of PSZ that are believed to be useful for the aforesaid components include Mg-PSZ and vitreous PSZ. Silicon nitride, quartz, and silicon carbide ceramics are also expected to be useful in such components.

It can be seen from the foregoing description and the accompanying drawings that the present invention provides a novel means for extending the operating life of high pressure oil well components and for maintaining desired operating pressures by substantially reducing the rate of abrasive wear to components in a pressure reducing assembly for a high pressure oil well head. Although the invention has been described with reference to specific components and assemblies thereof, including a ceramic pressure reducer, a ceramic-lined reducing valve, and ceramic-lined spool pipe adapters, it is contemplated that any metal component in such a pressure reducing assembly that is subject to erosive wear caused by the flow of an oil/sand mixture under very high pressure can be formed from or lined with a ceramic material to substantially reduce the rate of wear and erosion. A distinct advantage of the present invention is that a high pressure oil well, incorporating ceramic components in accordance with this invention, can be operated at the desired high well pressures while keeping the sand content low. The desired high pressures can be maintained over a much

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longer period of time than obtainable with known components because component deterioration is minimized. Lost oil production resulting from well down-time, during spent component replacement, is drastically reduced, because of the increased wear resistance and more efficient flow design of the ceramic components.

It will be recognized by those skilled in the art that changes or modifications may be made to the above described embodiments without departing from the broad, inventive concepts of the invention. It is understood, therefore, that the invention is not limited to the particular embodiment(s) disclosed, but is intended to cover all modifications and changes which are within the scope and spirit of the invention as defined in the appended claims.

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WHAT IS CLAIMED IS:

1. A method of increasing the operating life of a flow control component of a high pressure oil well, comprising the steps of:
providing a flow control component body formed of a metallic material, said body having a channel formed therein; and
placing a liner formed of a ceramic material in said channel.
2. A pressure control component for a high pressure oil well, said component being formed of a ceramic material.
3. A pressure reducing device for a high pressure oil well comprising:
a generally cylindrical body having a central flow channel extending longitudinally therethrough from an inlet opening to an outlet opening;
means for attaching said body in a channel of a pressure reducing valve housing; and
sealing means for preventing forward flowing oil from entering a space between said body and the pressure reducing valve housing channel;
wherein said body is formed of a ceramic material.
4. A pressure reducing assembly for a high pressure oil well comprising:
a housing formed of a metallic material, said housing including an inlet channel, an outlet channel, and a direction changing cavity;
a pressure reducer disposed in said outlet channel;
a first ceramic liner disposed in said inlet channel;
a second ceramic liner disposed in said outlet channel; and
a third ceramic liner disposed in said direction changing channel.
5. A pressure reducing assembly as set forth in Claim 4 wherein said

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pressure reducer is formed of a ceramic material.

6. A pipe spool for a high pressure oil well comprising:

a body formed of a metallic material, said body having a central channel formed longitudinally therethrough; and

a ceramic liner disposed in the central channel of said body, said ceramic liner having a flow channel extending longitudinally therethrough..

7. A pipe spool as set forth in Claim 6 wherein the flow channel of the ceramic liner is flared along its length to provide a gradually greater cross section as the flow channel extends from an inlet end to an outlet end of said flow channel.

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ABSTRACT OF THE DISCLOSURE

A pressure reducing assembly for high pressure oil wells is disclosed. The assembly includes a metallic body having inlet, outlet, and directional changing flow channels that are lined with ceramic inserts. The assembly also
5 includes a removable pressure reducing device that is preferably formed of a ceramic material. Pipe spool pieces associated with the pressure reducing assembly transition the narrow interior flow diameter of the assembly to the larger interior flow diameter of downstream oil process piping. The spool pieces have metallic bodies, with flow channels that are lined with ceramic inserts. The
10 ceramic inserts are disposed within the metallic spool, and are preferably designed with a flow channel taper that gradually increase the interior flow diameter from that of the outlet channel of the pressure reducing assembly to that of the process piping. The use of the ceramic inserts and liners in the pressure reducing assembly provides a method for increasing the operating life of the flow
15 control components of high pressure oil wells.

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DECLARATION, POWER OF ATTORNEY AND POWER TO INSPECT

As a below named inventor, I hereby declare:

that my residence, post office address and citizenship are as stated below next to my name;

that I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the invention entitled: CERAMIC COMPONENTS FOR HIGH PRESSURE OIL WELLS

the specification of which (check one(s) applicable)

___ was filed ___ as PCT International /U.S. Application No. ___

___ and was amended by Amendment filed ___ (if applicable); (or);

☒ is attached to this Declaration, Power of Attorney and Power to Inspect;

that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above; and

that I acknowledge my duty to disclose information which is material to the examination of this application in accordance with Rule 56(a) (37CFR§1.56(a)).

