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Trámite : 002
Evento : 001
Actuación : 329

Referencia : Expediente No. 12.175.776
Asunto : Solicitud de Patente para **BRAZO ROBOTICO MONTABLE EN UNA PLUMA**
Solicitante : **QUANTA ASSOCIATES, L.P.**
Fecha de solicitud : 05 de Octubre de 2012

PRESENTACIÓN DOCUMENTO DE PRIORIDAD

1. Yo, Luz Clemencia de PAEZ, en mi condición de apoderada de la sociedad solicitante en el asunto identificado en la referencia, acompaño con este escrito copia certificada de la solicitud de patente No. 13/374,057 presentada en Estados Unidos de América el 09 de diciembre de 2011, de la cual se reclama prioridad en esta solicitud de patente, junto con la correspondiente traducción al español.

La copia certificada del documento de prioridad está siendo presentada dentro del término legal correspondiente, esto es 09 de abril de 2013, de conformidad con lo establecido en los artículos 10 y 11 de la Decisión 486 de la Comisión de la Comunidad Andina.

2. Solicito a ese Despacho tener en cuenta los anteriores documentos y continuar con el trámite correspondiente.

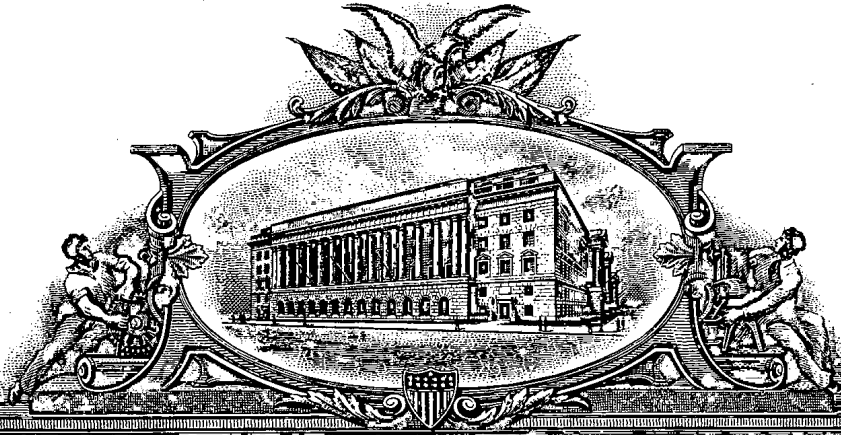
Señor Director,

Luz Clemencia de Páez
LUZ CLEMENCIA DE PAEZ
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December 31, 2012

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 13/374,057

FILING DATE: December 09, 2011

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US13/374,057

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120911

PTO/SB/05 (08-08)

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UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR 1.53(b))	Attorney Docket No.	ACE-40522
	First Inventor	Clifford William Devine
	Title	BOOM MOUNTABLE ROBOTIC ARM
	Express Mail Label No.	

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria VA 22313-1450
1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) 2. ☐ Applicant claims small entity status. See 37 CFR 1.27. 3. ☒ Specification [Total Pages <u>24</u>] Both the claims and abstract must start on a new page (For information on the preferred arrangement, see MPEP 608.01(e)) 4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>11</u>] 5. Oath or Declaration [Total Sheets _____] a. ☒ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63(d)) (For continuation/divisional with Box 18 completed) i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b). 6. ☐ Application Data Sheet. See 37 CFR 1.76 7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix) ☐ Landscape Table on CD 8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. - c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PARTS 9. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 10. ☐ 37 CFR 3.73(b) Statement (when there is an assignee) ☒ Power of Attorney 11. ☐ English Translation Document (if applicable) 12. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 13. ☐ Preliminary Amendment 14. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized) 15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 16. ☐ Nonpublication Request under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 17. ☐ Other: _____

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☒ Continuation-in-part (CIP) of prior application Nos.: 12/451,492 & 12/227,834

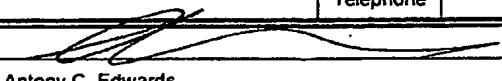
Prior application information:

Examiner _____

Art Unit: _____

19. CORRESPONDENCE ADDRESS

☒ The address associated with Customer Number: 010361 OR ☐ Correspondence address below

Name					
Address					
City	State	Zip Code			
Country	Telephone	Email			
Signature				Date	December 9, 2011
Name (Print/Type)	Antony C. Edwards			Registration No. (Attorney/Agent)	40,288

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
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Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL

