CONTROL FLOW, INC.
PATENTS

NO.	PATENTS	COUNTRY	DATE
1	**Automated Riser Recoil Control System and Method**	United States	11/16/2004
2	**Breech Block Connectors for Use With Oil Field Lines and Oil Field Equipment**	United States	1/16/2007
3	**Breech Block Connectors for Use With Oil Field Lines and Oil Field Equipment**	Singapore	8/31/2007
4	**Breech Block Connectors for Use With Oil Field Lines and Oil Field Equipment**	Norwegian	9/21/2015
5	**Breech Block Connectors for Use With Oil Field Lines and Oil Field Equipment**	Brazilian	2/23/2021
6	**Choke and Kill Line Systems for Blowout Preventers**	European	12/29/2004
7	**Choke and Kill Line Systems for Blowout Preventers**	United States	5/9/2006
8	**Choke and Kill Line Systems for Blowout Preventers**	Singapore	12/29/2006
9	**Choke and Kill Line Systems for Blowout Preventers**	Brazilian	6/30/2015
10	**Choke and Kill Line Systems for Blowout Preventers**	Norwegian	7/13/2015
11	**Co-Linear Tensioner and Methods for Assembling Production and Drilling Risers Using Same**	Norwegian	11/15/2002
12	**Co-Linear Tensioner and Methods for Assembling Production and Drilling Risers Using Same**	European	11/29/2002
13	**Co-Linear Tensioner and Methods for Assembling Production and Drilling Risers Using Same**	United States	4/29/2003
14	**Co-Linear Tensioner and Methods for Assembling Production and Drilling Risers Using Same**	Singapore	12/30/2005
15	**Co-Linear Tensioner and Methods for Assembling Production and Drilling Risers Using Same**	Brazil	1/21/2015
16	**Co-Linear Tensioner and Methods of Installing and Removing Same**	United States	3/4/2008
17	**Hydropneumatic Cable Tensioner**	United States	9/10/1985
18	**Linear Pipe Recovery/Lay Tensioners & Methods of Using Same**	Singapore	1/21/2013
19	**Linear Pipe Recovery/Lay Tensioners & Methods of Using Same**	United States	9/2/2014
20	**Linear Pipe Recovery/Lay Tensioners & Methods of Using Same**	United States	6/6/2017
21	**Linear Pipe Recovery/Lay Tensioners & Methods of Using Same**	European	10/16/2019

CONTROL FLOW, INC.
PATENTS

NO.	PATENTS	COUNTRY	DATE
22	**Linear Pipe Recovery/Lay Tensioners & Methods of Using Same**	Brazilian	12/8/2020
23	**Metal-To-Metal Well Equipment Seal**	United States	6/15/2021
24	**Metal-To-Metal Well Equipment Seal**	United States	5/16/2023
25	**Pipe Roller Assembly**	United States	1/8/2009
26	**Pipe Roller Assembly**	United States	10/19/2010
27	**Pipe Roller Assembly**	Singapore	3/15/2011
28	**Pipe Roller Assembly**	European	2/17/2021
29	**Portable Drill String Compensator**	Norwegian	11/28/2003
30	**Portable Drill String Compensator**	United States	11/29/2005
31	**Portable Drill String Compensator**	Singapore	8/31/2006
32	**Portable Drill String Compensator**	United States	11/7/2006
33	**Portable Drill String Compensator**	Brazil	2/21/2017
34	**Portable Heave Compensator**	European	11/19/2003
35	**Ram-Type Tensioner Assembly Having Integral Hydraulic Fluid Accumulator**	Norwegian	11/28/2003
36	**Ram-Type Tensioner Assembly Having Integral Hydraulic Fluid Accumulator**	European	12/8/2003
37	**Ram-Type Tensioner Assembly Having Integral Hydraulic Fluid Accumulator**	United States	3/7/2006
38	**Ram-Type Tensioner Assembly Having Integral Hydraulic Fluid Accumulator**	Singapore	10/31/2006
39	**Ram-Type Tensioner Assembly Having Integral Hydraulic Fluid Accumulator**	United States	11/7/2006
40	**Ram-Type Tensioner Assembly Having Integral Hydraulic Fluid Accumulator**	Brazil	1/13/2015
41	**System and Method for Riser Recoil Control**	United States	12/28/2004
42	**Tensioner/Slip-Joint Assembly**	Norwegian	6/14/2001

CONTROL FLOW, INC.
PATENTS

NO.	PATENTS	COUNTRY	DATE
43	**Tensioner/Slip-Joint Assembly**	United States	5/25/2004
44	**Tensioner/Slip-Joint Assembly**	United States	3/11/2003
45	**Tensioner/Slip-Joint Assembly**	Singapore	1/31/2005
46	**Tensioner/Slip-Joint Assembly**	European	3/29/2006
47	**Tensioner/Slip-Joint Assembly**	Brazil	9/6/2011
48	**Tensioner/Slip-Joint Assembly**	European	3/29/2006
49	**Tensioner/Slip-Joint Assembly**	Brazil	1/13/2015
50	**Weight Set Mandrel and Tubing Hanger**	United States	12/18/2018
51	**Weight Set Mandrel and Tubing Hanger**	European	7/28/2021

US006817422B2

(12) **United States Patent**
Jordan

(10) **Patent No.: US 6,817,422 B2**
(45) **Date of Patent: Nov. 16, 2004**

(54) **AUTOMATED RISER RECOIL CONTROL SYSTEM AND METHOD**

(75) Inventor: **Larry Russell Jordan**, Houston, TX (US)

(73) Assignee: **Cooper Cameron Corporation**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 3 days.

(21) Appl. No.: **10/276,411**

(22) PCT Filed: **May 15, 2001**

(86) PCT No.: **PCT/US01/15623**

§ 371 (c)(1),
(2), (4) Date: **Nov. 14, 2002**

(87) PCT Pub. No.: **WO01/88323**

PCT Pub. Date: **Nov. 22, 2001**

(65) **Prior Publication Data**

US 2003/0205383 A1 Nov. 6, 2003

Related U.S. Application Data

(60) Provisional application No. 60/204,442, filed on May 15, 2000.

(51) **Int. Cl.**[7] **E21B 19/00; E21B 23/00**

(52) **U.S. Cl.** **166/381**; 166/355; 175/7; 175/27

(58) **Field of Search** 166/355, 335, 166/352, 381; 175/5, 7, 27, 85

(56) **References Cited**

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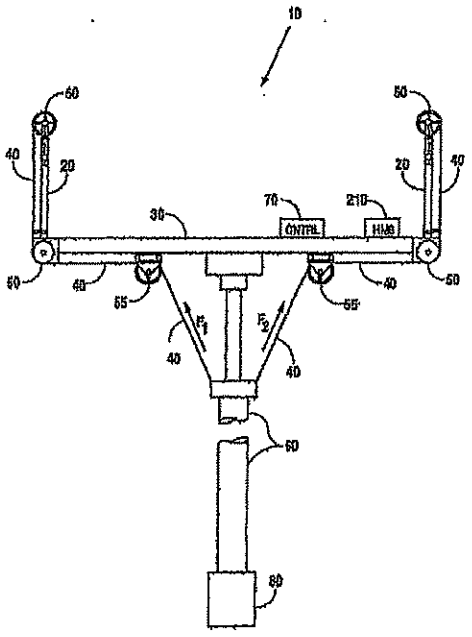
Primary Examiner—David Bagnell
Assistant Examiner—Jennifer Gay
(74) *Attorney, Agent, or Firm*—Michael P. Hartmann; Peter J. Bielinski

(57) **ABSTRACT**

An automated riser recoil control system (10) including a plurality of riser tensioners (20), a vessel heave measurement system (210) and a control processor (70) with each tensioner (20) having a piston travel indicator (27) which signals the processor (70) and a method of operation is disclosed.

15 Claims, 4 Drawing Sheets



US007163054B2

(12) **United States Patent**
Adams

(10) **Patent No.: US 7,163,054 B2**
(45) **Date of Patent: Jan. 16, 2007**

(54) **BREECHBLOCK CONNECTORS FOR USE WITH OIL FIELD LINES AND OIL FIELD EQUIPMENT**

(75) Inventor: **James Murph Adams**, Cypress, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 170 days.

(21) Appl. No.: **10/827,653**

(22) Filed: **Apr. 19, 2004**

(65) **Prior Publication Data**

US 2004/0256096 A1 Dec. 23, 2004

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/601,946, filed on Jun. 23, 2003, now Pat. No. 7,040,393.

(51) **Int. Cl.**
E21B 17/02 (2006.01)

(52) **U.S. Cl.** **166/75.13**; 166/242.6; 285/18

(58) **Field of Classification Search** 166/360, 166/380, 382, 75.13, 242.6; 285/18
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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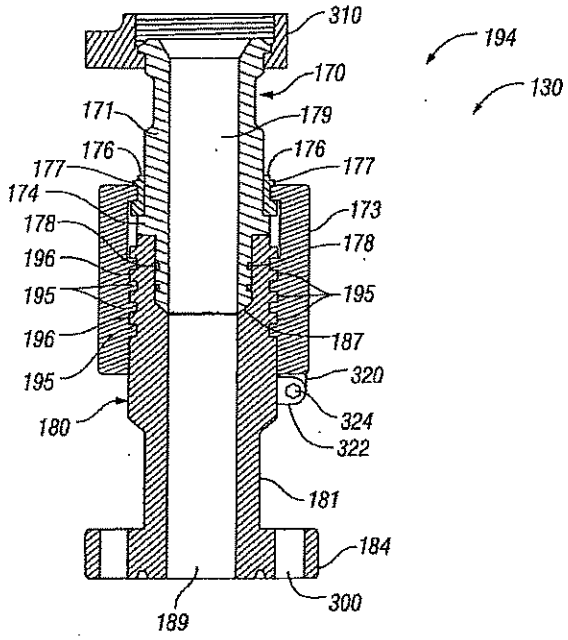
Primary Examiner—David Bagnell
Assistant Examiner—Matthew J. Smith
(74) *Attorney, Agent, or Firm*—Bracewell & Giuliani LLP; Anthony F. Matheny

(57) **ABSTRACT**

The invention is directed to breechblock connections to and between oil field equipment and oil field lines for use with oil field equipment associated with oil and gas exploration, drilling, and production. The oil field lines and oil field equipment of the invention include a breechblock connection for quick and easy removal and installation of the oil field lines to oil field equipment and to other oil field lines, and connections between different pieces of oil field equipment. Methods of connecting lines to oil field equipment and connecting one piece of oil field equipment to a second piece of oil field equipment are also disclosed.

29 Claims, 7 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 116624 has been granted in respect of an invention having the following particulars:

Title	:	BREECHBLOCK CONNECTORS FOR USE WITH OIL FIELD LINES AND OIL FIELD EQUIPMENT
Application Number	:	200502347-8
Date of Filing	:	18 April 2005
Priority Data	:	19 April 2004 - PATENT APPLICATION NO. 10/827,653 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	JAMES M. ADAMS
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW INC. 9201 FAIRBANKS NORTH HOUSTON ROAD HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
Date of Grant	:	31 August 2007

Dated this 31st day of August 2007

Chiam Lu Lin (Ms)
Deputy Registrar of Patents,
Singapore.

(12) **PATENT**

(19) NO (11) **336548** (13) **B1**

NORGE

(51) Int Cl.
F16L 23/00 (2006.01)
E21B 33/038 (2006.01)
E21B 33/064 (2006.01)
E21B 33/076 (2006.01)

Patentstyret

✓Breechblock Connectors for use with Oil Field Lines and Oil Field Equipment

(21)	Søknadsnr	20051701	(86)	Int.inng.dag og søknadsnr	
(22)	Inng.dag	2005.04.06	(85)	Videreføringsdag	
(24)	Løpedag	2005.04.06	(30)	Prioritet	2004.04.19, US, 827653
(41)	Alm.tilgj	2005.10.20			
(45)	Meddelt	v 2015.09.21			

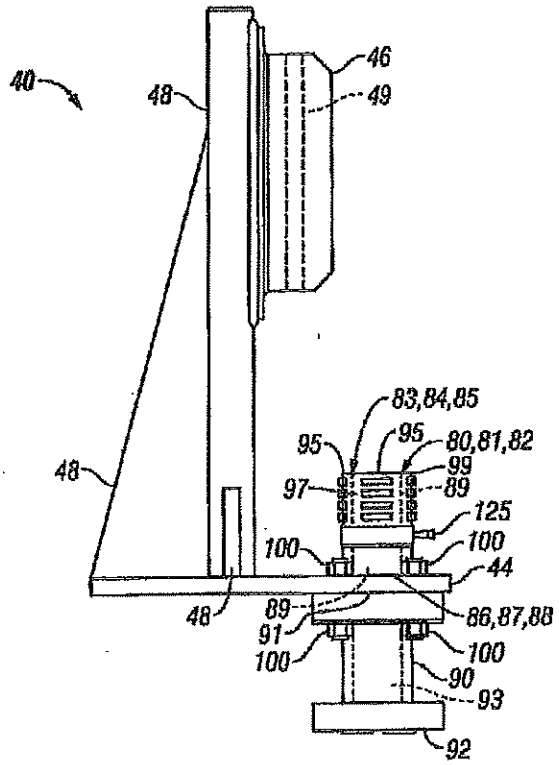
(73)	Innehaver	Control Flow Inc, 9201 Fairbanks North Houston Road, US-TX77064 HOUSTON, USA
(72)	Oppfinner	James M Adams, 12418 Winding Lane, US-TX77429 CYPRESS, USA
(74)	Fullmektig	Tandbergs Patentkontor AS, Postboks 1570 Vika, 0118 OSLO, Norge

(54) Benevnelse **Koplingssystem for tilkopling av ledninger til utrustning på oljefelt**

(56) Anførte publikasjoner
GB 2114631 A
US 5069288 A
US 4540053 A

(57) Sammendrag

Oppfinnelsen retter seg mot låseblokkoblinger til og mellom oljefeltutstyr og oljefeltledninger for bruk med oljefeltutstyr forbundet med olje og gassutforskning, boring og produksjon. Oljefeltledningene og oljefeltutstyret ifølge oppfinnelsen omfatter en låseblokkobling for hurtig og enkel fjerning og installasjon av oljefeltledninger til oljefeltutstyret og til andre oljefeltledninger, og tilkoblinger mellom ulike deler oljefeltutstyr. Fremgangsmåter for å tilkoble ledninger til oljefeltutstyr og tilkobling av en del av oljefeltutstyr til en andre del av oljefeltutstyr er også omtalt.



REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DA ECONOMIA
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº PI 0503005-6

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito: PI 0503005-6

(22) Data do Depósito: 15/04/2005

(43) Data da Publicação Nacional: 06/12/2005

(51) Classificação Internacional: E21B 7/12.

(30) Prioridade Unionista: US 10/827,653 de 19/04/2004.

(54) Título: CONEXÕES DE BLOCO DE CULATRA PARA USO COM LINHAS DE CAMPO DE PETRÓLEO E EQUIPAMENTO DE CAMPO DE PETRÓLEO

(73) Titular: CONTROL FLOW, INC, Empresa Norte Americana. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, ESTADOS UNIDOS DA AMÉRICA(US)

(72) Inventor: JAMES MURPH ADAMS.

Prazo de Validade: 10 (dez) anos contados a partir de 23/02/2021, observadas as condições legais

Expedida em: 23/02/2021

Assinado digitalmente por:
Liane Elizabeth Caldeira Lage
Diretora de Patentes, Programas de Computador e Topografias de Circuitos Integrados

(Breech Block Connectors for Use With Oil Field Lines & Oil Field Equipment)

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 491 717 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
03.10.2007 Bulletin 2007/40

(51) Int Cl.:
E21B 33/038 *(2006.01)* ***E21B 33/06*** *(2006.01)*

(21) Application number: **04076680.0**

(22) Date of filing: **08.06.2004**

(54) **Choke and kill line systems for blowout preventers**

Choke und Kill-Leitungen System für ein Backenausbruchsventil

System de connecteur de conduite d'injection pour un obturateur anti-éruption

(84) Designated Contracting States:
FI FR GB NL RO

(30) Priority: **23.06.2003 US 601946**

(43) Date of publication of application:
29.12.2004 Bulletin 2004/53

(73) Proprietor: **Control Flow Inc.**
Houston, TX 77064 (US)

(72) Inventors:
- **Adams, James M.**
Cypress,

Texas 77429 (US)
- **Curtiss, Jason P. III**
Houston,
Texas 77065 (US)

(74) Representative: **Newstead, Michael John et al**
Page Hargrave
Southgate
Whitefriars
Lewins Mead
Bristol BS1 2NT (GB)

(56) References cited:
US-A- 4 668 126
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US-B1- 6 470 975

EP 1 491 717 B1

Printed by Jouve, 75001 PARIS (FR)

US007040393B2

(12) **United States Patent**
Adams et al.

(10) **Patent No.: US 7,040,393 B2**
(45) **Date of Patent: May 9, 2006**

(54) **CHOKE AND KILL LINE SYSTEMS FOR BLOWOUT PREVENTERS**

(75) Inventors: **James M. Adams**, Cypress, TX (US); **Jason P. Curtiss, III**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 204 days.

(21) Appl. No.: **10/601,946**

(22) Filed: **Jun. 23, 2003**

(65) **Prior Publication Data**

US 2004/0256107 A1 Dec. 23, 2004

(51) **Int. Cl.**
E21B 23/02 (2006.01)

(52) **U.S. Cl.** **166/77.51**; 166/85.4; 166/85.5; 285/401; 285/391

(58) **Field of Classification Search** 166/77.51, 166/85.4, 85.5, 338, 344, 345, 368, 363; 285/124.4, 124.5, 360, 378, 401, 391
See application file for complete search history.

(56) **References Cited**

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4,668,126 A		5/1987	Burton	
4,807,705 A		2/1989	Henderson et al.	
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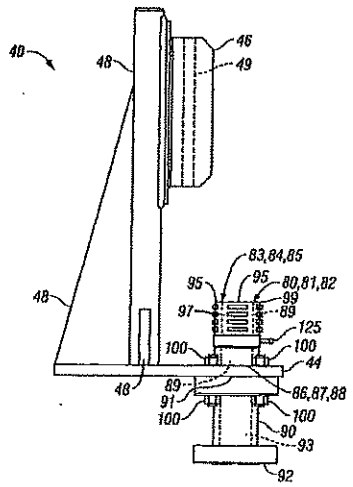
RetroSearch Search Results with Abstracts, Mar. 24, 2003, pp. 1-8.

Primary Examiner—Jennifer H. Gay
Assistant Examiner—Matthew J. Smith
(74) *Attorney, Agent, or Firm*—Andrews Kurth LLP; Anthony F. Matheny

(57) **ABSTRACT**

The invention is directed to pressure lines for use with equipment associated with drilling and production risers, and in particular, pressure lines having breechblock connections with the equipment and with choke and kill lines for use in connection with different sized blowout preventer stacks ("BOP stacks"). The pressure line systems and choke and kill line systems of the invention include a breechblock connection for quick and easy removal and installation of the pressure lines to riser equipment and the choke and kill lines to BOP stacks. Additionally, the choke and kill lines of the invention may include a coupling system having a BOP connector, or plate assembly, for permitting one set of choke and kill lines to be used on various sized BOP stacks. The plate assembly is in fluid communication with a first choke or kill line connector. Each of the choke and kill lines, or hoses, include a second choke or kill line connector, preferably as part of a line assembly, which is capable of being releaseably secured to the first choke or kill line connector. Therefore, by installing a plate assembly on different sized BOP stacks, one set of choke and kill lines can be used in connection with multiple sized BOP stacks. Methods of replacing BOP stacks and installing and removing choke and kill lines and pressure lines are also disclosed.

26 Claims, 5 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 118286 has been granted in respect of an invention having the following particulars:

Title	:	CHOKE AND KILL LINE SYSTEMS FOR BLOWOUT PREVENTERS
Application Number	:	200404133-1
Date of Filing	:	11 June 2004
Priority Data	:	23 June 2003 - PATENT APPLICATION NO. US 10/601,946 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	JAMES M. ADAMS; JASON P. CURTISS, III
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW INC. 9201 FAIRBANKS NORTH HOUSTON ROAD, HOUSTON, TEXAS 77064. UNITED STATES OF AMERICA
Date of Grant	:	29 December 2006

Dated this 29th day of December 2006.

Wong Sheng Kwai (Mr)
Acting Registrar of Patents,
Singapore

PI 04023951
PI 04023951

REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DO DESENVOLVIMENTO, INDÚSTRIA E COMÉRCIO EXTERIOR
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº PI 0402395-1

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito: PI 0402395-1

(22) Data do Depósito: 17/06/2004

(43) Data da Publicação do Pedido: 17/05/2005

(51) Classificação Internacional: F16L 55/00

(30) Prioridade Unionista: 23/06/2003 US 10/601,946

(54) Título: TUBULAÇÕES DE PRESSÃO PARA USO COM EQUIPAMENTO ASSOCIADO COM ELEVADORES DE PERFURAÇÃO E PRODUÇÃO

(73) Titular: CONTROL FLOW, INC.. Endereço: 9201 Fairbanks North Houston Road,Houston, Texas 77064, Estados Unidos da América (US).

(72) Inventor: JAMES M. ADAMS; JASON P. CURTISS III.

Prazo de Validade: 10 (dez) anos contados a partir de 30/06/2015, observadas as condições legais.

Expedida em: 30 de Junho de 2015.

Assinado digitalmente por:
Júlio César Castelo Branco Reis Moreira
Diretor de Patentes

Choke and Kill Line Systems for Blowout Preventers

(12) **PATENT**

(19) NO (11) **336291** (13) **B1**

NORGE

(51) Int Cl.
E21B 33/038 (2006.01)
E21B 33/064 (2006.01)
E21B 33/076 (2006.01)

Patentstyret

Choke and Kill Line Systems for Blowout Preventers

(21)	Søknadsnr	20042458	(86)	Int.inng.dag og søknadsnr	
(22)	Inng.dag	2004.06.14	(85)	Videreføringsdag	
(24)	Løpedag	2004.06.14	(30)	Prioritet	2003.06.23, US, 601946
(41)	Alm.tilgj	2004.12.27.			
(45)	Meddelt	2015.07.13			

(73)	Innehaver	Control Flow Inc, 9201 Fairbanks North Houston Road, US-TX77064 HOUSTON, USA
(72)	Oppfinner	James M Adams, 12418 Winding Lane, US-TX77429 CYPRESS, USA Jason P Curtiss III, 12519 Brants Way Court, US-TX77065 HOUSTON, USA
(74)	Fullmektig	Tandbergs Patentkontor AS, Postboks 1570 Vika, 0118 OSLO, Norge

(54) Benevnelse **Strupe- og drepeledning og koplingssystem for en utblåsingssikring.**

(56) Anførte publikasjoner
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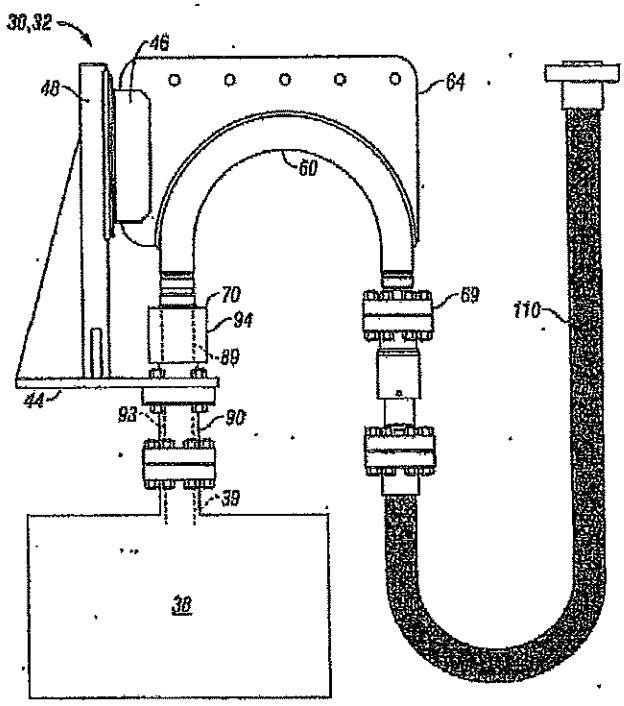
US 2003024705 A1
US 2003/136927 A1

(57) Sammendrag

Oppfinnelsen vedrører trykkledninger for anvendelse sammen med utstyr tilknyttet bore- og produksjonsstigerør, særlig stigerør som har låseblokkoplinger til utstyret og med strupe- og drepeledninger for anvendelse med utblåsingssikringer av forskjellige størrelser (UBIS-stakker). Trykkledningssystemene og drepe- og strupeledningssystemene ifølge oppfinnelsen omfatter en låseblokkopling for hurtig og enkel fjerning og installasjon av trykkledningene til stigerørsutstyret og strupe- og drepeledningene til UBIS-stakkene. Dessuten kan strupe- og drepeledningene omfatte et koplingssystem som har en UBIS koplingsanordning, eller en plateenhet for å muliggjøre anvendelse av ett sett strupe- og drepeledninger i forbindelse med en første strupe- og drepeledningskoplingsanordning. Hver strupe- og drepeledning eller -slange, omfatter en andre strupe- eller drepeledningskoplings-anordning, fortrinnsvis som del av en ledning, for løsgjørbar festing til den første strupe- eller drepeledningskoplingsanordning. Ved å installere en plateenhet for UBIS-stakker av forskjellig størrelse kan det derfor ett sett strupe- eller drepeledninger sammen med UBIS-stakker av flere forskjellige størrelser. Fremgangsmåter for utskifting UBIS-stakker og installering og fjerning av strupe- og drepeledninger beskrives.