POWER OF ATTORNEY: As inventor, I hereby appoint the practitioners associated with Customer No. 000110 as my attorneys or agents with full power of substitution to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith: Vincent T. Pace, Reg. No. 31,849, Bruce D. George, Reg. No. 43,631, and Henry H. Skillman, Reg. No. 17,352

POWER TO INSPECT: I hereby give DANN, DORFMAN, HERRELL AND SKILLMAN, P.C. of Philadelphia, PA or its duly Accredited representatives power to inspect and obtain copies of the papers on file relating to this application.

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DIRECT INQUIRIES TO: Vincent T. Pace

Telephone: (215) 563-4100

or

Facsimile: (215) 563-4044

Bruce D. George

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SOLE OR FIRST JOINT INVENTOR

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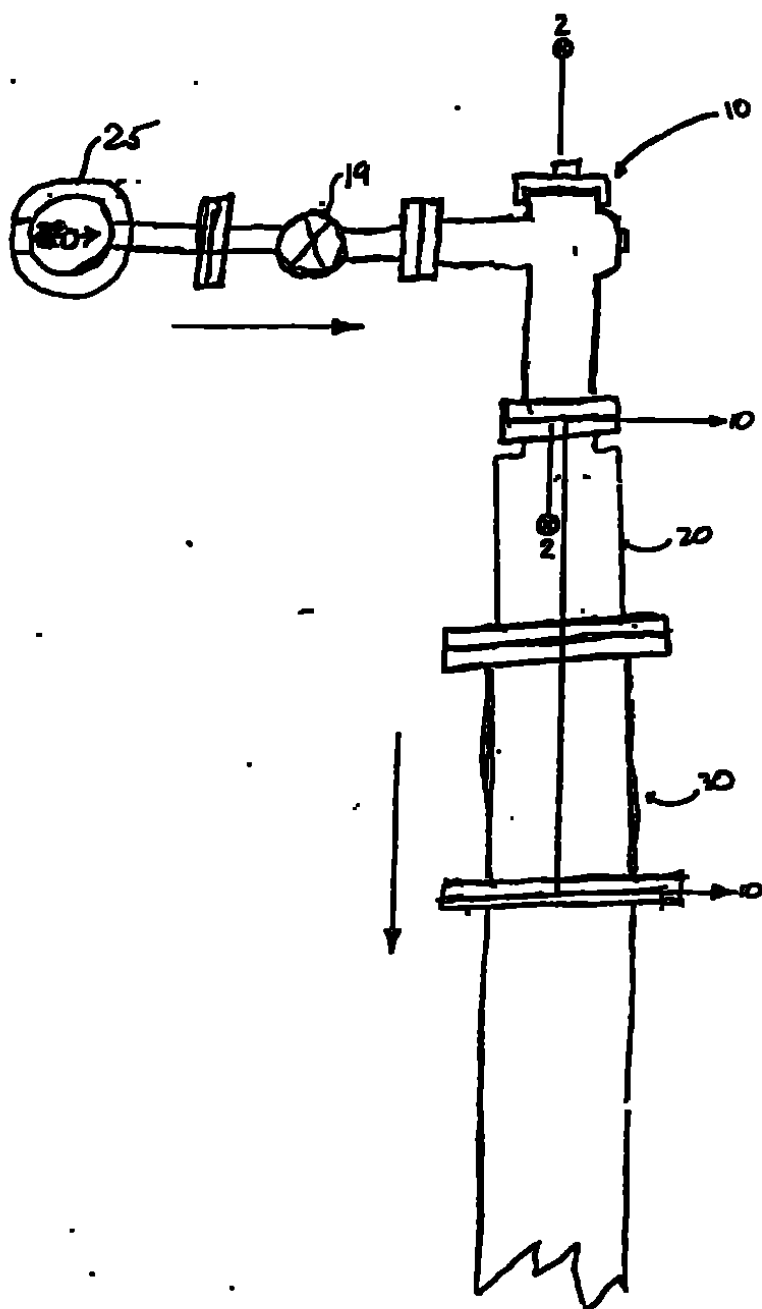


FIGURE 1

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FIGURE 2

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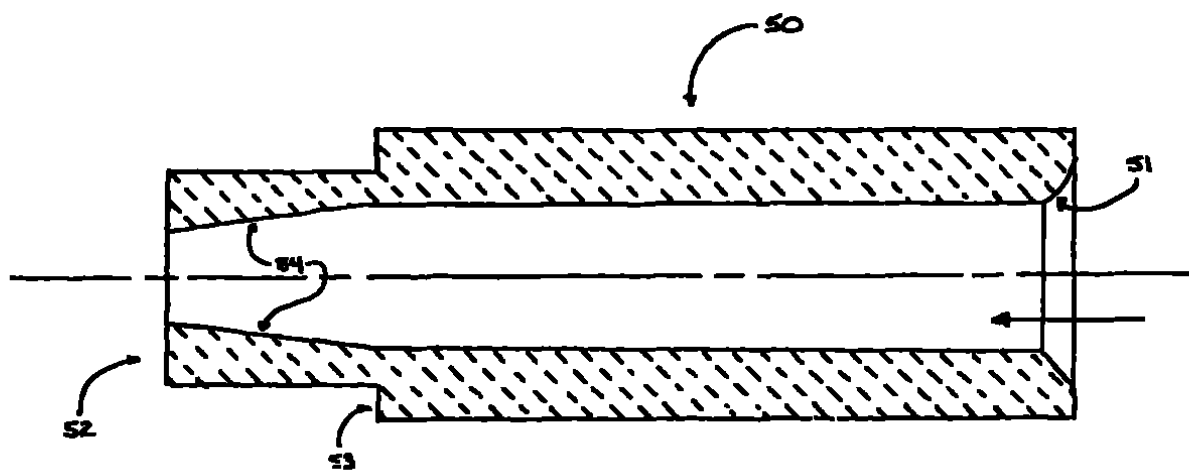