For FY 2009

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$)
1090.00

Complete if Known

Application Number	
Filing Date	
First Named Inventor	Clifford William Devine
Examiner Name	
Art Unit	
Attorney Docket No.	ACE-40522

METHOD OF PAYMENT (check all that apply)

☐ Check ☒ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☐ Deposit Account Deposit Account Number: 502297 Deposit Account Name: ANTONY C EDWARDS LAW CC

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	330	165	540	270	220	110	1090.00
Design	220	110	100	50	140	70	
Plant	220	110	330	165	170	85	
Reissue	330	165	540	270	650	325	
Provisional	220	110	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 (including Reissues)	52	26
Each independent claim over 3 (including Reissues)	220	110
Multiple dependent claims	390	195

Total Claims - 20 or HP = _____ x _____ = _____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims - 3 or HP = _____ x _____ = _____

HP = highest number of independent claims paid for, if greater than 3.

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$270 (\$135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
_____ - 100 = _____	_____ / 50 = _____	(round up to a whole number) x _____	_____	_____

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount) _____

Other (e.g., late filing surcharge): _____

SUBMITTED BY		Registration No. 40,288	Telephone 250-707-5250
Signature		(Attorney/Agent)	
Name (Print/Type)	Antony C. Edwards	Date	December 9, 2011

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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BOOM MOUNTABLE ROBOTIC ARM

Cross Reference to Related Applications

5 This application is a continuation in part from: (a) United States application No. 12/451,492 filed November 16, 2009, which is a national phase entry from PCT application number PCT/CA2007/000834 filed May 16, 2007, both entitled Boom Mountable Robotic Arm; and, (b) United States patent application No. 12/227,834 filed November 28, 2008, entitled Remote Manipulator for Manipulating Live Multiple Sub-Conductors in a Single Phase Bundle
10 which is a National Phase Entry from PCT application No. PCT/CA2006/000909 filed June 2, 2006, entitled Remote Manipulator for Manipulating Live Multiple Sub-Conductors in a Single Phase Bundle, and which all are incorporated herein in their entirety.

Field of the Invention

15 This application relates to a robotic arm which is mountable to the boom of a service vehicle for temporarily supporting and repositioning energized power lines to enable repair or replacement or re-location of transmission or distribution conductors while energized.

20 Background of the Invention

 High voltage transmission and distribution lines are typically strung between a series of spaced-apart support towers or poles. The conductors are connected to insulators mounted or suspended from crossarms extending at the upper end of transmission or distribution
25 poles, or conductor support points built into transmission towers. Periodically it is necessary to replace or repair the poles or towers, crossarms and insulators to maintain the electrical circuit in good working order. It is preferable if this maintenance and repair work can be performed without de-energizing the conductors in order to avoid the necessity of purchasing power from an alternative source, or other system disruptions.

Hot line repair work is a potentially hazardous undertaking. Safety regulations require that linemen maintain a minimum work clearance or "limit of approach" from energized conductors. The limit of approach varies depending upon the voltage of the conductors in question.

Conventional procedures used by linemen to temporarily support energized conductors in order to enable repair of damaged or obsolete components involve the use of insulated wire tongs, lift poles and rope blocks in labor-intensive, complex rigging arrangements. Conventional fiberglass insulated tools are limited to use only in good weather. Any accumulation of moisture which may impair their insulating property requires that the job be stopped, and that all and that the conductors be placed in an insulator which is rated for all-weather use.

Several auxiliary crossarms have also been proposed in the past for temporarily supporting conductors, thereby reducing the need for labor-intensive "stick work" by linemen. For example, United States Patent No. 4,973,795, which issued to Sharpe on November 27, 1990, relates to an auxiliary crossarm consisting of an insulated boom fitted with polymer insulators and conductor hooks for releasably engaging energized conductors. The Sharpe boom is suspended from a crane above the transmission lines to be serviced.

Auxiliary crossarms for temporarily lifting and supporting energized conductors from below are also well-known. Such crossarms typically have sleeves which are compatible to the boom jibs of derrick and bucket trucks.

Utility companies often find it convenient to string both transmission lines and distribution lines on the same pole or tower. The distribution lines are usually suspended between four to twelve feet below the transmission lines.

This makes it very difficult or impossible to safely raise prior art boom-mounted auxiliary crossarms to a position immediately beneath the transmission lines in order to provide temporary support to the lower mounted distribution conductors.