(12) **PATENT**

(19) NO (11) **330579** (13) **B1**

NORGE (51) Int Cl.
E21B 19/00 (2006.01)

Patentstyret

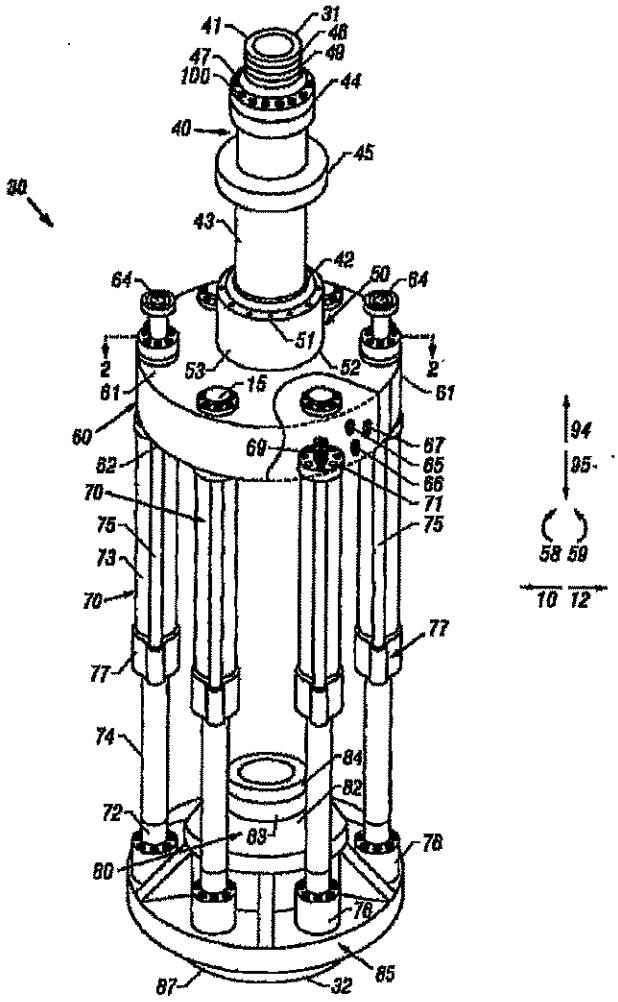
Co-Linear Tensioner and Methods for Assembling Production and Drilling Risers using same

(21)	Søknadsnr	20025468	(86)	Int.inng.dag og søknadsnr	
(22)	Inng.dag	2002.11.15	(85)	Videreføringsdag	
(24)	Løpedag	2002.11.15	(30)	Prioritet	2001.11.30, US, 000393
(41)	Alm.tilgj	2003.06.02			
(45)	Meddelt	2011.05.16			

(73)	Innehaver	Control Flow Inc, 9201 Fairbanks North Houston Road, US-TX77064 HOUSTON, USA
(72)	Oppfinner	Graeme E Reynolds, 2053 Western Village, Houston, TX 77043, USA Timothy I Mournian, 4237 Olive Avenue, Long Beach, CA 90807, USA
(74)	Fullmektig	Acapo AS, Postboks 1880 Nordnes, 5817 BERGEN, Norge

(54)	Benevnelse	**Anordning ved koblingsorgan for stigerørsystemer**
(56)	Anførte publikasjoner	GB 2358032 A, US 4934870 A, US 20010041096 A1
(57)	Sammendrag	

Foreliggende oppfinnelse vedrører en strekkmodul for å skaffe en rørledning, for eksempel bore- og produksjons-stigerør, fra et drivende fartøy på vannoverflaten til sjøen til utblåsningssikringen, produksjonstre, eller en annen anordning som er koblet til brønnhodet på sjøbunnen. Strekkmodulen kompenserer for fartøysbevegelse forårsaket av bølgenes virkning, og hiv, og opprettholder en variabel strekk på stigerørsstrengen, og reduserer dermed potensialet for kompresjon og således knekking eller sammenbrudd av stigerørsstrengen. Strekkmodulen ifølge foreliggende oppfinnelse omfatter fortrinnsvis minst én røropphengsforing som omfatter minst en opphengsring, minst én øvre fleksibel dreieskjøtsammenstilling, minst én manifold med radiale åpninger, og minst én strekksylinder, kolineær kombinert i en enhet. Fremgangsmåter for å sammenstille stigerør omfattes også.



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 316 671 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
01.06.2005 Bulletin 2005/22

(51) Int Cl.7: **E21B 19/00**

(21) Application number: **02258242.3**

(22) Date of filing: **29.11.2002**

(54) Co-linear tensioner and methods for assembling production and drilling risers using same

Kolineare Spannvorrichtung und Verfahren zur Montage von Bohrloch- und Produktionssteigrohren unter Verwendung desselben

Dispositif tendeur co-linéaire et méthode d'assemblage de colonnes montantes de forage et de production utilisant ce dispositif

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR

(30) Priority: **30.11.2001 US 393**

(43) Date of publication of application:
04.06.2003 Bulletin 2003/23

(73) Proprietor: **Control Flow Inc.**
Houston, TX 77064 (US)

(72) Inventors:
- **Reynolds, Graeme E.**
  Houston, Texas 77043 (US)
- **Mournian, Timothy I.**
  Long Beach, California 90807 (US)

(74) Representative: **Newstead, Michael John et al**
Page Hargrave
Southgate
Whitefriars
Lewins Mead
Bristol BS1 2NT (GB)

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EP 1 316 671 B1

US006554072B1

(12) **United States Patent**
Mournian et al.

(10) **Patent No.: US 6,554,072 B1**
(45) **Date of Patent: *Apr. 29, 2003**

(54) **CO-LINEAR TENSIONER AND METHODS FOR ASSEMBLING PRODUCTION AND DRILLING RISERS USING SAME**

(75) Inventors: **Timothy I. Mournian**, Long Beach, CA (US); **Graeme E. Reynolds**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/000,393**

(22) Filed: **Nov. 30, 2001**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/881,139, filed on Jun. 14, 2001.
(60) Provisional application No. 60/211,652, filed on Jun. 15, 2000.

(51) **Int. Cl.**[7] **E21B 29/12**; E21B 41/04
(52) **U.S. Cl.** **166/355**; 166/346; 166/367; 405/224.2; 405/224.4
(58) **Field of Search** 166/350, 359, 166/367, 355, 346; 405/224.4, 224.2

(56) **References Cited**

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WO	WO 00/24998	5/2000

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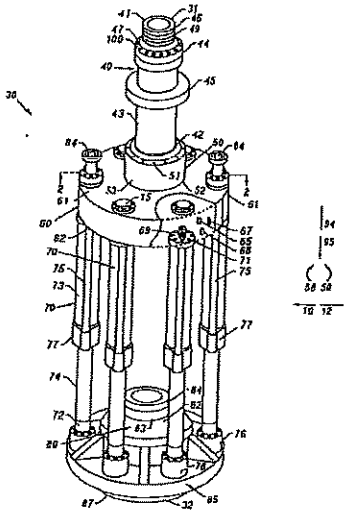
Primary Examiner—Robert E. Pezzuto
Assistant Examiner—Thomas A. Beach
(74) *Attorney, Agent, or Firm*—Anthony F. Matheny; Andrews & Kurth L.L.P.

(57) **ABSTRACT**

A tensioner for providing a conduit, e.g., drilling and production riser strings, from a floating vessel at the surface of the ocean to the blowout preventer stack, production tree, or other assembly which is connected to the wellhead at the sea floor. The tensioner compensates for vessel motion induced by wave action and heave and maintains a variable tension to the riser string alleviating the potential for compression and thus buckling or failure of the riser string. The tensioner of the present invention preferably includes at least one mandrel having at least one hang-off donut; at least one upper flexjoint swivel assembly, at least one radially ported manifold, and at least one tensioning cylinder co-linearly combined in a single unit. Methods for assembling risers are also disclosed.

47 Claims, 7 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 98499 has been granted in respect of an invention having the following particulars:

Title	:	CO-LINEAR TENSIONER AND METHODS FOR ASSEMBLING PRODUCTION AND DRILLING RISERS USING SAME
Application Number	:	200207166-0
Date of Filing	:	27 November 2002
Priority Data	:	30 November 2001 - PATENT APPLICATION NO. 10/000,393 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	GRAEME E. REYNOLDS; TIMOTHY I. MOURNIAN
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW, INC. 9201 FAIRBANKS NORTH HOUSTON ROAD HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
Date of Grant	:	30 December 2005

Dated this 30th day of December 2005.

Liew Woon Yin (Ms)
Registrar of Patents.
Singapore.

REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DO DESENVOLVIMENTO, INDÚSTRIA E COMÉRCIO EXTERIOR
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº PI 0205824-3

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

Co-Linear Tensioner and Methods for Assembling Production & Drilling Risers Using Same

(21) Número do Depósito: PI 0205824-3

(22) Data do Depósito: 27/11/2002

(43) Data da Publicação do Pedido: 28/10/2003

(51) Classificação Internacional: E21B 17/01

(30) Prioridade Unionista: 30/11/2001 US 10/000,393

(54) Título: TENSOR CO-LINEAR E MÉTODOS PARA MONTAGEM DE COLUNAS DE TUBOS ASCENDENTES DE AÇO DE PRODUÇÃO E DE PERFURAÇÃO COM O USO DO MESMO

(73) Titular: CONTROL FLOW, INC.. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, Estados Unidos (US).

(72) Inventor: TIMOTHY I. MOURNIAN; GRAEME E. REYNOLDS

Prazo de Validade: 10 (dez) anos contados a partir de 21/01/2015, observadas as condições legais.

Expedida em: 21 de Janeiro de 2015.

Assinado digitalmente por:
Liane Elizabeth Caldeira Lage
Diretora de Patentes Substituta

US007337849B2

(12) **United States Patent**
Williams

(10) **Patent No.: US 7,337,849 B2**
(45) **Date of Patent: Mar. 4, 2008**

(54) **CO-LINEAR TENSIONER AND METHODS OF INSTALLING AND REMOVING SAME**

(75) Inventor: **Richard D. Williams**, Sugar Land, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/487,270**

(22) Filed: **Jul. 14, 2006**

(65) **Prior Publication Data**

US 2006/0254776 A1 Nov. 16, 2006

Related U.S. Application Data

(63) Continuation of application No. 11/060,660, filed on Feb. 17, 2005.

(51) **Int. Cl.**
E21B 29/12 (2006.01)

(52) **U.S. Cl.** **166/355**; 166/359; 166/367

(58) **Field of Classification Search** 166/355, 166/346, 367, 359; 405/224.2, 224.4
See application file for complete search history.

(56) **References Cited**

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2006/0016605	A1 *	1/2006	Coles	166/355
2006/0151176	A1 *	7/2006	Moe	166/355

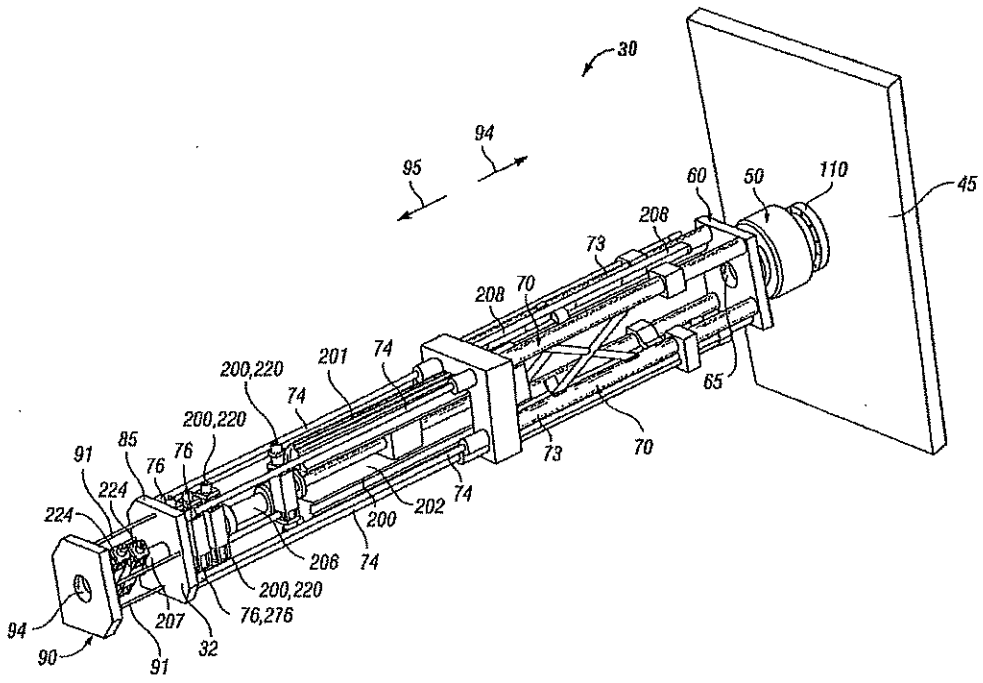
* cited by examiner

Primary Examiner—Thomas A Beach
(74) *Attorney, Agent, or Firm*—Greenberg Traurig LLP; Anthony F. Matheny

(57) **ABSTRACT**

The invention is directed to a tensioner for providing linear and angular movement of a drilling or production facility relative to a conduit or riser secured to the tensioner and to the wellhead in offshore operations. The tensioner compensates for vessel motion induced by wave action and heave and maintains a variable tension to the riser string alleviating the potential for compression and thus buckling or failure of the riser string. The tensioner of the present invention preferably includes at least one top load plate that facilitates easy and quick installation and removal of the tensioner from the rig floor of the vessel or platform. The tensioner also facilitates the placement of at least one piece of equipment disposed within the area formed by the tensioning cylinders. The tensioner may also include one or more pieces of equipment, e.g., a rotary table, integrally formed with the tensioner to further increase the ease and speed of installation and removal of the tensioner from the rig floor. Methods for installing and removing tensioners from the rig floor are also disclosed.

25 Claims, 6 Drawing Sheets



United States Patent [19]

Jordan

[11] **Patent Number: 4,540,159**

[45] **Date of Patent: Sep. 10, 1985**

[54] **HYDROPNEUMATIC CABLE TENSIONER**

[75] Inventor: Larry B. Jordan, Houston, Tex.

[73] Assignee: Retsco, Inc., Houston, Tex.

[21] Appl. No.: 516,102

[22] Filed: Jul. 22, 1983

[51] Int. Cl.³ B25B 25/00; B66D 1/50

[52] U.S. Cl. 254/228; 254/277; 254/386; 254/392

[58] Field of Search 254/228, 272, 277, 386, 254/392; 92/143

[56] **References Cited**

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FOREIGN PATENT DOCUMENTS

12110 of 1884 United Kingdom .

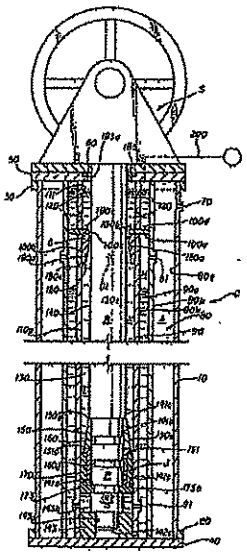
919768 2/1963 United Kingdom 254/228

Primary Examiner—Stuart S. Levy
Assistant Examiner—Joseph J. Hail, III
Attorney, Agent, or Firm—Baker & Kirk

[57] **ABSTRACT**

A hydropneumatic cable tensioner is comprised of an enclosed cylinder featuring a plurality of annular chambers. A fixed cable sheave is mounted to one end of the cylinder. A movable cable sheave is mounted to a piston rod connected to a piston which reciprocates in the innermost or piston bore chamber of the cylinder. Regulated compressed gas is connected to the outer chamber of the cylinder thereby exerting high pressure forces on oil found in the middle or high pressure oil chamber of the cylinder. Pressurized oil forces a piston to move outwardly thereby increasing the distance between the two sheaves and tensioning a cable. Restriction means within the piston bore chamber regulate movement of the piston and prevent uncontrolled acceleration should a cable failure occur.