FIGURE 3

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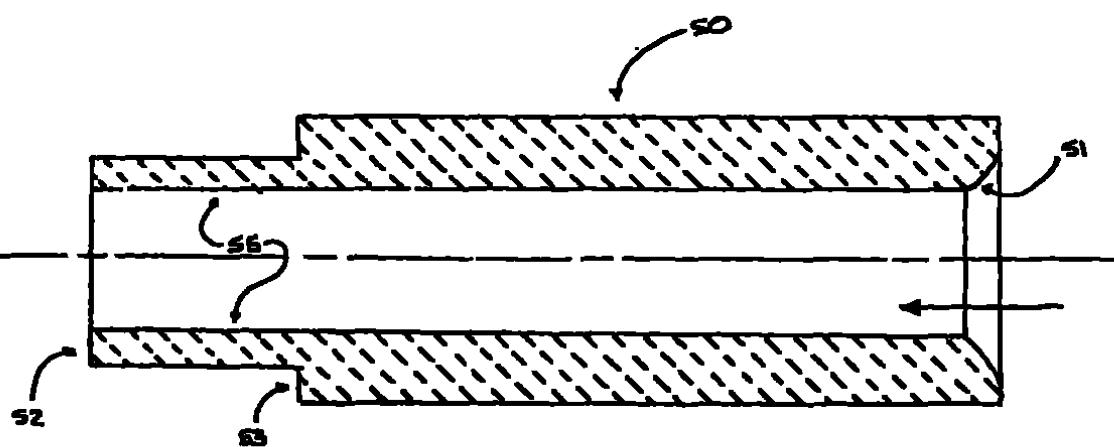


FIGURE 4

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FIGURE 5A

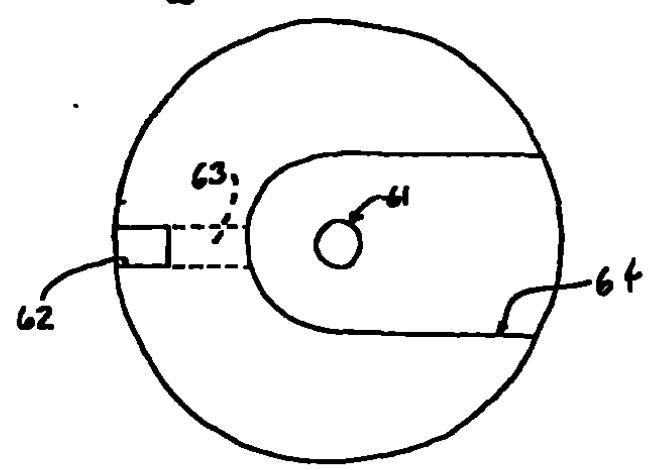
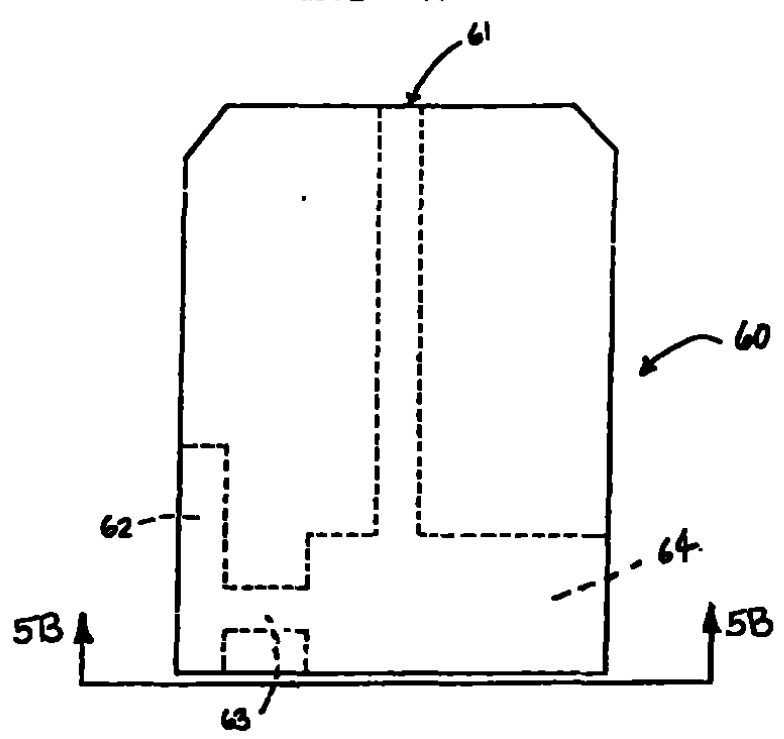