5 Another limitation of prior art designs such as that found in applicants United States Patent No. 5,538,207 which issued July 23, 1996, is that they do not permit extensive pivotal movement of the auxiliary crossarm relative to the boom of a service vehicle. A large range of pivotal movement is desirable so that no matter what the orientation of the service vehicle, for example when parked on rough uneven terrain, movement of the auxiliary crossarm easily facilitates simultaneous multiphase conductor capture, and enables insertion of the crossarm between upper and lower-mounted conductors no matter what the angle of the service truck, and to allow for relocation of conductors to different final configurations or different orientations. Fold-down-flat insulators make for compactness, for example when the auxiliary cross-arm is flush down against the boom of transport, and for insertion into tight spacing between existing conductors and crossarms.

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Summary of the Invention

In the summary, the boom mountable robotic arm for temporarily supporting an elongate conductor may be characterized according to one aspect of the invention as including a beam pivotally mounted on a boom mounting adaptor, wherein the boom mounting adaptor is mountable onto an upper end of a boom. At least two electrically insulated support posts are mounted to and spaced apart along the beam. At least a first rotation coupling and second rotation couplings which are collectively mounted in cooperation with the beam. The first rotation coupling provides pivotal mounting of the beam on the boom mounting adaptor so as to provide selectively controllable rotation of the beam about a first axis of rotation, wherein the first axis of rotation extends laterally of and between the beam and an upper end of the boom mounting adaptor for rotation of the beam relative to the boom mounting adaptor in a substantially vertical plane. The second rotation couplings provide selectively controllable rotation of the electrically

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insulated support posts about corresponding second axes of rotation. The second axes of rotation include axes of rotation extending substantially laterally across the beam at base ends of the support posts for rotation of each support post relative to and substantially along the beam. Positions of the support posts are thereby selectively adjustable between a retracted position
 5 substantially laid flush along the beam and a pick-up position ready to receive a conductor being supported. Each electrically insulated support post is adapted to temporarily support an energized electrical conductor.

10 A scissor linkage is mounted to the beam and the boom mounting adaptor for selectively adjusting an angular position of the beam relative to the boom mounting adaptor. A selectively actuable first actuator is mounted so as to cooperate between the beam and the scissor linkage. The scissor linkage includes first and second linkage members. Each of the first and second linkage members has, respectively, opposite first and second ends. The first ends are pivotally connected to one another. The second ends are pivotally mounted to, respectively, the
 15 beam and the boom mounting adaptor. The first actuator is pivotally mounted at a first end thereof to the first ends of the linkage members. A second end of the first actuator, opposite the first end of the first actuator, is mounted to the beam.

20 The beam is pivotable in an angular displacement about the first rotation coupling by substantially 160 degrees relative to the boom mounting adaptor. The angular displacement includes a substantially horizontal orientation and a substantially vertical orientation.

The beam may be a substantially linear beam. The at least two electrically insulated support posts include one or more insulated support posts mounted on each of the opposite ends of
 25 the beam. The support posts on each end of the beam are mounted on corresponding second rotation couplings on the opposite ends of the beam. The second rotation couplings have corresponding substantially parallel the second axes of rotation allowing distal ends of the pair of support posts, distal from the beam, to rotate in a substantially vertical plane into the support posts' retracted positions.

The second axes of rotation may also include axes which extend along the beams so that the posts rotate laterally relative to the beam, and may also include axes which extend vertically or off-vertically so that the posts rotate while up-standing, or wherein the second axes of rotation are a combination of these by the use of a universal joint-like coupling or other forms of multiple degree-of-freedom couplings between the posts and the beam.

The second rotation couplings may each include a hinge mounted to the beam. Each hinge may include at least one hinge plate. Each hinge plate may have a plurality of bores therein for securing a corresponding pair of electrically insulated support posts thereto. Each hinge plate may have a fastener for securing the hinge plate in an operating position in which the electrically insulated support posts extend in their pick-up positions and substantially perpendicularly away from the beam.

Each hinge plate may be pivotally mounted to a corresponding base plate which is mounted to the beam. The hinge plate and its corresponding base plate may have cooperating holes at opposite ends thereof so that, with a first end of the hinge plate pinned by a pin or rod or shaft to the first end of the base plate, the opposite second end of the hinge plate may be swung or pivoted open relative to the base plate by rotation of the plates about the pin, rod or shaft. Conversely, the second ends of the hinge plate and base plate may be pinned together for opening or pivoting open of the hinge in the opposite direction, that is, about the pin, rod or shaft pinning the second end of the hinge plate to the second end of the base plate.