8 Claims, 5 Drawing Figures



REPUBLIC OF SINGAPORE
THE PATENT ACT (CHAPTER 221)
CERTIFICATE ISSUED UNDER SECTION 35

I HEREBY CERTIFY that under the provisions of the Patent Act, a patent has been granted in respect of an invention having the following particulars:

TITLE	:	LINEAR PIPE RECOVERY/LAY TENSIONERS AND METHODS OF USING SAME
APPLICATION NUMBER	:	2013004718
PATENT NUMBER	:	192370
DATE OF FILING	:	21 JANUARY 2013
PRIORITY DATA	:	24 JANUARY 2012 - PATENT APPLICATION NO. 13/357,007 (UNITED STATES OF AMERICA)
NAME OF INVENTOR(S)	:	PATRICK K. ALLOWAY; KEVIN L. PRESTON; LOREN D. SKILES
NAME(S) AND ADDRESS(ES) OF PROPRIETOR(S) OF PATENT	:	CONTROL FLOW INC. 9201 FAIRBANKS NORTH HOUSTON ROAD, HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
DATE OF GRANT	:	16 February 2017

DATED THIS 16th DAY OF FEBRUARY 2017

Daren Tang Heng Shim
Registrar of Patents
Singapore

US008821069B2

(12) **United States Patent**
Alloway et al.

(10) **Patent No.: US 8,821,069 B2**
(45) **Date of Patent: Sep. 2, 2014**

(54) **LINEAR PIPE RECOVERY/LAY TENSIONERS AND METHODS OF USING SAME**

(75) Inventors: **Patrick K. Alloway**, Magnolia, TX (US); **Kevin L. Preston**, Houston, TX (US); **Loren D. Skiles**, Tomball, TX (US)

(73) Assignee: **Control Flow, Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 116 days.

(21) Appl. No.: **13/357,007**

(22) Filed: **Jan. 24, 2012**

(65) **Prior Publication Data**

US 2013/0189035 A1 Jul. 25, 2013

(51) **Int. Cl.**
F16L 1/23 (2006.01)
E21B 19/22 (2006.01)

(52) **U.S. Cl.**
USPC **405/168.4**; 226/173

(58) **Field of Classification Search**
USPC 405/166, 168.1, 168.4, 184; 226/172, 226/173, 188; 166/77.3; 74/162
See application file for complete search history.

(56) **References Cited**

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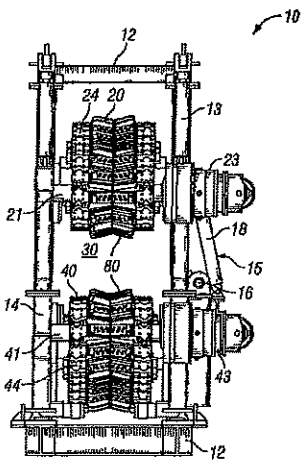
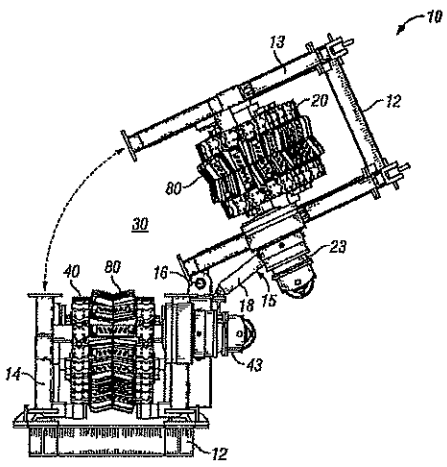
Primary Examiner — John Kreck
Assistant Examiner — Kyle Armstrong

(57) **ABSTRACT**

Linear pipe recovery/lay tensioners can include one or more pivot assemblies for rotatably moving an upper track away from a lower track to facilitate placement of a pipe segment between the two tracks. In addition, or alternatively, the tensioners can include one or more hydraulic cylinders that provide flexible suspension to the upper and lower tracks so the tracks can move and rotate as necessary due to differing pipe segment shapes. In addition, or alternatively, the upper and lower tracks include one or more gripping pad having one or more gripping member that is sheathed by a compliant member until such time as the pipe segment compresses the compliant member causing the gripping member(s) to protrude from the compliant member and bite into the pipe segment. Rotation of the tracks is controlled by a hydraulic pump capable of rotating the tracks at the same rate or at different rates.

14 Claims, 6 Drawing Sheets





US009671044B2

(12) **United States Patent**
Alloway et al.

(10) **Patent No.: US 9,671,044 B2**
(45) **Date of Patent: *Jun. 6, 2017**

(54) **LINEAR PIPE RECOVERY/LAY TENSIONERS AND METHOD OF USING SAME**

(71) Applicant: **Control Flow, Inc.**, Houston, TX (US)

(72) Inventors: **Patrick K. Alloway**, Waller, TX (US); **Kevin L. Preston**, Tomball, TX (US); **Loren D. Skiles**, Tomball, TX (US)

(73) Assignee: **Control Flow, Inc**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 29 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/475,334**

(22) Filed: **Sep. 2, 2014**

(65) **Prior Publication Data**

US 2014/0369763 A1 Dec. 18, 2014

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/357,007, filed on Jan. 24, 2012, now Pat. No. 8,821,069.

(51) **Int. Cl.**

F16L 1/23	(2006.01)
E21B 19/22	(2006.01)
B65H 51/14	(2006.01)

(52) **U.S. Cl.**

CPC ***F16L 1/23*** (2013.01); ***B65H 51/14*** (2013.01); ***E21B 19/22*** (2013.01)

(58) **Field of Classification Search**

USPC 405/166, 168.1, 168.4, 184; 226/172, 226/173, 188; 166/77.3; 74/162

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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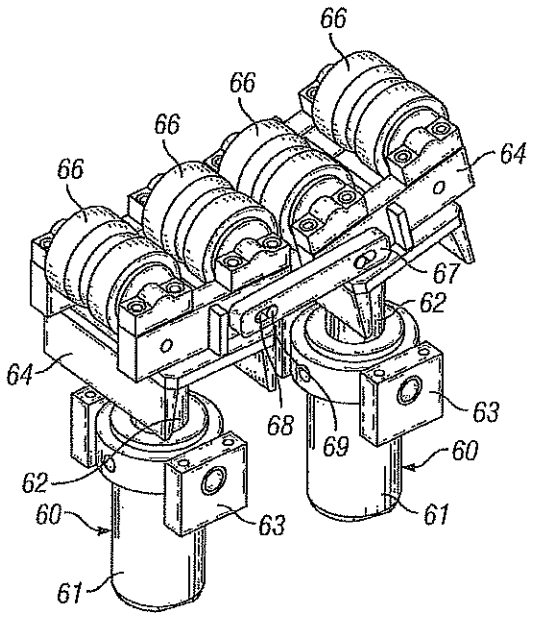
2010/0034592	A1	2/2010	Roodenburg et al.

Primary Examiner — Kyle Armstrong

(57) **ABSTRACT**

Linear pipe recovery/lay tensioners can include one or more pivot assemblies for rotatably moving an upper track away from a lower track to facilitate placement of a pipe segment between the two tracks. In addition, or alternatively, the tensioners can include one or more hydraulic cylinders that provide flexible suspension to the upper and lower tracks so the tracks can move and rotate as necessary due to differing pipe segment shapes. In addition, or alternatively, the upper and lower tracks include one or more gripping pads having one or more gripping members that can be sheathed by a compliant member until such time as the pipe segment compresses the compliant member causing the gripping member(s) to protrude from the compliant member and engage the pipe segment. Rotation of the tracks is controlled by a hydraulic pump capable of rotating the tracks at the same rate or at different rates.

16 Claims, 8 Drawing Sheets



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 620 682 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
16.10.2019 Bulletin 2019/42

(51) Int Cl.:
F16L 1/23 *(2006.01)* ***B65H 51/14*** *(2006.01)*

(21) Application number: **13275014.2**

(22) Date of filing: **18.01.2013**

(54) PIPE TENSIONER

ROHRSPANNGERÄT

TENDEUR DE TUYAU

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **24.01.2012 US 201213357007**

(43) Date of publication of application:
31.07.2013 Bulletin 2013/31

(73) Proprietor: **Control Flow Inc.**
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(72) Inventors:
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- **Preston, Kevin L.**
  Houston, Texas 77069 (US)
- **Skiles, Loren D.**
  Tomball, Texas 77377 (US)

(74) Representative: **Barker Brettell LLP**
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Birmingham B16 8QQ (GB)

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- **TECHMDL: "50 Te, 4 Track Pipe or Cable lay Tensioner, made in UK", youtube, 1 April 2011 (2011-04-01), page 1 pp., XP054977340, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=Jix8FLM08kY [retrieved on 2017-05-10]**

EP 2 620 682 B1

REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DA ECONOMIA
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº BR 102013001466-4

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito: BR 102013001466-4

(22) Data do Depósito: 21/01/2013

(43) Data da Publicação Nacional: 02/12/2014

(51) Classificação Internacional: F16L 1/23.

(30) Prioridade Unionista: US 13/357,007 de 24/01/2012.

(54) Título: TENSORES DE RECUPERAÇÃO/INSTALAÇÃO DE TUBOS LINEARES E MÉTODOS PARA O USO DOS MESMOS

(73) Titular: CONTROL FLOW INC, Pessoa Jurídica. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, ESTADOS UNIDOS DA AMÉRICA(US)

(72) Inventor: PATRICK K. ALLOWAY; KEVIN L. PRESTON; LOREN D. SKILES.

Prazo de Validade: 20 (vinte) anos contados a partir de 21/01/2013, observadas as condições legais

Expedida em: 08/12/2020

Assinado digitalmente por:
Liane Elizabeth Caldeira Lage
Diretora de Patentes, Programas de Computador e Topografias de Circuitos Integrados

US011035509B2

(12) **United States Patent**
Irvine et al.

(10) **Patent No.: US 11,035,509 B2**
(45) **Date of Patent: Jun. 15, 2021**

(54) **METAL-TO-METAL WELL EQUIPMENT SEAL**

(71) Applicants: **Jock W. Irvine**, Houston, TX (US); **Thomas M. Lambert**, Houston, TX (US)

(72) Inventors: **Jock W. Irvine**, Houston, TX (US); **Thomas M. Lambert**, Houston, TX (US)

(73) Assignee: **CONTROL FLOW, INC.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/600,440**

(22) Filed: **May 19, 2017**

(65) **Prior Publication Data**

US 2017/0336003 A1 Nov. 23, 2017

Related U.S. Application Data

(60) Provisional application No. 62/338,905, filed on May 19, 2016.

(51) **Int. Cl.**

F16L 23/20	(2006.01)
G01M 3/02	(2006.01)
F16L 23/16	(2006.01)
F16J 15/08	(2006.01)
E21B 33/03	(2006.01)

(52) **U.S. Cl.**

CPC ***F16L 23/20*** (2013.01); ***E21B 33/03*** (2013.01); ***F16J 15/08*** (2013.01); ***F16L 23/167*** (2013.01); ***G01M 3/022*** (2013.01); *F16L 2201/30* (2013.01)

(58) **Field of Classification Search**

CPC F16J 15/02; F16J 15/062; F16J 15/064; F16J 15/08; F16J 15/0881; F16J 15/0887; F16J 15/0893; F16L 23/20; F16L 15/008; F16L 15/053; F16L 19/0218

USPC 285/368, 351, 334.2, 371, 353, 354

See application file for complete search history.

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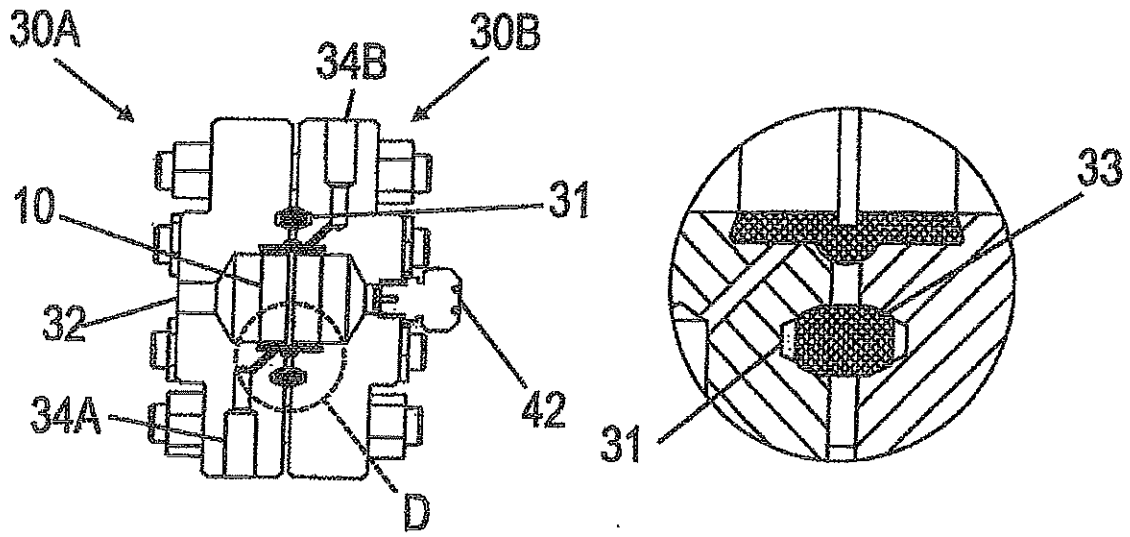
EP	2619496 B1	11/2019

Primary Examiner — Kristina R Fulton
Assistant Examiner — L. Susmitha Konera
(74) *Attorney, Agent, or Firm* — Matthews, Lawson, McCutcheon & Joseph, PLLC

(57) **ABSTRACT**

A metal-to-metal sealing system is described for forming a pressure-activated connection between two pieces of equipment under HPHT (high pressure high temperature) conditions which will degrade elastomers. The roughly cylindrical seal comprises four sealing surfaces, two sealing surfaces formed by the circular longitudinal edge, and two sealing surfaces formed by either side of a bulge located halfway along the outer diameter. These surfaces correspond with sealing surfaces on the pieces of equipment to be joined. These pieces of equipment also utilize testing ports in fluid communication with the seal in order to ensure a secure connection.