FIGURE 5B

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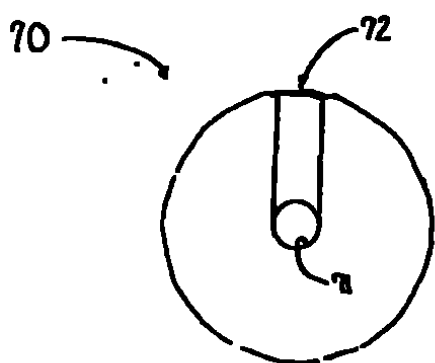


FIGURE 6B

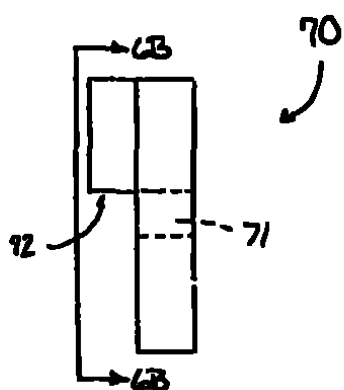


FIGURE 6A

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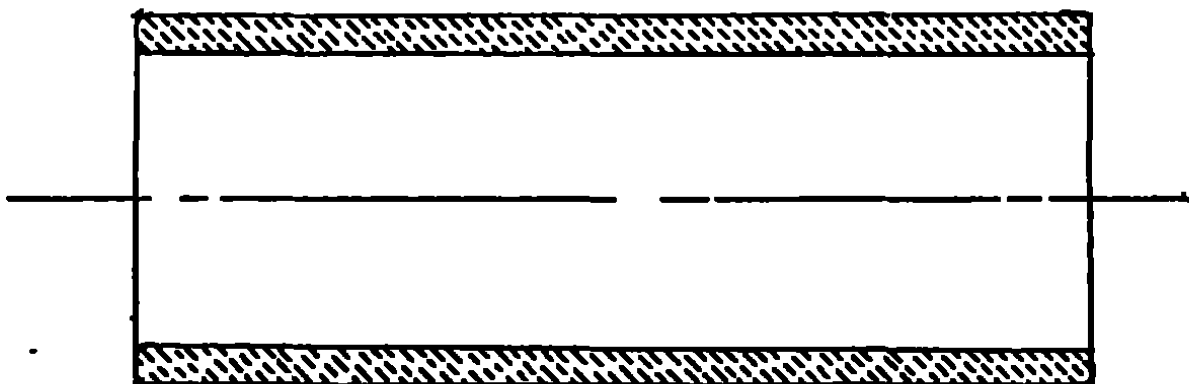


FIGURE 7

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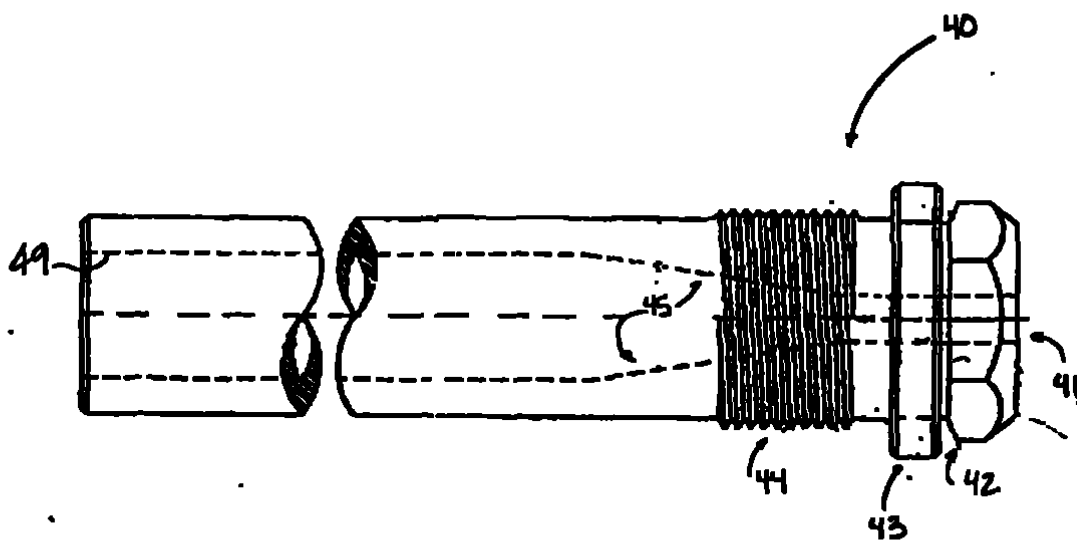