The beam may include telescopic beam extensions and a second actuator cooperating between the beam and the beam extensions for selective lengthening of the beam, and wherein the support posts are mounted on distal ends of the beam extensions. The beam may include a main beam member and one extension member at at least one end of the main beam member. The extension member extends so as to elongate the beam. At least one electrically insulated support

posts is mounted on a distal end of the extension member, distal from the main beam member. An oppositely disposed pair of the extension members may be mounted on the distal ends of the main beam member. The extension members extend from a collapsed position to an extended position. The pair of support posts on the distal ends of the extension members pivot on the support posts' corresponding second rotation couplings so as to, for example, fold along the main beam member when the extension members are in their collapsed position, that is, when the beam is shortened. The individual or pairs of support posts on the distal ends of the extension members may pivot towards one another when pivoted about the second rotation couplings into their retracted positions. At least a third support post may be mounted on the main beam member. The third support post is pivotable about a corresponding second rotation coupling so as to, for example, lay flush along the main beam member when the third support post is in the retracted position. When in the retracted position the third support post is advantageously substantially co-linearly aligned with and between the first and second support posts when in their corresponding retracted positions.

Static picks may be mounted to the main beam between the support posts so as to extend substantially perpendicularly from the beam, and may also be mounted by second rotation couplings to, for example, pivot along the beam.

Angular positioners may be mounted acting between the posts and/or picks for adjusting the inclination angle of the posts or picks about the second rotation coupling on the beam. The angular positioners may be rigid positioners for example using links of different lengths to selectively tip or pivot the posts or picks about their hinges by set angles such as for example 15°, 30°, 45°, etc.

Alternatively, instead of the use of links holding the hinges open, that is, mounted between the open ends of the open hinges, the hinges may be selectively pivoted between their open-most and their closed positions, or otherwise the posts or picks may pivoted about second rotational couplings such as pinned joints, rotational sleeves, shafts and bearings, universal joints, ball-joints,

etc as would be known to those skilled in the art, by the use of actuators such as for example hydraulic cylinders cooperating between the posts or picks and the beam.

In the various embodiments, the posts may be single posts mounted one post per hinge or pivot, or the posts may be multiple posts, for example, pairs of posts mounted one pair or group of posts per hinge or pivot.

The opposite first and second ends of the main beam member define a beam length there-between. The first rotation coupling is adjacent the first end of the main beam member. The second end of the first actuator is mounted adjacent to the second end of the main beam member. The first actuator may be a linearly extensible actuator which selectively extends between a shortened length and a long length corresponding to retraction and extension of the first actuator respectively. The first and second linkage members have corresponding first and second lengths. The first or second lengths of the first and second linkage members when summed with, that is, added to, the shortened length of the first actuator, is substantially no longer than the beam length.

When the first actuator is retracted into its shortened length, the first actuator pulls on the first ends of the first and second linkage members so as to reduce an included angle between the first and second linkage members to thereby rotate the second end of the main beam member towards the boom mounting adaptor. The boom mounting adaptor may be elongate. First and second included angles are formed between the first end of the main beam member and the boom mounting adaptor, and between the second end of the main beam member and the boom mounting adaptor respectively. The first included angle is increased and the second included angle is decreased as the second end of the main beam member rotates towards the boom mounting adaptor. When said first actuator is retracted and thereby in its shortened length, the included angle between the first and second linkage members is minimized and the main beam member is rotated about said first rotation coupling so as to be substantially flush along the linkage members,

the first actuator, and the boom mounting adaptor. The beam and the support posts may thereby be compactly stowed when the boom is in a lowered position.

5 Brief Description of the Drawings

In drawings which illustrate embodiments of the invention, but which should not be constructed to limit the spirit or scope of the invention:

10 Figure 1 is, in side elevation view, a boom mountable robotic arm according to one embodiment, wherein the beam on the arm is vertical and the telescopic arm extensions are extended.

15 Figure 2 is the view of Figure 1 with the beam rotated to the nearly horizontal and with the arm extensions retracted.

Figure 3 is the view of Figure 2 with the beam rotated down flush with the boom adaptor and scissor linkage.

20 Figure 4 is the view of Figure 1 with the arm rotated to the horizontal.

Figure 5 is the view of Figure 4 with the optional rigid extensions mounted onto the ends of the telescopic arm extensions.

25 Figure 6 is, in side elevation view, the boom mountable robotic arm of Figure 1 further comprising static picks mounted on opposite ends of the upper frame or beam.