7 Claims, 7 Drawing Sheets



REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DO DESENVOLVIMENTO, INDÚSTRIA, COMÉRCIO E SERVIÇOS
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº BR 112018073573-6

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito: BR 112018073573-6

(22) Data do Depósito: 19/05/2017

(43) Data da Publicação Nacional: 29/10/2019

(51) Classificação Internacional: E21B 33/00; E21B 33/03; E21B 33/038.

(30) Prioridade Unionista: US 62/338,905 de 19/05/2016; US 15/600,440 de 19/05/2017.

(54) Título: EQUIPAMENTO VEDADOR METAL-METAL DE POÇO

(73) Titular: CONTROL FLOW, INC., Pessoa Jurídica. Endereço: 9201 FAIRBANKS NORTH HOUSTON ROAD, HOUSTON, TEXAS 77064, ESTADOS UNIDOS DA AMÉRICA(US), Norte Americana

(72) Inventor: JOCK W. IRVINE; THOMAS M. LAMBERT.

(87) Publicação PCT: WO 2017/201474 de 23/11/2017

Prazo de Validade: 20 (vinte) anos contados a partir de 19/05/2017, observadas as condições legais

Expedida em: 16/05/2023

Assinado digitalmente por:
Alexandre Dantas Rodrigues
Diretor Substituto de Patentes, Programas de Computador e Topografias de Circuitos Integrados

US 20090008513A1

(19) **United States**

(12) **Patent Application Publication**

Preston et al.

(10) **Pub. No.: US 2009/0008513 A1**

(43) **Pub. Date: Jan. 8, 2009**

(54) **PIPE ROLLER ASSEMBLY**

(75) Inventors: **Kevin L. Preston**, Tomball, TX (US); **H. Paul Reinhardt, JR.**, Houston, TX (US); **Loren D. Skiles**, Tomball, TX (US)

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(73) Assignee: **CONTROL FLOW INC.**

(21) Appl. No.: **11/824,640**

(22) Filed: **Jul. 2, 2007**

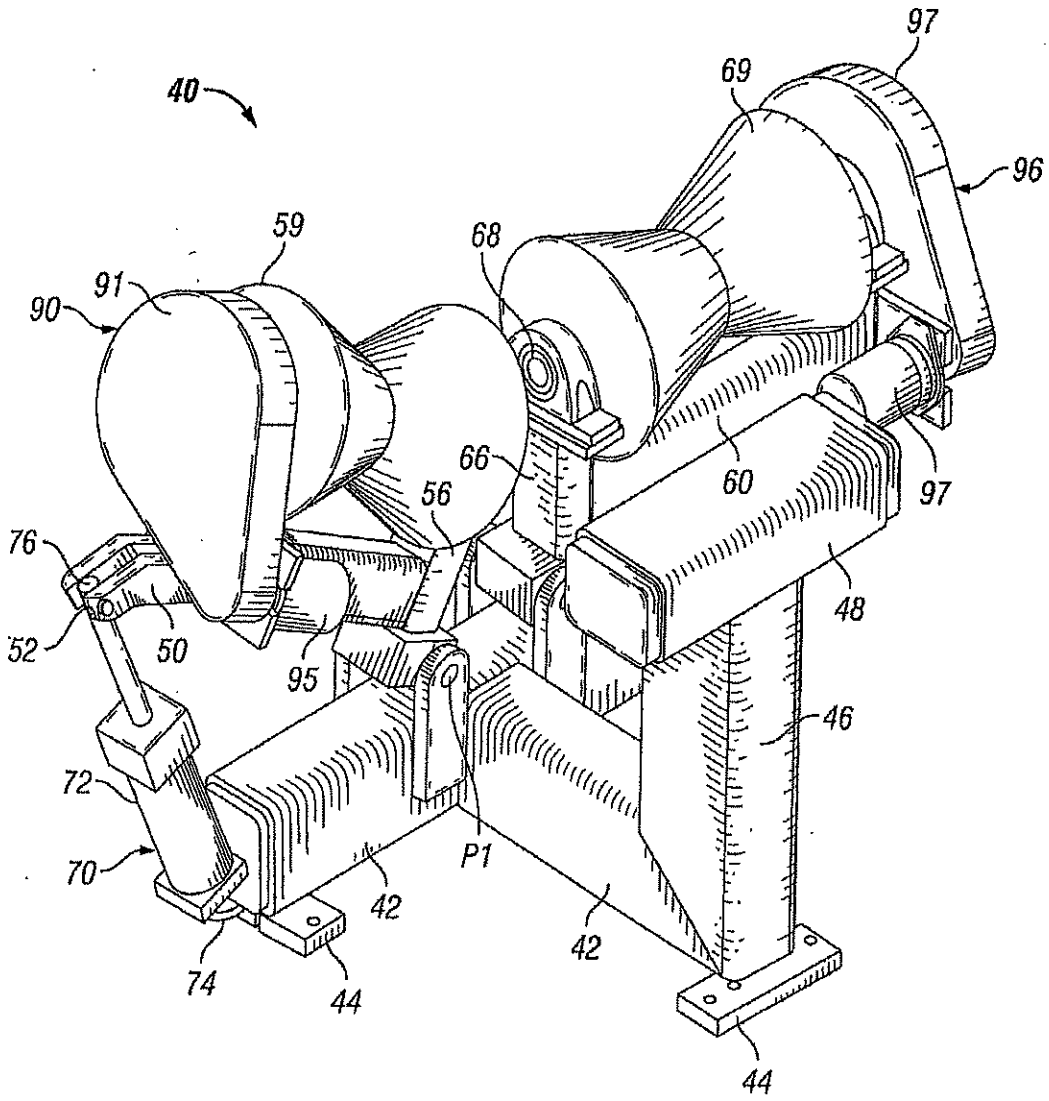
Publication Classification

(51) **Int. Cl.**
F16L 3/16 (2006.01)

(52) **U.S. Cl.** **248/55**; 242/397.3; 242/615.2; 248/371

(57) **ABSTRACT**

Roller assemblies for transporting and laterally shifting pipe section, or joints, on oil and gas exploration and production laybarges, drilling/production vessels and platforms, and pipe spooling yards are disclosed. The roller assemblies comprise rollers that are capable of being tilted to facilitate lateral shifting of the pipe sections or joints. The roller assemblies comprise a frame, a tilting assembly, a roller frame pivotally connected to the tilting assembly and the frame, and a roller rotatably connected to the roller frame by an axle. The tilting assembly lifts one end of the roller frame to tilt the roller.



US007815032B2

(12) **United States Patent**
Preston et al.

(10) **Patent No.: √US 7,815,032 B2**
(45) **Date of Patent: Oct. 19, 2010**

(54) **PIPE ROLLER ASSEMBLY**

(75) Inventors: **Kevin L. Preston**, Tomball, TX (US); **H. Paul Reinhardt, Jr.**, Houston, TX (US); **Loren D. Skiles**, Tomball, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 649 days.

(21) Appl. No.: **11/824,640**

(22) Filed: **Jul. 2, 2007**

(65) **Prior Publication Data**

US 2009/0008513 A1 Jan. 8, 2009

(51) **Int. Cl.**
B65G 47/46 (2006.01)

(52) **U.S. Cl.** **198/369.6**; 198/369.3; 198/370.09; 198/463.2

(58) **Field of Classification Search** 198/370.04, 198/370.09, 597, 598, 369.3, 369.4, 369.6, 198/782, 786, 463.2, 463.3; 414/22.65, 745.4, 414/746.7, 746.4
See application file for complete search history.

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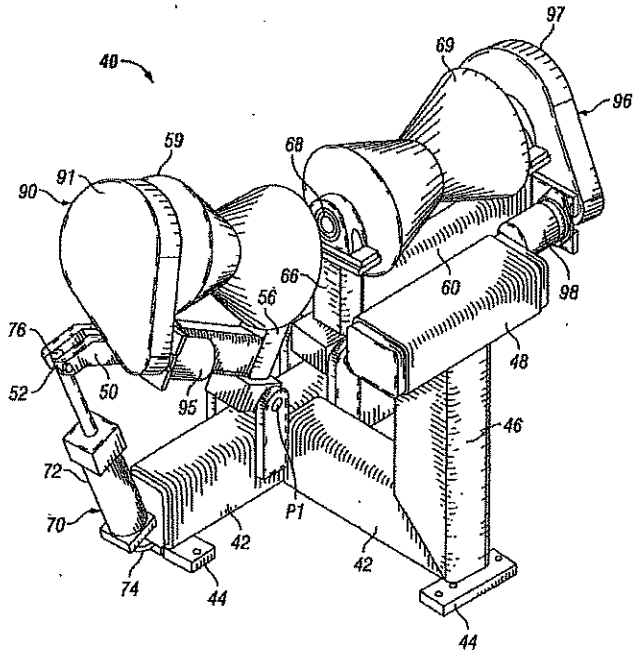
Primary Examiner—James R Bidwell
(74) *Attorney, Agent, or Firm*—Greenberg Traurig LLP; Anthony F. Matheny

(57) **ABSTRACT**

Roller assemblies for transporting and laterally shifting pipe section, or joints, on oil and gas exploration and production laybarges, drilling/production vessels and platforms, and pipe spooling yards are disclosed. The roller assemblies comprise rollers that are capable of being tilted to facilitate lateral shifting of the pipe sections or joints. The roller assemblies comprise a frame, a tilting assembly, a roller frame pivotally connected to the tilting assembly and the frame, and a roller rotatably connected to the roller frame by an axle. The tilting assembly lifts one end of the roller frame to tilt the roller.

21 Claims, 2 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 148984 has been granted in respect of an invention having the following particulars:

Title	:	PIPE ROLLER ASSEMBLY
Application Number	:	200804979-3
Date of Filing	:	02 July 2008
Priority Data	:	2 July 2007 - PATENT APPLICATION NO. 11/824,640 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	KEVIN L. PRESTON; H. PAUL REINHARDT, JR.,; LOREN D. SKILES
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW INC. 9201 FAIRBANKS NORTH HOUSTON ROAD HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
Date of Grant	:	15 March 2011

Dated this 15th day of March 2011.

Liew Woon Yin (Ms)
Registrar of Patents
Singapore

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 011 959 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
→ **17.02.2021 Bulletin 2021/07**

(51) Int Cl.:
E21B 19/15 *(2006.01)*

(21) Application number: **08159415.2**

(22) Date of filing: **01.07.2008**

→ (54) Pipe roller assembly

Rohrrollenanordnung

Ensemble de suspension à rouleau

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

(30) Priority: **02.07.2007 US 824640**

(43) Date of publication of application:
07.01.2009 Bulletin 2009/02

(73) Proprietor: **Control Flow Inc.**
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(72) Inventors:
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- **Reinhardt, Jr., H. Paul**
  Houston, TX 77065 (US)
- **Skiles, Loren D.**
  Tomball, TX 77377 (US)

(74) Representative: **Barker Brettell LLP**
100 Hagley Road
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US-B1- 6 364 011

EP 2 011 959 B1

(12) **PATENT**

(19) NO (11) **329534** (13) **B1**

NORGE (51) Int Cl.
E21B 19/09 (2006.01)

Patentstyret

(21)	Søknadsnr	20035286	(86)	Int.inng.dag og søknadsnr	
(22)	Inng.dag	2003.11.28	(85)	Videreføringsdag	
(24)	Løpedag	2003.11.28	(30)	Prioritet	2002.12.09, US, 314747
(41)	Alm.tilgj	2004.06.10			
(45)	Meddelt	2010.11.08			

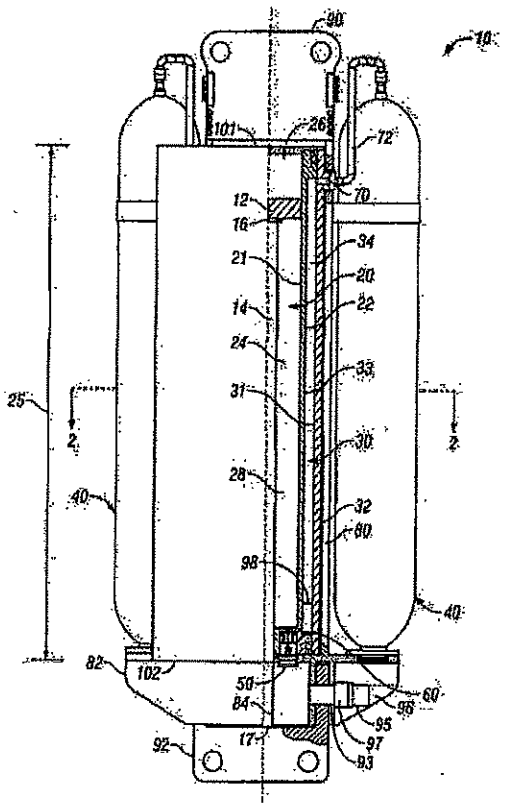
(73) Innehaver Control Flow Inc, 9201 Fairbanks North Houston Road, US-TX77064 HOUSTON, USA
(72) Oppfinner Lacey C Coffey, Houston, TX, US-, USA
Richard D Williams, Sugar Land, TX 77008, US-, USA
(74) Fullmektig Acapo AS, Postboks 1880 Nordnes, 5817 BERGEN, Norge

(54) Benevnelse **Bærbar borestrengkompensator** ✓(Portable Drill String Compensator)

(56) Anførte publikasjoner US4799827 , US4638978 , US3841607

(57) Sammendrag

Det omtales et lukket borestrengkompensatorsystem med en hydraulisk fluidakkumulator, minst én lufttrykkbeholder, og et stempel og en stempelstang glidbart innkoblet i en sylinder. Borestrengkompensatoren frembringer strekkkrefter for å støtte en borestreng og muliggjør at et borefartøy kan bli værende koblet til borestrengen under havnivåendringer forårsaker av bølgebevegelse eller hiv. I én utførelse omgir akkumulatoren sylinderen og minst én lufttrykkbeholder er radialt anordnet rundt akkumulatoren og sylinderen. I en annen utførelse omgir akkumulatoren sylinderen og omfatter 2 porter, én port for å muliggjøre fluidkommunikasjon mellom sylinderen og akkumulatoren og en andre port for å muliggjøre fluidkommunikasjon mellom akkumulatoren og lufttrykkbeholderen, hvor den første porten omfatter en avstengningsventil anordnet deri. Det er også omtalt en fremgangsmåte for kompensering av en borestreng.



