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(12) **EX PARTE REEXAMINATION CERTIFICATE** (10626th)
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Torrance et al.

(10) **Number:** **US 7,581,565 C1**(45) **Certificate Issued:** **Jun. 9, 2015**(54) **TEAR CORD FOR JACKETED TUBE**(76) Inventors: **Roy Torrance**, Houston, TX (US); **Jody James**, Pearland, TX (US)(58) **Field of Classification Search**

None

See application file for complete search history.

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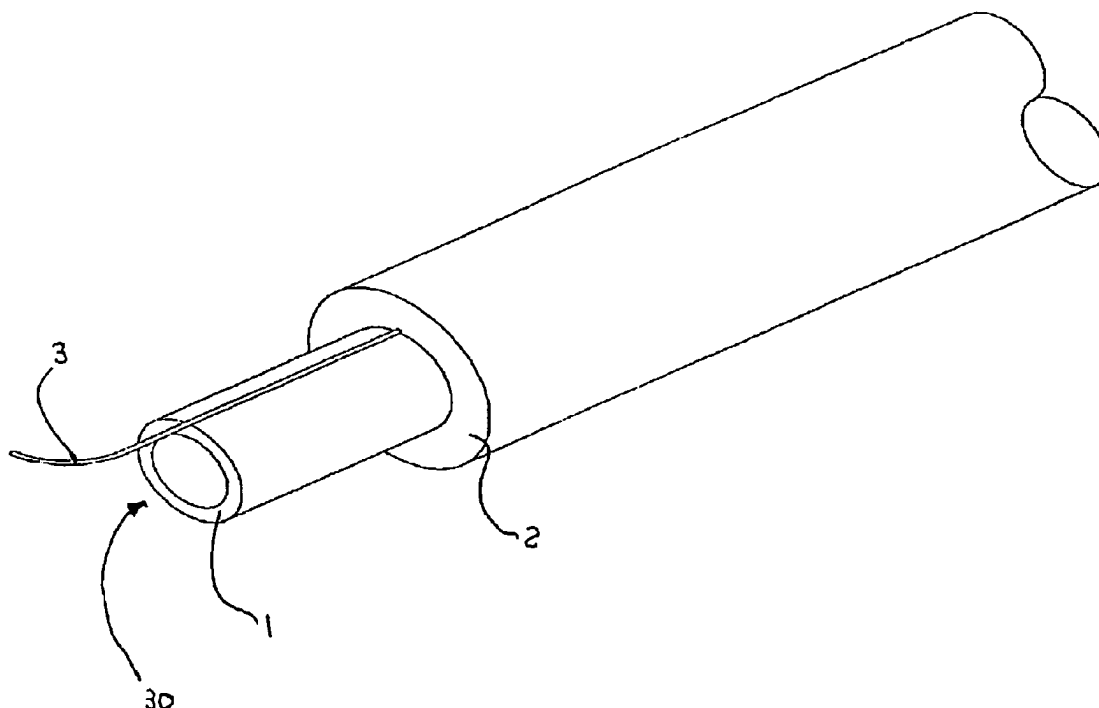
To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/020,065, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — David O Reip(51) **Int. Cl.****F16L 11/00** (2006.01)**F16L 9/147** (2006.01)**F16L 57/06** (2006.01)**F16L 59/16** (2006.01)**F16L 13/02** (2006.01)**H01B 7/04** (2006.01)**H01B 7/38** (2006.01)**G02B 6/44** (2006.01)(52) **U.S. Cl.**

CPC **F16L 9/147** (2013.01); **F16L 13/0272** (2013.01); **H01B 7/046** (2013.01); **F16L 57/06** (2013.01); **H01B 7/385** (2013.01); **G02B 6/4459** (2013.01); **F16L 59/16** (2013.01)

(57) **ABSTRACT**

The disclosure pertains to installing a tear cord between a metal tube and a protective jacket. The jacketed tubes may be used in a hydrocarbon production downhole well bore. The tubes may be used to furnish hydraulic fluid or chemicals into the well bore. The contents may be pressurized or under vacuum. The jacketed tubes are hermetically sealed. The tubes, which may be 1 inch in diameter, are joined using compression fittings. Tear cords are used to facilitate removal of the protective jacket without damage to the tube surface thereby facilitating the placement of compression fittings and maintaining the integrity of the tube wall.