Figure 7 is the boom mountable robotic arm of Figure 6 wherein the paired insulators mounted on each hinge have been replaced with single insulators mounted on each hinge.

5 Figure 8 is the boom mountable robotic arm of Figure 7 wherein the static picks have been removed and the insulators rotated in a first direction by pinning first ends of their hinges and tilting the insulators about the pinned first ends and bracing the separated second ends of the hinges with rigid links to fix the angular inclination of the insulators relative to the arm.

10 Figure 9a is, in side elevation view, an alternative embodiment of a means for selectively inclining an insulator mounted onto the beam, wherein an actuator mounted to the beam selectively rotates the insulator about a pivot, wherein the insulator is shown extending perpendicularly from the beam.

15 Figure 9b is the view of Figure 9a with the actuator extended and the insulator thereby pivoted about the pivot on the beam.

20 Figure 10a is, in side elevation view, a pair of insulators mounted on a hinge which is mounted on one end of the beam, wherein the hinge is in its closed position so that the insulators extend perpendicularly from the beam.

 Figure 10b is the view of Figure 10a wherein the hinge has been pivoted about a first pinned end and the open second ends of the hinge braced by a rigid link so as to incline the insulators relative to the beam.

25 Figure 11 is, in perspective view, a static pick such as seen in Figure 6.

Detailed Description of Embodiments of the Invention

United States Patent No. 5,538,207 is incorporated herein by reference.

The robotic arm 20 discussed herein is adapted to provide a very large range of motion for servicing, by the arm, of energized electrical high voltage lines or conductors. Robotic arm 20 is mountable on the boom 22 of a service vehicle by means of a boom adaptor 24. Boom adaptor 24 preferably includes an insulated section which mounts onto the upper end of boom 22. This permits the use of non-insulated booms 22. A scissor-linkage 26 is interposed between boom adaptor 24 and beam or upper frame 28 which preferably consists of an elongated tube and is pivotally connected to the end of boom adaptor 24 by means of a pivot joint 30. Boom adaptor 24 is connected towards one end of upper frame 28.

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Actuator 32 extends between boom adaptor 24 and upper frame 28 and is mounted at one end to the upper frame 28 and at the other end to the elbow 26a of scissor-linkage 26 for adjusting the angular position of upper frame 28 within substantially a 160 degree range of motion within a substantially vertical plane. Extension and retraction of the actuating rod 32a of actuator 32 is actuated by hydraulic cylinder 32b. Insulators 34 are mounted on upper frame 28 by means of pivoting hinges 28a. One or more insulators 34 may be mounted on each hinge 28a. Hinges 28a allow insulators 34 to be for example laid flat along on top of, and flush against upper frame 28.

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In an alternative embodiment, robotic arm 20 may, although this is not intended to be limiting, further include first and second telescoping arms 36, 38 which are telescopically coupled to opposite ends of upper frame 28. As discussed further below, each telescoping arm 36, 38 is independently adjustable between a retracted position and an extended position coaxial with upper frame 28. Movement of telescoping arms 36, 38 is preferably actuated by hydraulic cylinders housed within upper frame 28. Alternatively, threaded rods powered by hydraulic motors, worm gears, or other suitable mechanical actuators could be employed.

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Insulators 34 are mounted as a parallel series or parallel array on the upper surface of upper frame 28 and may also be mounted on telescoping arms 36, 38 if telescoping arms are employed. Insulators may be mounted in pairs 34a, 34b and 34c or may be mounted singly or in

groups of more than two. A conductor holder 40 is mounted at the upper end of each insulator 34 for releasably coupling robotic arm 20 to a corresponding energized conductor. The number of insulators 34 and corresponding conductor holders required depends upon the number of transmission and/or distribution conductors in question. Further, the length of insulators 34; and
 5 the coupling together, for example on pairs, of more than one insulator 34, is determined by the mechanical arrangement of the conductors and the voltage level at which they are operating.

The centre conductor of a three phase transmission line often extends above the two outside conductors. Accordingly, the centre insulator 34, that is, the insulator stack mounted
 10 between the ends of upper frame 28 may be longer in length than the insulator stacks mounted on the ends of the beam, for example on the ends of telescoping arms 36, 38 or an example may consist of two insulators 42 bolted together for extra length. Insulators 34 preferably consist of station class polymer insulators which are rated for all weather use.