FIGURE 8

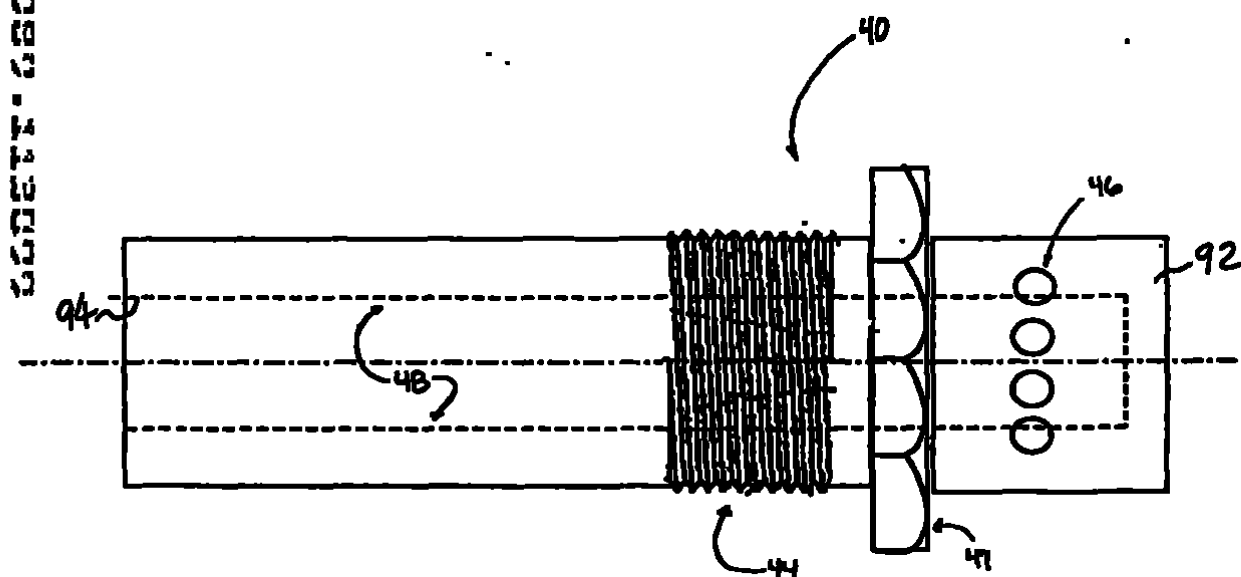


FIGURE 9

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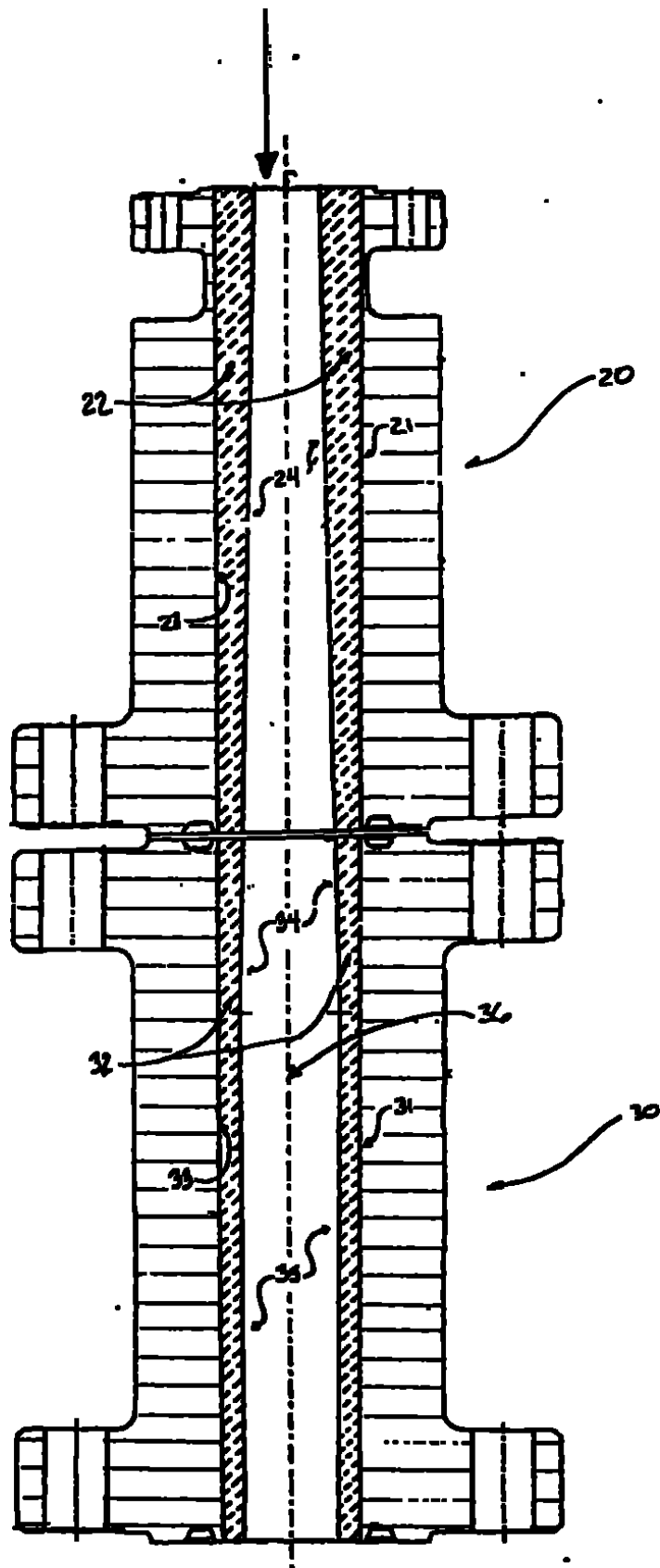
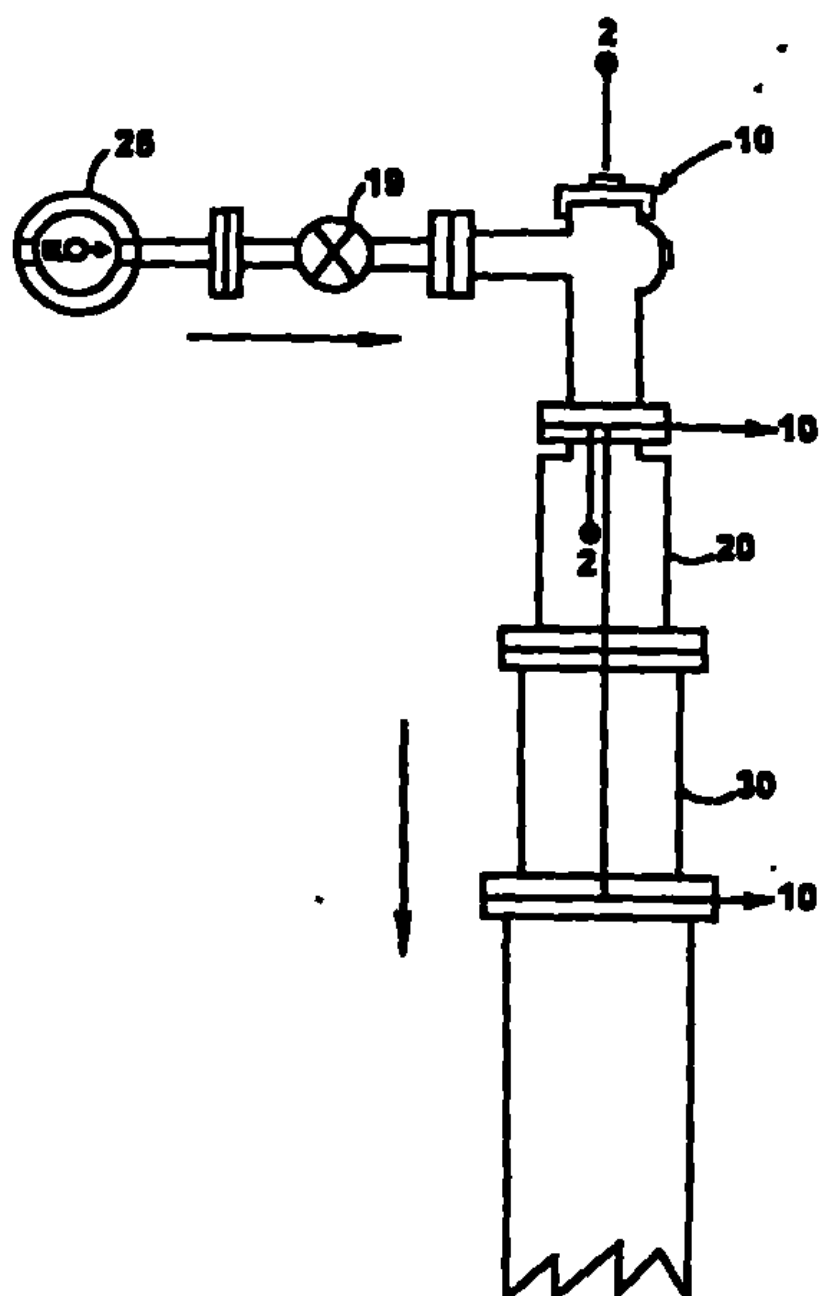


FIGURE 10

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FIGURA 1

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TRADUCCIÓN OFICIAL No. 01/ 017 de un documento escrito en inglés, el cual para su identificación se sella con el sello del traductor al tiempo con la presente. Esta traducción ha sido preparada por Juan Pablo Piedrahita Aguilera, Traductor e Intérprete Oficial debidamente reconocido de conformidad con el Certificado de Idoneidad Profesional No. 0045 expedido por la Universidad Nacional de Colombia.