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EX PARTE

REEXAMINATION CERTIFICATE

ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS
INDICATED BELOW.

Matter enclosed in heavy brackets [] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims 8, 16, 17, 21 and 23 are cancelled.

Claims 1-7, 9-15, 18-20 and 22 are determined to be patentable as amended.

Claim 24, dependent on an amended claim, is determined to be patentable.

New claim 25 is added and determined to be patentable.

1. A jacketed metal tube comprising a *metal tube*, a first protective jacket *adjoining and* surrounding [a smooth solid wall] *the metal tube*, [having an outer sealing surface and a tear cord between the inside diameter of said jacket and the outer surface of said tube whereby the tear cord can be] *and a tear cord positioned between the metal tube and the first protective jacket characterized wherein the protective jacketed metal tube is for use in downhole applications relating to hydrocarbon extraction, wherein the protective jacketed metal tube has a wall which is of hollow cylindrical shape and is smooth walled, solid, substantially straight, continuous, without break or interruption, is structured to be hermetically sealed, maintain a positive or negative pressure, and is structured for connection to hermetically sealing compression fittings to convey fluids downhole, and in that the tear cord is positioned proximate to an outer surface of the metal tube and inside the diameter of the outer first protective jacket and is able to be pulled back to create a slit in the first protective jacket and to allow the first protective jacket to be separated from the metal tube without damage to the metal tube surface.*

2. A jacketed metal tube [comprising a first protective jacket surrounding a smooth solid wall metal tube, wherein the tube conveys hydraulic fluid, and a tear cord located between the inside diameter of the jacket and an outer sealing surface of the tube whereby the tear cord can be pulled back to create a slit in the protective jacket and to allow the protective jacket to be separated from the metal tube without damage to the metal tube surface.] *of claim 1 wherein the tube is to convey hydraulic fluid.*

3. A jacketed metal tube [comprising a first protective jacket surrounding a smooth solid wall metal tube,] *of claim 1* wherein the tube conveys chemicals[, and a tear cord located between the inside diameter of the jacket and an outer sealing surface of the tube whereby the tear cord can be pulled back to create a slit in the protective jacket and to allow the protective jacket to be separated from the metal tube without damage to the metal tube surface].

4. The *jacketed* tube of claim 1 wherein the jacket comprises polyamide, polyethylene, ethylene chlorotrifluoroethylene or a thermoplastic elastomer cross linking ethylene propylene diene monomer rubber and polypropylene.

5. The *jacketed* tube of claim 1 wherein the jacket comprises engineered thermoplastic vulcanates, perfluoroalkoxy, polyvinylidene fluoride or fluorinated ethylene propylene.

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6. The *jacketed* tube of claim 1 further comprising a tear cord made of poly-aramid fiber.

7. The *jacketed* tube of claim 1 wherein the solid wall metal tube comprises incoloy, stainless steel, carbon steel, or galvanized carbon steel.

9. The *jacketed* tube of claim 1 further comprising a tear cord made of metal.

10. [A] *The jacketed metal tube of claim 1 wherein [a first protective jacket surrounding a smooth solid wall metal tube, and a] the tear cord is helically wound around the tube [and the tear cord located between the inside diameter of the jacket and an outer sealing surface of the tube whereby the tear cord can be pulled back to create a slit in the protective jacket and to allow the protective jacket to be separated from the metal tube without damage to the metal tube surface].*

11. The *jacketed* tube claim 1 further comprising a tear cord placed at a selected location on a length of the tube.

12. A jacketed metal tube *of claim 1* further comprising one or more steel ropes within one or more protective jackets surrounding [a smooth solid wall] *the metal tube* and [a] *one or more tear [cord] cords wherein at least one tear cord is positioned next to each steel rope and metal tube wherein [the] each steel rope has the same axis of orientation as the metal tube and is positioned adjacent to the metal tube within the one or more protective [jacket] jackets whereby each tear cord can be pulled back to create a slit in the one or more protective [jacket] jackets and to allow the one or more protective [jacket] jackets to be separated from [the] each steel rope and metal tube without damage to the metal tube surface.*