Robotic arm 20 is controlled remotely by an operator so as to control the angular position of upper frame 28 relative to the boom and boom adaptor, and the position of telescoping arms 36, 38 if they are included. The control system may consist of hydraulic hose (not shown) connected to the auxiliary port of the service vehicle hydraulic system and valving for controlling the operation of hydraulic cylinder 32b. Alternatively, the operation of hydraulic cylinder 32b may
 15 be remotely controlled by means of digital radio signals, fiber optic cables, or other suitable insulated control means. The remote operator may be positioned for example in a bucket secured to the service vehicle boom on transmission tower, on the deck of the service vehicle, or on the ground.

In operation, robotic arm 20 is first mounted on boom 22 of the service vehicle described above. The hydraulic hoses (if any) are then connected to the auxiliary hydraulic port of the service vehicle. The service is typically parked immediately underneath or adjacent to the support tower to be serviced. The truck boom 22 is extended to position arm 20 underneath the
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energized transmission lines in question. If necessary, boom 22 may be rotated about the turret of the service vehicle until the desired angular position of the boom relative to the vehicle is reached.

Depending upon the angle of boom 22 it may be necessary to actuate hydraulic leveling cylinder 32 until upper frame 28 rotates about pivot joint 30 to a position immediately underneath and parallel to the tower crossarm. Once in the level position, insulators 34 mounted on upper frame 28 (and on telescoping arms 36, 38 if included) are positioned immediately underneath the corresponding transmission lines. The angle, relative to upper frame 28, of the conductor support posts including insulators 34 may be adjusted as better described below to assist in positioning conductor holders 40 under the transmission lines.

Once boom 22 has been extended and conductor holders 40 positioned, linemen working on the tower may then place each energized transmission line into a corresponding conductor holder 40 mounted at the upper end of each insulator 24. Each conductor holder 40 is first positioned below a corresponding conductor. Conductor holders 40 may for example be rotatable about bearing adaptors for alignment with the corresponding conductor irrespective of the orientation of boom 22.

Once the conductors are securely captured within a corresponding conductor holder 40, the linemen manually unties the conductors from the insulator mounted on the tower crossarm. The conductors may then be raised well above the tower by extending boom 22. Additionally, the outside conductor strands may be extended laterally away from the tower by either or both extending telescoping arms 36, 38 if provided, and inclining end insulators 34 outwardly of upper frame 28, by actuators which are independently controllable by actuating corresponding hydraulic cylinders such as would be mounted within on or upper frame 28, or by manually adjusting the extension and/or angling of the beam or insulators respectively. The distance between phases may be extended from, for example, six feet to fourteen or fifteen feet to provide linemen with safe working clearances even in the case of high voltage lines (for example greater than 100 kV).

Robotic arm 20 temporarily supports the weight of the conductors to enable servicing of replacement of conductor support structures, such as the tower, insulators, or crossarms by the linemen. After the required line maintenance has been completed, telescoping arms 36, 38 are retracted to thereby return the outer conductor strands to their original position.

5 The truck boom 22 may be lowered, if necessary, until upper frame 28 is positioned slightly below the level of the crossarm. The conductors are then retied by the linemen to the tower insulators and the conducting holder latching mechanisms on insulators 34 are opened to complete the servicing procedure.

10 In some circumstances it is useful to adjust the angular position of robotic arm 20 during the conductor fastening procedure. For example, an outside conductor strand could be connected to a corresponding connector holder 40 and insulator 34 mounted the end of upper frame 28 or on a telescoping arm 36 or 38 while frame 28 is tilted at an angle or vertically, for example to pick up outside conductors which are spaced apart vertically on a tower. Telescoping
15 arms 36, 38 could then be extended or the insulators angled away from the ends of upper frame 28 or arms 26, 38 to move the conductor a safe distance away from the tower to be serviced. In some situations, robotic arm, 20 could then be pivoted as described above until frame 28 is level with the tower crossarm. The remaining conductor lines could be then coupled to robotic arm 20, if necessary. This technique may be suitable, for example, if there is very little clearance between
20 the transmission tower and surrounding structures.

Distribution lines are often strung between support towers a short distance below transmission lines. Both transmission lines and distribution lines may be supported on conductors 34 on upper frame 28.

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When the boom truck moves from jobsite to jobsite, and for road travel, the boom 22 is retracted and laid flat down on the deck of the truck. To minimize the size of the retracted load, which includes the boom 22, upper frame 28, and insulators 34, it is advantageous if the

upper frame 28 and insulators 34 fold down onto the boom 22 so that the load on the boom truck is as compact as possible.