Se traduce una solicitud de patente de modelo de utilidad, el certificado de la oficina de patentes y marcas y el correspondiente capítulo reivindicatorio.

ESTADOS UNIDOS DE AMERICA

A TODOS A QUIENES ESTOS PRESENTES LLEGAREN:

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS

OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS

Diciembre 1 de 2000

POR EL PRESENTE CERTIFICO QUE ADJUNTA SE ENCUENTRA UNA COPIA FIEL DE LOS ARCHIVOS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE AMÉRICA DE LOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADOS ABAJO Y QUE CUMPLIERON CON LOS REQUISITOS PARA QUE SE LES OTORGARA UNA FECHA DE PRESENTACIÓN BAJO EL CÓDIGO DE COMERCIO DE LOS ESTADOS UNIDOS DE AMÉRICA TÍTULO 35 SECCIÓN 111.

TRADUCCION OFICIAL No. 01/017
JUAN PABLO PIEDRAHITA AGUILERA
TRADUCTOR E INTERPRETE OFICIAL
C. IDONEIDAD 045
UNIVERSIDAD NACIONAL DE COLOMBIA

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NÚMERO DE SOLICITUD: 09/451,989

FECHA DE PRESENTACIÓN: *Noviembre 30, 1999*

Por autoridad del

COMISARIO DE PATENTES Y MARCAS

(Firmado.)

N. WOODSON

Funcionario que Certifica

(SELLO DE OBLEA DE LA OFICINA DE PATENTES Y MARCAS DE LOS
ESTADOS UNIDOS DE AMÉRICA)

(Al margen, Código de Barras jc844 Oficina de Patentes y Marcas de los EE.UU;
11/30/99)

(Al margen, Código de Barras jc511 Oficina de Patentes y Marcas de los EE.UU;
09/451989, 11/30/99)

(En todas las páginas a continuación, sello a tinta: 09451989.113099)

Por favor escriba un signo mas (+) dentro de esta caja

TRANSMISIÓN DE SOLICITUD DE PATENTE DE UTILIDAD <i>(Solamente para solicitudes nuevas no provisionales bajo 37CFR 1 53 (b))</i>	No. de Expediente Oficial	CA-301 US	Total de páginas	22
	Primer Inventor Nombrado o Identificación de Solicitud			
	Mentesh, Ibrahim M. et al.			
	Gula de Correo Expreso No.	EL421454422US	Fecha de envío	Noviembre 30, 1999

TRADUCCION OFICIAL No 01/017
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ELEMENTOS DE SOLICITUD <i>Véase MPEP capítulo 600 referente al contenido de la solicitud para patentes de modelos de utilidad.</i>	Dirjase a: Comisario Asistente de Patentes Casilla de Solicitud de Patentes Washington, D.C. 20231
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1. ☒ Formulario de Transmisión de Pago (*Presentar original y copia para procesamiento de pago*).

(Total de páginas)

2. ☒ Especificación (*arreglo preferido a continuación*)
- Título Descriptivo de la Invención
 - Referencias Cruzadas con Solicitudes Relacionadas
 - Declaración Referente a R & D patrocinadas por Fed
 - Referencia al Apéndice Microficha
 - Antecedentes de la Invención
 - Resumen Breve de la Invención
 - Descripción Breve de los Dibujos (*si se entregaron*)
 - Descripción Detallada
 - Reivindicación(es)
 - Resumen de la Divulgación

3. ☒ Dibujo(s) (35 USC 113) (Total de Páginas)

4. ☒ Juramento o Declaración (Total de Páginas)

- a. ☒ Firmado por primera vez (original o copia)

- b. Copia de una solicitud anterior (37 CFR 1.63 (d))
(*para continuación/división con Casilla 17 llena*)
(*Nota Casilla 5 abajo*)

- i. ELIMINACIÓN DE INVENTOR(ES)

Adjunto declaración firmada eliminando el(los) inventor(es)

TRADUCCION FICIAL No. 61/017 nombrado(s) en la solicitud anterior, ver 37 CFR 1.63 (d)(2) y
JUAN PABLO PIEDRAHITA AGUILERA
TRADUCTOR E INTERPRETE OFICIAL
C. IDONEIDAD 045
UNIVERSIDAD NACIONAL DE COLOMBIA

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1.33(b).