US006968900B2

(12) **United States Patent**
Williams et al.

(10) **Patent No.: US 6,968,900 B2**
(45) **Date of Patent: Nov. 29, 2005**

(54) **PORTABLE DRILL STRING COMPENSATOR**

(75) Inventors: **Richard D. Williams**, Sugar Land, TX (US); **Lacey C. Coffey**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 255 days.

(21) Appl. No.: **10/314,747**

(22) Filed: **Dec. 9, 2002**

(65) **Prior Publication Data**

US 2004/0108117 A1 Jun. 10, 2004

(51) **Int. Cl.**[7] **E21B 43/01**
(52) **U.S. Cl.** **166/355**; 405/224.4; 405/224.3
(58) **Field of Search** 166/355; 405/224.3, 405/224.4, 223.1, 224.1

(56) **References Cited**

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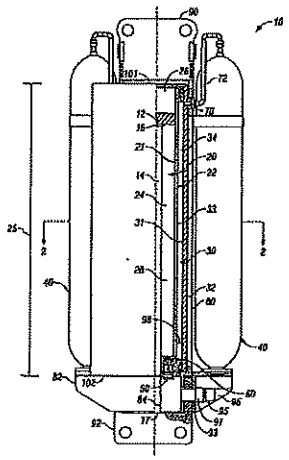
WO	WO 00/24998	5/2000

Primary Examiner—David Bagnell
(74) *Attorney, Agent, or Firm*—Andrews Kurth LLP; Anthony F. Matheny

(57) **ABSTRACT**

A closed system drill string compensator having a hydraulic fluid accumulator, at least one air pressure vessel, and a piston and a piston rod slidably engaged within a cylinder. The drill string compensator provides tensioning force for supporting a drill string and permits the drilling vessel to remain connected to the drill string during ocean level changes caused by wave action or ocean heave. In one embodiment, the accumulator surrounds the cylinder and at least one air pressure vessel is radially disposed around the accumulator and the cylinder. In another embodiment, the accumulator surrounds the cylinder and includes two ports, one port for permitting fluid communication between the cylinder and the accumulator and a second port for permitting fluid communication between the accumulator and the air pressure vessel, the first port including a shut-off valve disposed therein. Methods of compensating a drill string are also disclosed.

17 Claims, 3 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 115591 has been granted in respect of an invention having the following particulars:

Title	:	PORTABLE DRILL STRING COMPENSATOR
Application Number	:	200306898-8
Date of Filing	:	19 November 2003
Priority Data	:	09 December 2002 - PATENT APPLICATION NO. US 10/314,747 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	RICHARD D. WILLIAMS; LACEY C. COFFEY
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW, INC. 9201 FAIRBANKS NORTH HOUSTON ROAD HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
Date of Grant	:	31 August 2006

Dated this 31st day of August 2006.

Liew Woon Yin (Ms)
Registrar of Patents,
Singapore.

US007131496B2

(12) **United States Patent**
Williams et al.

(10) **Patent No.: US 7,131,496 B2**
(45) **Date of Patent: *Nov. 7, 2006**

(54) **PORTABLE DRILL STRING COMPENSATOR**

(75) Inventors: **Richard D. Williams**, Sugar Land, TX (US); **Lacey C. Coffey**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/182,636**

(22) Filed: **Jul. 15, 2005**

(65) **Prior Publication Data**

US 2005/0247452 A1 Nov. 10, 2005

Related U.S. Application Data

(63) Continuation of application No. 10/314,747, filed on Dec. 9, 2002, now Pat. No. 6,968,900.

(51) **Int. Cl.**
E21B 43/01 (2006.01)

(52) **U.S. Cl.** **166/355**; 405/224.2; 405/224.3

(58) **Field of Classification Search** 166/355; 405/224.1, 224.3, 224.4, 223.1
See application file for complete search history.

(56) **References Cited**

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U.S. Appl. Ser. No. 10/314,747, filed Dec. 9, 2002, last amended May 23, 2005.*

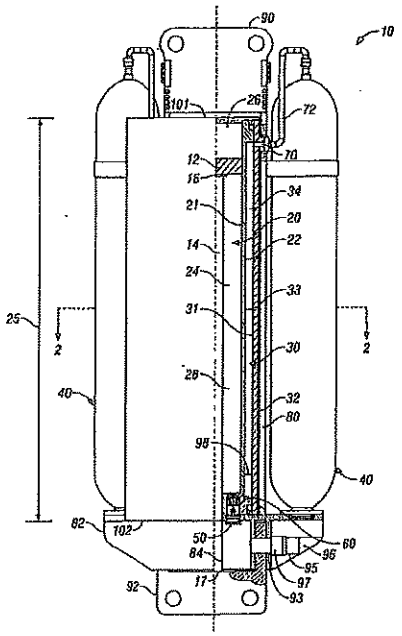
* cited by examiner

Primary Examiner—David Bagnell
Assistant Examiner—G M Collins
(74) *Attorney, Agent, or Firm*—Bracewell & Giuliani LLP; Anthony F. Matheny

(57) **ABSTRACT**

A closed system drill string compensator having a hydraulic fluid accumulator, at least one air pressure vessel, and a piston and a piston rod slidably engaged within a cylinder. The drill string compensator provides tensioning force for supporting a drill string and permits the drilling vessel to remain connected to the drill string during ocean level changes caused by wave action or ocean heave. In one embodiment, the accumulator surrounds the cylinder and at least one air pressure vessel is radially disposed around the accumulator and the cylinder. In another embodiment, the accumulator surrounds the cylinder and includes two ports, one port for permitting fluid communication between the cylinder and the accumulator and a second port for permitting fluid communication between the accumulator and the air pressure vessel, the first port including a shut-off valve disposed therein. Methods of compensating a drill string are also disclosed.

14 Claims, 3 Drawing Sheets



REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DA INDÚSTRIA, COMÉRCIO EXTERIOR E SERVIÇOS
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº PI 0307860-4

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO

(21) Número do Depósito: PI 0307860-4

(22) Data do Depósito: 01/12/2003

(43) Data da Publicação do Pedido: 07/12/2004

(51) Classificação Internacional: E21B 19/09

(30) Prioridade Unionista: US 10/314,747 de 09/12/2002

(54) Título: COMPENSADOR PORTÁTIL DE COLUNA DE PERFURADOR E PROCESSO DE UTILIZAÇÃO DO MESMO (Portable Drill String Compensator)

(73) Titular: CONTROL FLOW, INC. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, ESTADOS UNIDOS DA AMÉRICA(US)

(72) Inventor: RICHARD D. WILLIAMS; LACEY C. COFFEY

Prazo de Validade: 10 (dez) anos contados a partir de 21/02/2017, observadas as condições legais

Expedida em: 21 de Fevereiro de 2017.

Assinado digitalmente por:
Júlio César Castelo Branco Reis Moreira
Diretor de Patente

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 428 973 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
31.05.2006 Bulletin 2006/22

(51) Int Cl.:
E21B 19/09 *(2006.01)*

(21) Application number: **03078680.0**

(22) Date of filing: **19.11.2003**

(54) **Portable heave compensator**

Tragbarer Tauschwingungskompensator

Compensateur de pilonnement portatif

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: **09.12.2002 US 314747**

(43) Date of publication of application:
16.06.2004 Bulletin 2004/25

(73) Proprietor: **Control Flow Inc.**
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(72) Inventors:
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- **Coffey, Lacey C.**
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(74) Representative: **Newstead, Michael John et al**
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Bristol BS1 2NT (GB)

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US-A- 3 841 607
US-A- 4 449 854
US-A- 4 638 978
US-A- 4 799 827

EP 1 428 973 B1

Printed by Jouve, 75001 PARIS (FR)

Ram-Type Tensioner Having Integral Hydraulic Fluid Accumulator

(12) **PATENT**

(19) NO (11) **324759** (13) **B1**

NORGE (51) Int Cl.
E21B 19/09 (2006.01)

Patentstyret

(21)	Søknadsnr	20035285	(86)	Int.inng.dag og søknadsnr	
(22)	Inng.dag	2003.11.28	(85)	Videreføringsdag	
(24)	Løpedag	2003.11.28	(30)	Prioritet	2002.12.09, US, 314710
(41)	Alm.tilgj	2004.06.10			
(45)	Meddelt	2007.12.10			

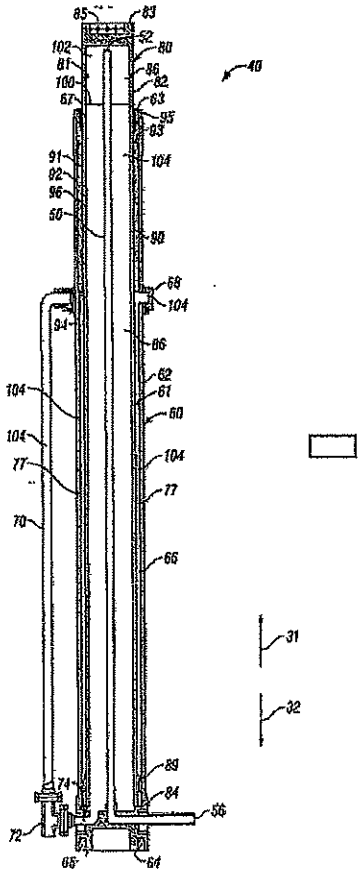
(73) Innehaver Control Flow Inc, 9201 Fairbanks North Houston Road, TX77064 HOUSTON, US
(72) Oppfinner Lacey C Coffey, Houston, TX, US
Richard D Williams, Sugar Land, TX 77008, US
(74) Fullmektig Acapo AS, Postboks 1880 Nordnes, 5817 BERGEN

(54) Benevnelse **Strekkanordning med integrert hydraulisk fluidakkumulator**

(56) Anførte publikasjoner US 3897045, US 4638978, US 5252004

(57) Sammendrag

Oppfinnelsen er rettet mot en strekksammenstilling for å frembringe strekk-krefter fra et flytende fartøy ved overflaten av havet til utblåsningssikrings-stack'en, eller produksjonstreet, som er koblet til brønnhoder på sjøbunnen. Strekksammenstillingen kompenserer for fartøybevegelser påført av bølgebevegelse og hiv og opprettholder et variabelt strekk på stigerørstrengen som reduserer mulighet for sammentrekning og således knekking eller feil på stigerørstrengen. Strekksammenstillingen ifølge oppfinnelsen omfatter en sylinder, et stopprør anordnet i sylinderen og et slagstempel glidbart i kontakt med stopprøret. Strekksammenstillingen omfatter også minst ett gass- eller luft-overføringsrør for å frembringe et trykksatt luft-over-hydraulisk fluid-arrangement for å frembringe strekk-krefter til strekksammenstillingen.



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 428 971 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
03.05.2006 Bulletin 2006/18

(51) Int Cl.:
E21B 19/00 *(2006.01)*

(21) Application number: **03257691.0**

(22) Date of filing: **08.12.2003**

(54) **Tensioner assembly having integral hydraulic fluid accumulator** (Ram-Type) ✓

Spannanordnungsvorrichtung mit integriertem Druckmittelspeicher

Ensemble de tension ayant un accumulateur de fluide sous-pression intégré

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **09.12.2002 US 314710**

(43) Date of publication of application:
16.06.2004 Bulletin 2004/25

(73) Proprietor: **Control Flow Inc.**
Houston, TX 77064 (US)

(72) Inventors:
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EP 1 428 971 B1

Printed by Jouve, 75001 PARIS (FR)

US007008340B2

(12) **United States Patent**
Williams et al.

(10) **Patent No.: US 7,008,340 B2**
(45) **Date of Patent: Mar. 7, 2006**

(54) **RAM-TYPE TENSIONER ASSEMBLY HAVING INTEGRAL HYDRAULIC FLUID ACCUMULATOR**

(75) Inventors: **Richard D. Williams**, Sugar Land, TX (US); **Lacey C. Coffey**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 238 days.