When in operation, it is advantageous if the upper frame 28 may be articulated across a large range of motion to thereby allow for situations where the boom truck has to park some distance out from under the conductors to be serviced so that the boom 22 is extended at a considerable angle off the vertical, as seen in figure 2, especially where, in order to pick for example three vertically spaced apart conductors, the upper frame 28 has to be rotated to the vertical as seen in figure 1.

In a preferred embodiment, an increased range of motion of upper frame 28 relative to boom 22, is achieved by the use of scissor-linkage 26. The range of motion about pivot point 30 is indicated by angles "a" and β . Rigid linkage members 26b and 26c are pivotally pinned together at elbow 26a. The opposite ends of linkage members 26b and 26c are pivotally pinned at hinges 30a and 30b respectively, adjacent base end 28b of upper frame 28 and on the head 24a of boom adapter 24. Linkage members 26b, 26c may be substantially the same length.

One end of actuator 32, illustrated to be the distal end of rod 32a (although this is not intended to be limiting), is pivotally mounted to elbow 26a. The other end of actuator 32, illustrated to be the base end of cylinder 32b, is pivotally mounted to upper frame 28, for example adjacent distal end 28c.

Pivot joint 30 and hinge 30a may be mounted to a pair of mounting plates 42, mounted one on each side of upper frame 28 at base end 28b. In one embodiment linkage members 26b and 26c are each a pair of parallel members spaced apart across the width of upper frame 28. Elbow 26a is a pin or shaft joining the common ends of the pairs of members. The distal end of rod 32a is mounted on the pin or shaft by collar 32c. The base end of cylinder 32b is mounted to upper frame 28 by a pair of plates 32d.

By way the example of Figure 1, at the limit, or at almost the limit, of the extension of actuator 32, angle β is approximately 20 degrees and angle α is approximately 160 degrees, and scissor linkage 26 is at its most-open, or almost most-open, separation between hinges 30a and 30b. This positions upper frame 28 at the vertical, or substantially the vertical if boom 22 is closer to the vertical, i.e., when the mounting plates 24b of boom adaptor 24 and/or the upper end of boom 22 may interfere with the lowermost end of telescoping arm 38.

When it is desired to rotate upper frame 28 from its vertical position seen in Figure 1 (that is, when in use the position to pick-up vertically spaced apart conductors), to its folded down position for storage and travel, actuator 32 is retracted thereby closing the separation of scissor linkage 26 as seen in the progression of Figures 2 and 3. In Figure 3, boom 22 has been lowered to horizontal, and the telescoping arms, if any, telescopically retracted if they were extended, so as to lay the boom down on the deck of the boom truck. Upper frame 28 lies substantially horizontally on and along boom 22. Manually pivotable insulators 34 are folded down onto horizontal upper frame 28 by their pinned or bolted mounts being released, thereby releasing base ends 34d from corresponding pairs of hinge plates 44 mounted on opposite sides of upper frame 28 so that the base ends 34d may pivot about pivoting hinges 28a. Where insulators 34 are inclined by actuators such as actuators 46, illustrated by way of example in Figure 9, the insulators are laid flat or substantially flat by the actuations of actuators 46.

Advantageously, when three or more insulators 34 are mounted on upper frame 28 and are to be folded or actuated down for storage or travel, the spacing between the base ends 34d is sufficient to allow an adjacent pair of insulators 34 to fold down into an end-to-end alignment such as seen in Figure 3.

Figures 4 and 5 show upper frame 28 in a horizontal position such as would be used to pick-up horizontally spaced apart conductors. Figure 5 shows the use of optional rigid extension members 46 mounted in oppositely disposed co-axial alignment to the opposite ends of telescoping arms 36, 38 or of upper frame 28 when arms 36, 28 are not employed. Insulators 34

are mounted at the outermost ends of the extension members to provide for situations where the spacing between conductors is larger than the extendable range of telescoping arms 36 and 38 at their maximum extension from upper frame 28, including the extra range afforded by angling insulators 34 outwardly of the ends of the beam.

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Static picks 46 may be mounted to the main beam or upper frame 28 between the support posts or insulators 34 so as to extend substantially perpendicularly from the beam, and may also be mounted by second rotation couplings such as hinges 28a to, for example, pivot along the beam.