5. Inclusión por Referencia (se usa si se llena la casilla No.4b)
La divulgación completa de la solicitud anterior de la cual se adjunta copia de juramento o declaración bajo la Casilla 4b, se considera como parte de la divulgación de la solicitud adjunta y por el presente se incluye por referencia en ella.
6. Programa de Computador Microficha (Apéndice)
7. Presentación de Secuencia de Aminoácidos y/o Nucleótidos (si es aplicable y/o necesario)
- a. Copia en medio magnético (copia legible por computador)
- b. Copia en papel (idéntica a la copia de computador)

PARTES ADJUNTAS A LA SOLICITUD

8. Documentos de Cesión (carátula & documento(s))
9. Declaración 37 CFR 3.73(b) Poder
(cuando existe cesionario)
10. Documento de Traducción del Inglés (si se aplica)
11. Declaración de Divulgación de Información Copias de
(IDS) VPTO-1449 citas IDS
12. Modificación Preliminar
13. ☒ Devolución de Recibo Postal (MPEP 503)
14. Declaración(es) de Entidades Pequeñas
 Declaración archivada en solicitudes anteriores, Condición actual propia y deseada
15. Copia Certificada de Documento(s) de Prioridad (si se reivindica prioridad extranjera)

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16. ☒ Otros _____

17. a- SI ES UNA CONTINUACIÓN DE SOLICITUD, *llene la casilla apropiada y suministre la información requerida, y la reforma preliminar.*

☐ (en blanco) Continuación ☐ (en blanco) Divisional ☐ (en blanco) Continuación parcial

de las siguientes solicitudes, cada una de las cuales esta incorporada aquí como referencia:

b- Solicitudes de prioridad

Además de cualquier solicitud mencionada en 17a, la presente solicitud también reclama prioridad de las siguientes solicitud(es), cada una de las cuales esta incorporada aquí como referencia:

18. DIRECCIÓN DE CORRESPONDENCIA

☒

Número de cliente 000110 ó

DANN, DORFMAN, HERRELL AND SKILLMAN, P.C.

1601 Market Street, Suite 720

Philadelphia, PA 19103-2307

Telefono (215) 563-4100 Fax (215) 563-4044

A la atención del individuo identificado abajo

(FIRMA ILEGIBLE)

Bruce D. George

Registro Oficina de Patentes y Marcas de los EE.UU. 43,631

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UNIVERSIDAD NACIONAL DE COLOMBIA

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LO QUE SE REIVINDICA ES:

1. Un método para aumentar la vida operacional de un componente de flujo de control de un pozo petrolero de alta presión, que comprende los pasos de:

Suministrar un componente de cuerpo de flujo de control formado por un material metálico, en donde dicho cuerpo tiene un canal formado allí; y

Colocar un revestimiento de un material cerámico en dicho canal

2. Un componente de control de presión para un pozo petrolero de alta presión, en donde dicho componente está formado de un material cerámico.

3. Un dispositivo para reducir la presión en un pozo petrolero de alta presión, que comprende:

un cuerpo generalmente cilíndrico que tiene un canal central de flujo que se extiende longitudinalmente desde una abertura de entrada hasta una abertura de salida;

medios para unir dicho cuerpo en un canal del alojamiento de una válvula reductora de presión; y

medios de sellamiento para prevenir que flujo de aceite hacia adelante entrando al espacio entre dicho cuerpo y el canal del alojamiento de una válvula reductora de presión;

en donde dicho cuerpo está hecho de material cerámico.

4. Un ensamble para reducir presión en un pozo petrolero de alta presión,

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que comprende:

una caja hecha de un material metálico, en donde dicha caja incluye un canal de entrada, un canal de salida, y una cavidad de cambio de dirección;

un reductor de presión colocado en dicho canal de salida;

un primer revestimiento de cerámica colocado en dicho canal de entrada;

un segundo revestimiento de cerámica colocado en dicho canal de salida; y

un tercer revestimiento de cerámica colocado en dicho canal de cambio de dirección.

5. Un ensamble para reducir presión tal y como se describió en la reivindicación 4 en donde dicho reductor de presión está hecho de un material cerámico.

6. Un carrete de tubería para un pozo petrolero de alta presión, que comprende:

un cuerpo hecho de un material metálico, en donde dicho cuerpo tiene un canal central que se forma longitudinalmente a través de él; y

un revestimiento de cerámica colocado en el canal central de dicho cuerpo, en donde dicho revestimiento de cerámica tiene un canal de flujo que se extiende longitudinalmente a través de él.

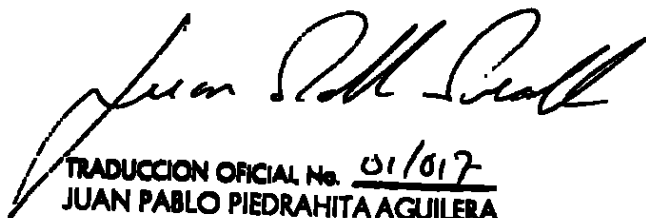
7. Un carrete de tubería tal y como se describió en la reivindicación 6 en donde el canal de flujo del revestimiento de cerámica es acampanado a lo largo

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de su longitud para suministrar sección transversal gradualmente mayor a medida que el flujo se extiende desde la entrada hasta la salida de dicho canal de flujo.

ES TRADUCCIÓN FIEL Y COMPLETA de la cual se deja copia en los archivos de esta oficina para su confrontación y a la cual me remito.

Bogotá, 29 de enero de 2001.


TRADUCCION OFICIAL No. 01/017
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