13. The *jacketed metal tube* of claim 1 [further comprising a jacket of] *wherein the first protective jacket comprises one or more materials of a group consisting of polyethylene, ethylene chlorotrifluoroethylene, a thermoplastic elastomer cross linking ethylene propylene diene monomer rubber and polypropylene, perfluoroalkoxy, polyvinylidene fluoride and fluorinated ethylene propylene, and wherein the material is extruded onto the metal tube without radiation curing.*

14. An encapsulated cable comprising a [first] protective jacket [surrounding] *in which the protective jacket surrounds a plurality of solid wall metal tubes, and [a plurality of tear cords with one tear cord located between the outside surface of each said tube and the inside diameter of said jacket whereby each tear cord is oriented longitudinally along the length of a tube,] wherein each metal tube has a parallel axis of orientation with the other tube or tubes and further [comprising] wherein the metal tubes comprise smooth metal walls [with sealing surfaces for attachment of compression fittings for performance in a negative or positive internal pressure environment] structured to be hermetically sealed, maintain a positive or negative pressure, and are structured for connection to hermetically sealing compression fittings and whereby [the] at least one tear [cord with one tear cord located] cords is positioned between the outside surface of [each said] at least one metal tube and the inside [diameter] of said protective jacket whereby [each] the at least one tear cord is oriented longitudinally along the length of [a] the at least one metal tube and whereby the at least one tear cord can be pulled back to create a slit in the protective jacket to allow the protective jacket to be separated from the at least one [or more] metal [tubes] tubes without damage to [a] the outside surface of the at least one metal tube [sealing surface].*

15. The *encapsulated* cable of claim 14 [further comprising] wherein at least one of the metal tubes [containing] contains therein a fiber optic cable, electrical wire or data communication cable.

18. A method of conveying [liquids] *fluids* into a well bore, the method comprising: i. placing [a tear cord adjacent to an

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outer sealing surface of a first spoolable,] *a first outer protective jacket around a metal tube to form a jacketed tube which is spoolable, the metal tube having a wall which is of hollow cylindrical shape and is smooth, solid, [wall metal tube;] substantially straight, continuous, without break or interruption, capable of being hermetically sealed and suitable for connection to hermetically sealing compression fittings to convey fluids under positive or negative pressure downhole;* ii. placing a [protective jacket around the metal tube and the] *tear cord proximate to an outer surface of the metal tube and inside the first protective jacket;* and iii. pulling the tear cord back to create a slit in the *first protective jacket to allow the first protective jacket to be separated from the metal tube without damage to [a] the metal tube surface.*

19. The method of claim 18 further comprising placing a second tear cord adjacent to the outer [diameter] *surface of the first protective jacket and covering the first protective jacket with a second protective jacket.*

20. The method of claim 18 [further comprising placing the tear cord on the outer surface of the tube at a selected location] *wherein the first protective jacket comprises one or more materials of the group consisting of polyethylene, ethylene chlorotrifluorethylene, a thermoplastic elastomer cross link-*

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ing ethylene propylene diene monomer rubber and polypropylene, perfluoroalkoxy, polyvinylidene fluoride fluorinate ethylene propylene.

22. The tube of claim [8] *1 further comprising a second [inner jacket surrounding the tube and said second jacket positioned between the first protective jacket and said metal tube, and a first tear cord positioned between the inner diameter of the first jacket and the outer diameter of the second jacket and a second tear cord positioned between the inner diameter of the second jacket and the outer surface of the metal tube] protective jacket and a second tear cord, wherein the second protective jacket surrounds the first protective jacket, and the second tear cord is positioned between the outer diameter of the first protective jacket and the inner diameter of the second protective jacket.*

25. *The jacketed metal tube of claim 1 further comprising a plurality of substantially straight metal tubes with the same planar axis of orientation wherein at least one metal tube is surrounded by a second protective jacket, and wherein a second tear cord is located between the first protective jacket and the second protective jacket.*

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