(21) Appl. No.: **10/314,710**

(22) Filed: **Dec. 9, 2002**

(65) **Prior Publication Data**

US 2004/0110589 A1 Jun. 10, 2004

(51) **Int. Cl.**
F16H 7/08 (2006.01)
F16H 7/18 (2006.01)
F21B 29/12 (2006.01)

(52) **U.S. Cl.** **474/101**; 474/110; 166/355; 405/224.4

(58) **Field of Classification Search** ..... 474/101, 474/110, 109; 175/5, 7, 8; 91/4 R, 4 A; 166/355, 350, 346, 367; 405/224.3, 224.2, 405/224.4
See application file for complete search history.

(56) **References Cited**

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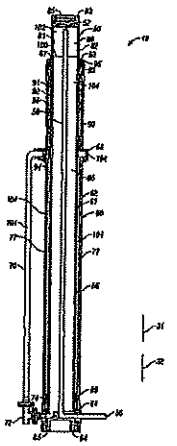
(Continued)

Primary Examiner—Marcus Charles
(74) *Attorney, Agent, or Firm*—Andrews Kurth LLP; Anthony F. Matheny

(57) **ABSTRACT**

The invention is directed to a tensioner assembly for providing tensile force from a floating vessel at the surface of the ocean to the blowout preventer stack, or production tree, which is connected to the wellhead at the sea floor. The tensioner assembly compensates for vessel motion induced by wave action and heave and maintains a variable tension to the riser string alleviating the potential for compression and thus buckling or failure of the riser string. The tensioner assembly of the present invention includes a cylinder, a stop tube disposed with the cylinder, and a ram slidably engaged within the stop tube. The tensioner assembly also includes at least one gas, or air, transfer tube to create a pressurized air over hydraulic fluid arrangement to provide tensile force to the tensioner assembly.

6 Claims, 4 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 125097 has been granted in respect of an invention having the following particulars:

Title	:	RAM-TYPE TENSIONER ASSEMBLY HAVING INTEGRAL HYDRAULIC FLUID ACCUMULATOR
Application Number	:	200306913-5
Date of Filing	:	19 November 2003
Priority Data	:	9 December 2002 - PATENT APPLICATION NO. US 10/314,710 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	RICHARD D. WILLIAMS; LACEY C. COFFEY
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW, INC. 9201 FAIRBANKS NORTH HOUSTON ROAD HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
Date of Grant	:	31 October 2006

Dated this 31st day of October 2006.

Liew Woon Yin (Ms)
Registrar of Patents,
Singapore

US007131922B2

(12) **United States Patent**
Williams et al.

(10) **Patent No.: US 7,131,922 B2**
(45) **Date of Patent: Nov. 7, 2006**

(54) **RAM-TYPE TENSIONER ASSEMBLY HAVING INTEGRAL HYDRAULIC FLUID ACCUMULATOR**

(75) Inventors: **Richard D. Williams**, Sugar Land, TX (US); **Lacey C. Coffey**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/368,076**

(22) Filed: **Mar. 3, 2006**

(65) **Prior Publication Data**

US 2006/0154764 A1 Jul. 13, 2006

Related U.S. Application Data

(62) Division of application No. 10/314,710, filed on Dec. 9, 2002, now Pat. No. 7,008,340.

(51) **Int. Cl.**
F16H 7/08 (2006.01)
F16H 7/18 (2006.01)
F21B 29/12 (2006.01)

(52) **U.S. Cl.** **474/101**; 474/110; 165/355; 405/224.5

(58) **Field of Classification Search** 474/109–110, 474/101, 117; 405/224.3, 224.4; 166/346, 166/350, 367, 355; 175/5–6
See application file for complete search history.

(56) **References Cited**

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FOREIGN PATENT DOCUMENTS

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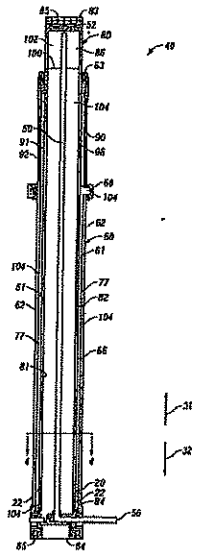
* cited by examiner

Primary Examiner—Marcus Charles
(74) *Attorney, Agent, or Firm*—Bracewell & Giuliani LLP; Anthony F. Matheny

(57) **ABSTRACT**

The invention is directed to a tensioner assembly for providing tensile force from a floating vessel at the surface of the ocean to the blowout preventer stack, or production tree, which is connected to the wellhead at the sea floor. The tensioner assembly compensates for vessel motion induced by wave action and heave and maintains a variable tension to the riser string alleviating the potential for compression and thus buckling or failure of the riser string. The tensioner assembly of the present invention includes a cylinder, a stop tube disposed with the cylinder, and a ram slidably engaged within the stop tube. The tensioner assembly also includes at least one gas, or air, transfer tube to create a pressurized air over hydraulic fluid arrangement to provide tensile force to the tensioner assembly.

17 Claims, 4 Drawing Sheets



Ram-Type Tensioner Assembly Having Ingetral Hydraulic Fluid Accumulator

INPI Assinado Digitalmente

REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DO DESENVOLVIMENTO, INDÚSTRIA E COMÉRCIO EXTERIOR
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº PI 0306552-9

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito: PI 0306552-9

(22) Data do Depósito: 04/12/2003

(43) Data da Publicação do Pedido: 05/10/2004

(51) Classificação Internacional: E21B 17/00

(30) Prioridade Unionista: 09/12/2002 US 10/314,710

(54) Título: CONJUNTO TENSOR TIPO ÊMBOLO COM ACUMULADOR DE FLUIDO HIDRÁULICO INTEGRADO

(73) Titular: CONTROL FLOW, INC. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, Estados Unidos (US).

(72) Inventor: RICHARD D. WILLIAMS

Prazo de Validade: 10 (dez) anos contados a partir de 13/01/2015, observadas as condições legais.

Expedida em: 13 de Janeiro de 2015.

Assinado digitalmente por:
Liane Elizabeth Caldeira Lage
Diretora de Patentes Substituta

US006834723B2

(12) **United States Patent**
Jordan

(10) **Patent No.: US 6,834,723 B2**
(45) **Date of Patent: Dec. 28, 2004**

(54) **SYSTEM AND METHOD FOR RISER RECOIL CONTROL**

(75) Inventor: **Larry Russell Jordan**, Houston, TX (US)

(73) Assignee: **Cooper Cameron Corporation**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 64 days.

(21) Appl. No.: **10/258,512**

(22) PCT Filed: **Apr. 27, 2001**

(86) PCT No.: **PCT/US01/13800**

§ 371 (c)(1),
(2), (4) Date: **Oct. 24, 2002**

(87) PCT Pub. No.: **WO01/81164**

PCT Pub. Date: **Nov. 1, 2001**

(65) **Prior Publication Data**

US 2003/0205382 A1 Nov. 6, 2003

Related U.S. Application Data

(60) Provisional application No. 60/200,398, filed on Apr. 27, 2000.

(51) **Int. Cl.**[7] **E21B 19/09**

(52) **U.S. Cl.** **166/355**; 114/264; 166/367; 175/5

(58) **Field of Search** 175/5, 7; 166/355, 166/354, 367; 114/264; 405/224.1, 224.2, 224.3, 224.4, 195.1

(56) **References Cited**

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5,978,739 A		11/1999	Stockton	702/6

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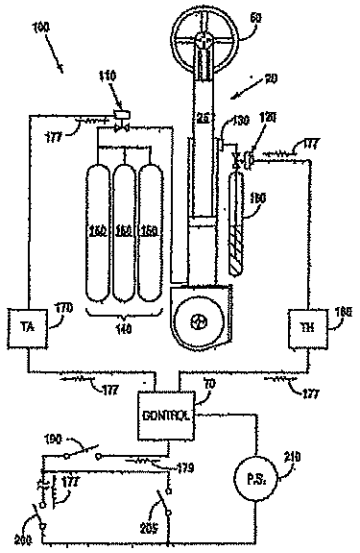
Primary Examiner—William Neuder
(74) *Attorney, Agent, or Firm*—Michael P. Hartman; Peter J. Bielinski

(57) **ABSTRACT**

A riser recoil control system (10) adjusts tension forces (F1, F2) applied to a marine riser (60), which is attached to an anchored, floating vessel (30) and a wellhead (80). The riser (60) is attached to the vessel (30) using tension forces (F1, F2) asserted by riser tensioners (20). Each tensioner (20) has an air shutoff valve (110), and an orifice-controlled fluid valve (120). A disconnection sensing means (200) provides a disconnect signal when the riser (60) is disconnected from the wellhead (80), which closes the valves (110, 120) and adjusts the tension forces (F1, F2) applied by the tensioners (20). The invention includes a method for adjusting the tension forces (F1, F2) applied to the riser (60), including sensing the disconnect signal and adjusting the tension forces (F1, F2) supplied to the riser (60) by closing the air shutoff valves (110) and partially closing the orifice-controlled fluid valves (120).

12 Claims, 3 Drawing Sheets



(12) **PATENT**

✓Tensioner/Slip Joint Assembly

(19) NO (11) **330547** (13) **B1**

NORGE

(51) Int Cl.
E21B 19/00 (2006.01)

Patentstyret

(21)	Søknadsnr	20025469	(86)	Int.inng.dag og søknadsnr	2001.06.14 PCT/US2001/19371
(22)	Inng.dag	2002.11.15	(85)	Videreføringsdag	2002.11.15
(24)	Løpedag	2001.06.14 ←	(30)	Prioritet	2000.06.15, US, 211652
(41)	Alm.tilgj	2003.02.12			
(45)	Meddelt	2011.05.16			

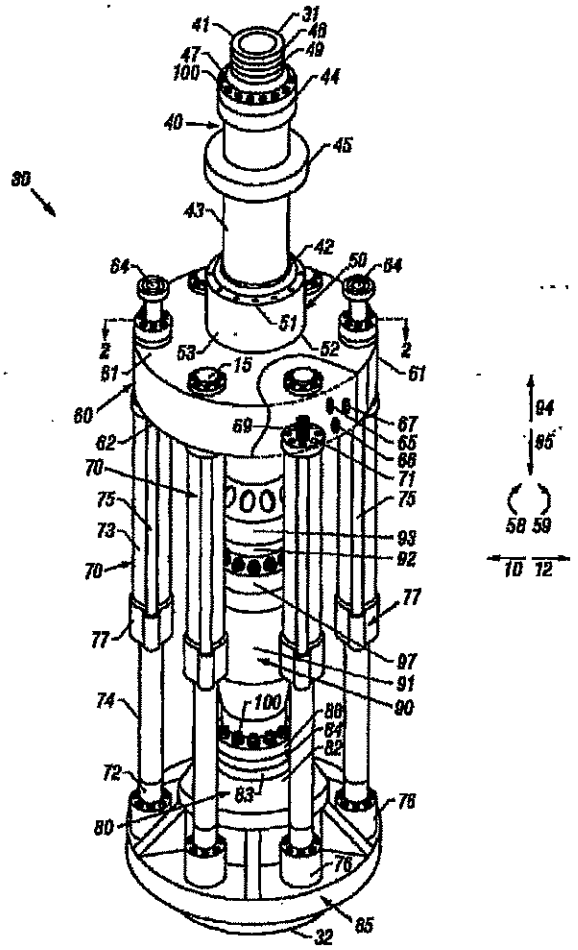
(73) Innehaver Control Flow Inc, 9201 Fairbanks North Houston Road, TX77064 HOUSTON, USA
(72) Oppfinner Graeme E Reynolds, 2053 Western Village, Houston, TX 77043, USA
(74) Fullmektig Acapo AS, Postboks 1880 Nordnes, 5817 BERGEN, Norge

(54) Benevnelse **Anordning ved glidekobling**

(56) Anførte publikasjoner US 4712620 A, US 5846028 A, US 5951061 A, US 4068868 A, US 5727630 A

(57) Sammendrag

Oppfinnelsen vedrører en strekk/glideskjøtmodul for å frembringe en rørledning fra et drivende fartøy på havets overflate til utblåsningssikringen, eller produksjonstreet, som er koblet til brønnhodet på havbunnen. Strekk/glide- skjøtmodulen (30) kompenserer for fartøyets bevegelse forårsaket av bølgenes påvirkning og løft og opprettholder en variabel strekk på stigerørsstrengen, som reduserer potensialet for kompresjon og således knekking eller sammenbrudd av stigerørsstrengen. Strekk/glideskjøtmodulen (30) i foreliggende oppfinnelse omfatter foretrukket minst en røropphengsforing (40) med minst en opphengsring (45); minst en øvre fleksibel dreieskjøtsammenstilling (50), minst en manifold med radiale åpninger (60), minst en strekksylinder (70) og minst en glideskjøtsammenstilling (90), satt sammen som en enhet.



US006739395B2

(12) **United States Patent**
Reynolds

(10) **Patent No.: US 6,739,395 B2**
(45) **Date of Patent: *May 25, 2004**

(54) **TENSIONER/SLIP-JOINT ASSEMBLY**

(75) Inventor: **Graeme E. Reynolds**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/342,996**

(22) Filed: **Jan. 15, 2003**

(65) **Prior Publication Data**

US 2003/0102134 A1 Jun. 5, 2003

Related U.S. Application Data

(63) Continuation of application No. 09/881,139, filed on Jun. 14, 2001, now Pat. No. 6,530,430.
(60) Provisional application No. 60/211,652, filed on Jun. 15, 2000.

(51) **Int. Cl.**[7] **E21B 29/12**; E21B 12/01
(52) **U.S. Cl.** **166/346**; 166/355; 166/367
(58) **Field of Search** 166/350, 359, 166/367, 355, 346; 405/224.4, 224.2

(56) **References Cited**

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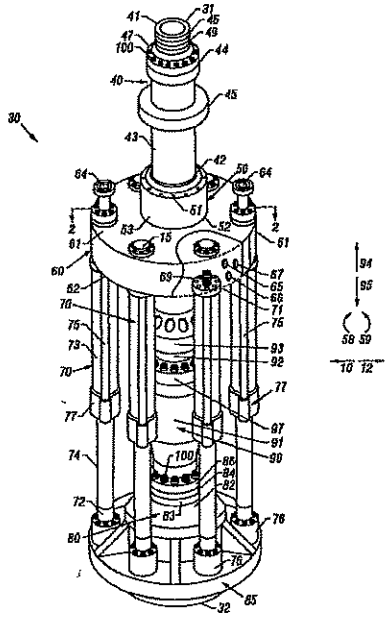
Primary Examiner—Robert E. Pezzuto
Assistant Examiner—Thomas A Beach
(74) *Attorney, Agent, or Firm*—Anthony F. Matheny; Andrews Kurth LLP

(57) **ABSTRACT**

The invention is directed to a tensioner/slip-joint module for providing a conduit from a floating vessel at the surface of the ocean to the blowout preventer stack, or production tree, which is connected to the wellhead at the sea floor. The tensioner/slip-joint module compensates for vessel motion induced by wave action and heave and maintains a variable tension to the riser string alleviating the potential for compression and thus buckling or failure of the riser string. The tensioner/slip-joint module of the present invention preferably includes at least one mandrel having at least one hang-off donut; at least one upper flexjoint swivel assembly, at least one radially ported manifold, at least one tensioning cylinder, and at least one slip-joint assembly combined in a single unit.

24 Claims, 5 Drawing Sheets



US006530430B2

(12) **United States Patent**
Reynolds

(10) **Patent No.: US 6,530,430 B2**
(45) **Date of Patent: Mar. 11, 2003**

(54) **TENSIONER/SLIP-JOINT ASSEMBLY**

(75) Inventor: **Graeme E. Reynolds**, Houston, TX (US)

(73) Assignee: **Control Flow Inc.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 30 days.

(21) Appl. No.: **09/881,139**

(22) Filed: **Jun. 14, 2001**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 60/211,652, filed on Jun. 15, 2000.

(51) **Int. Cl.**[7] **E21B 29/12**; E21B 12/01

(52) **U.S. Cl.** **166/346**; 166/355; 166/367

(58) **Field of Search** 166/350, 359, 166/367, 355, 346; 405/224.4, 224.2

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WO	WO 00/24998	5/2000

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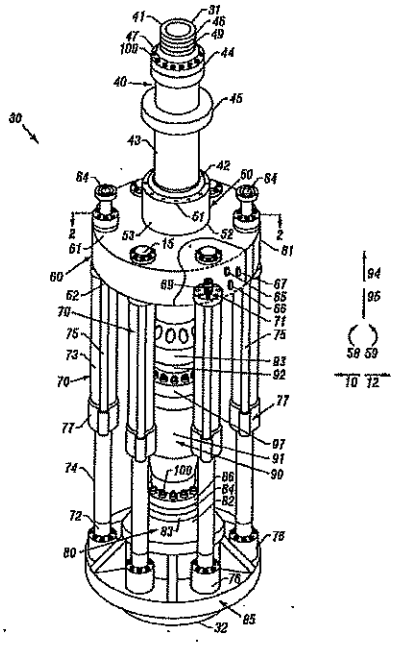
Primary Examiner—Thomas B. Will
Assistant Examiner—Thomas A. Beach
(74) *Attorney, Agent, or Firm*—Andrews & Kurth L.L.P.; Anthony F. Matheny

(57) **ABSTRACT**

A tensioner/slip-joint module for providing a conduit from a floating vessel at the surface of the ocean to the blowout preventer stack, or production tree, which is connected to the wellhead at the sea floor. The tensioner/slip-joint module compensates for vessel motion induced by wave action and heave and maintains a variable tension to the riser string alleviating the potential for compression and thus buckling or failure of the riser string. The tensioner/slip-joint module preferably includes at least one mandrel having at least one hang-off donut; at least one upper flexjoint swivel assembly, at least one radially ported manifold, at least one tensioning cylinder, and at least one slip-joint assembly combined in a single unit.

24 Claims, 5 Drawing Sheets



THE REGISTRY OF PATENTS
SINGAPORE

THE PATENTS ACT
(CHAPTER 221)

CERTIFICATE OF GRANT OF PATENT

In accordance with section 35 of the Patents Act, it is hereby certified that a patent having the P-No. 93649 [WO 01/96706] has been granted in respect of an invention having the following particulars:

Title	:	TENSIONER/SLIP-JOINT ASSEMBLY
Application Number	:	200207553-9
Date of Filing	:	14 June 2001
Priority Data	:	15 June 2000 - PATENT APPLICATION NO. 60/211,652 (UNITED STATES OF AMERICA)
Name of Inventor(s)	:	REYNOLDS, GRAEME, E.
Name(s) and Address(es) of Proprietor(s) of Patent	:	CONTROL FLOW, INC. 9201 FAIRBANKS N. HOUSTON ROAD, HOUSTON, TEXAS 77064 UNITED STATES OF AMERICA
Date of Grant	:	31 January 2005

Dated this 31st day of January 2005.

Wong Sheng Kwai (Mr)
Acting Registrar of Patents,
Singapore.

✓Tensioner/Slip-Joint Assembly

SUOMI – FINLAND
(FI)

PATENTTI- JA REKISTERIHALLITUS
PATENT- OCH REGISTERSTYRELSEN

(12) **EUROOPAN PATENTTIJULKAISUN KÄÄNNÖS**
ÖVERSÄTTNING AV EUROPEISK PATENTSKRIFT

(10) **FI/EP1295009 T3**

(45) Käännöksen kuul. pvm - Övers. kungörelsedag **14.07.2006**

(80) Euroopan patentin myöntämispäivä -
Meddelandedatum för det europeiska patentet **29.03.2006**

(51) Kv.lk. - Int.kl.

E21B 19/00 (2006.01)

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(87) EP-hakemuksen julkiseksi tulo pvm -
EP-ansökans publiceringsdag **26.03.2003**

(86) Kv. hakemus - Int. ansökan **PCT/ US2001019371**

(30) Etuoikeus - Prioritet

15.06.2000 US 211652 P

(73) Haltija - Innehavare

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(72) Keksijä - Uppfinnare

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Kiristin/liukuliitoskokonaisuus
Spänningsanordning / glidförbandsuppsättning

(56) Viitejulkaisut - Anförda publikationer

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REPÚBLICA FEDERATIVA DO BRASIL

Ministério do Desenvolvimento, Indústria e Comércio Exterior
Instituto Nacional da Propriedade Industrial

CARTA PATENTE N.º PI0111376-3 *Patente de Invenção*

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito : PI0111376-3

(22) Data do Depósito : 14/06/2001

(43) Data da Publicação do Pedido : 20/12/2001

(51) Classificação Internacional : E21B 19/00

(30) Prioridade Unionista : 15/06/2000 US 60/211,652

(54) Título : CONJUNTO TENSOR/JUNTA DESLIZANTE.
√ (Tensioner/Slip-Joint Assembly)

(73) Titular : Control Flow, Inc.. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, Estados Unidos (US).

(72) Inventor : Graeme E. Reynolds. Endereço: 2053 Western Vilage, Houston, TX 77043, Estados Unidos.

Prazo de Validade : 10 (dez) anos contados a partir de 06/09/2011, observadas as condições legais.

Expedida em : 6 de Setembro de 2011.

Júlio César Castelo Branco Reis Moreira
Diretor de Patentes

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 295 009 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.03.2006 Bulletin 2006/13

(21) Application number: **01948420.3**

(22) Date of filing: **14.06.2001**

(51) Int Cl.:
E21B 19/00 *(2006.01)*

(86) International application number:
PCT/US2001/019371

(87) International publication number:
WO 2001/096706 (20.12.2001 Gazette 2001/51)

(54) **TENSIONER/SLIP-JOINT ASSEMBLY**

TELESKOPISCHE SPANNVORRICHTUNG FÜR EINE STEIGROHRVERBINDUNG

ASSEMBLAGE JOINT COULISSANT/TENSIONNEUR

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR

(30) Priority: **15.06.2000 US 211652 P**

(43) Date of publication of application:
26.03.2003 Bulletin 2003/13

(73) Proprietor: **Control Flow Inc.**
Houston, TX 77064 (US)

(72) Inventor: **REYNOLDS, Graeme, E.**
Houston, TX 77043 (US)

(74) Representative: **Newstead, Michael John et al**
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Bristol BS1 2NT (GB)

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US-A- 4 712 620
US-A- 5 727 630
US-A- 5 846 028
US-A- 5 951 061

EP 1 295 009 B1

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REPÚBLICA FEDERATIVA DO BRASIL
MINISTÉRIO DO DESENVOLVIMENTO, INDÚSTRIA E COMÉRCIO EXTERIOR
INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

CARTA PATENTE Nº PI 0306552-9

O INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL concede a presente PATENTE DE INVENÇÃO, que outorga ao seu titular a propriedade da invenção caracterizada neste título, em todo o território nacional, garantindo os direitos dela decorrentes, previstos na legislação em vigor.

(21) Número do Depósito: PI 0306552-9

(22) Data do Depósito: 04/12/2003

(43) Data da Publicação do Pedido: 05/10/2004

(51) Classificação Internacional: E21B 17/00

(30) Prioridade Unionista: 09/12/2002 US 10/314,710

(54) Título: CONJUNTO TENSOR TIPO ÊMBOLO COM ACUMULADOR DE FLUIDO HIDRÁULICO INTEGRADO

(73) Titular: CONTROL FLOW, INC. Endereço: 9201 Fairbanks North Houston Road, Houston, Texas 77064, Estados Unidos (US).

(72) Inventor: RICHARD D. WILLIAMS

Prazo de Validade: 10 (dez) anos contados a partir de 13/01/2015, observadas as condições legais.

Expedida em: 13 de Janeiro de 2015.

Assinado digitalmente por:
Liane Elizabeth Caldeira Lage
Diretora de Patentes Substituta

US010156115B2

(12) **United States Patent**
Irvine et al.

(10) **Patent No.: US 10,156,115 B2**
(45) **Date of Patent: Dec. 18, 2018**

(54) **WEIGHT SET MANDREL AND TUBING HANGER**

(71) Applicants: **Jock W. Irvine**, Houston, TX (US); **Thomas M. Lambert**, Houston, TX (US)

(72) Inventors: **Jock W. Irvine**, Houston, TX (US); **Thomas M. Lambert**, Houston, TX (US)

(73) Assignee: **CONTROL FLOW, INC.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 133 days.

(21) Appl. No.: **15/257,700**

(22) Filed: **Sep. 6, 2016**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 62/214,754, filed on Sep. 4, 2015.

(51) **Int. Cl.**
E21B 33/04 (2006.01)
E21B 23/01 (2006.01)

(52) **U.S. Cl.**
CPC ***E21B 33/04*** (2013.01); ***E21B 23/01*** (2013.01)

(58) **Field of Classification Search**
CPC E21B 33/04; E21B 23/01
USPC 166/382
See application file for complete search history.

(56) **References Cited**

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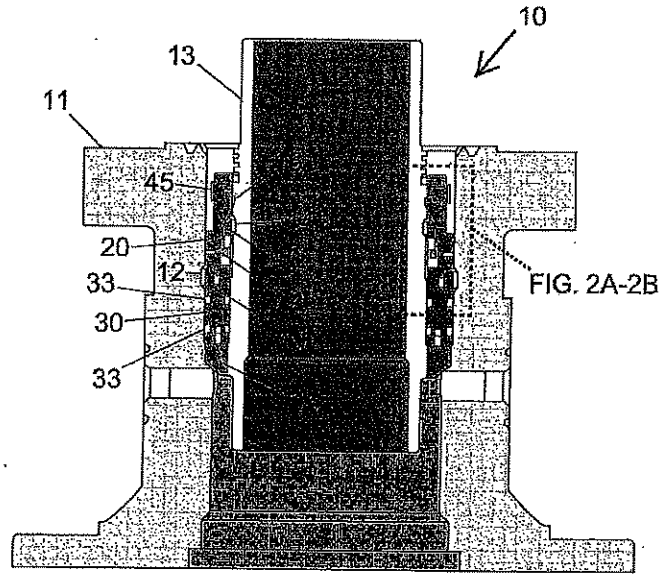
Primary Examiner — Taras P Bemko

(57) **ABSTRACT**

An improved weight-set hanger system and method of securing the weight set hanger for use comprises three independent locking mechanisms that are built into an actuator/packoff assembly. These independent locking mechanisms comprise two locking rings, one of which fastens the actuator/packoff assembly to a spool body, and the other of which internally locks the hanger to the actuator/packoff assembly. A third locking mechanism comprises a plurality of screw down spring loaded lock pin assemblies, which, in an embodiment, are spaced out at 90 degree intervals.

10 Claims, 2 Drawing Sheets



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 344 847 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
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(21) Application number: **16843197.1**

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(51) Int Cl.:
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E21B 33/04 *(2006.01)* ***E21B 43/10*** *(2006.01)*

(86) International application number:
PCT/US2016/050433

(87) International publication number:
WO 2017/041108 (09.03.2017 Gazette 2017/10)

(54) **WEIGHT-SET MANDREL AND TUBING HANGER**

AUFHÄNGER MIT EINGESTELLTEM GEWICHT FÜR DORN UND ROHR

MANDRIN ENSEMBLE DE POIDS ET SUSPENSION DE TUBULURE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **04.09.2015 US 201562214754 P**

(43) Date of publication of application:
11.07.2018 Bulletin 2018/28

(73) Proprietor: **Control Flow Inc.**
Houston, TX 77064 (US)

(72) Inventors:
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  Houston, TX 77065 (US)
- **LAMBERT, Thomas, M**
  Houston, TX 77073 (US)

(74) Representative: **Barker Brettell LLP**
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EP 3 344 847 B1