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Angular positioners such as actuators 46 may be mounted acting between the posts 34 and/or picks 48 for adjusting the inclination angle C of the posts or picks about the second rotation coupling on the beam. The angular positioners may be rigid positioners, for example using links 29 of different lengths to selectively tip or pivot the posts or picks about their hinges 28a by set angles C such as for example 15°, 30°, 45°, etc.

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Alternatively, instead of the use of links 29 holding the hinges open, that is, mounted between the open ends of the open hinges i.e. between the ends of hinge plates 44 and base ends 34d, the hinges may be selectively pivoted between their open-most and their closed positions, or otherwise the posts or picks may pivoted about their second rotational couplings. The second rotationally couplings may also include pinned joints, rotational sleeves, shafts and bearings, universal joints, ball-joints, etc (not shown) as would be known to those skilled in the art. Actuators 46 may be for example hydraulic cylinders cooperating between the posts or picks and the beam.

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In the various embodiments, the support posts 34 may be single support posts 34 mounted one post per hinge 28a or pivot, or the support posts 34 may be multiple support posts, for example, pairs of support posts mounted one pair or group of support posts per hinge 28a or pivot.

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

WHAT IS CLAIMED IS:

- 5 1. A boom mountable robotic arm for temporarily supporting an elongate conductor comprising:

a beam pivotally mounted on a boom mounting adaptor, said boom mounting adaptor mountable onto an upper end of a boom,

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at least two electrically insulated support posts mounted to and spaced apart along said beam,

at least a first rotation coupling and second rotation couplings,

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wherein said first rotation coupling provides said pivotal mounting of said beam on said boom mounting adaptor so as to provide selectively controllable rotation of said beam about a first axis of rotation, wherein said first axis of rotation extends laterally of and between said beam and an upper end of said boom mounting adaptor for rotation of said beam relative to said boom mounting adaptor in a substantially vertical plane,

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and wherein said second rotation couplings provide selectively controllable rotation of said at least two electrically insulated support posts about corresponding second axes of rotation, and wherein said second axes of rotation include axes of rotation extending substantially laterally across said beam at base ends of said support posts for rotation of each said support post relative to and substantially along said beam, whereby positions of said support posts are selectively adjustable between a retracted position substantially laid flush along said beam and a pick-up position ready to receive a conductor being supported, and wherein each post of said at least two electrically insulated support posts is adapted to temporarily support an energized electrical conductor,

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and wherein a selectively actuatable first actuator is mounted so as to cooperate between, said beam and a scissor linkage mounted to said beam and said boom mounting adaptor for selectively adjusting an angular position of said beam relative to said boom mounting adaptor wherein said scissor linkage includes first and second linear members, each said first and second linkage members having, respectively, opposite first and second ends, said first ends of said first and second linkage members pivotally connected to one another, said second ends of said first and second linkage members pivotally mounted to, respectively, said beam and said boom mounting adaptor, said first actuator pivotally mounted at a first end thereof to said first ends of said first and second linkage members, and a second end of said first actuator, opposite said first end of said first actuator, mounted to said beam.

2. The boom mountable robotic arm of claim 1 wherein said boom is pivotable in an angular displacement about said first rotation coupling by substantially 160 degrees relative to said boom mounting adaptor, and wherein said angular displacement includes a substantially horizontal orientation and a substantially vertical orientation.

3. The boom mountable robotic arm of claim 2 wherein said beam includes telescopic beam extensions and a second actuator cooperating between said beam and said beam extensions for selective lengthening of said beam, and wherein said support posts are mounted on distal ends of said beam extensions.

4. The boom mountable robotic arm of claim 1 wherein said beam is a substantially linear beam and wherein said at least two electrically insulated support posts include a pair of insulated support posts mounted one on each of opposite ends of said beam on a corresponding pair of said second rotation couplings on said opposite ends of said beam, said second rotation couplings having corresponding substantially parallel said second axes

of rotation allowing distal ends of said pair of support posts, distal from said beam, to rotate in a substantially vertical plane into said retracted positions.

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5. The boom mountable robotic arm of claim 4 wherein said second rotation couplings each include a hinge mounted to said beam.

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6. The boom mountable robotic arm of claim 5 wherein each said hinge includes at least one hinge plate, each said hinge plate having a plurality of bores therein for securing a corresponding said pair of electrically insulated support posts thereto.

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7. The boom mountable robotic arm of claim 6 wherein said hinge includes a hinge plate having a fastener for securing said at least one hinge plate in an operating position in which said electrically insulated support posts extend in said pick-up position and substantially perpendicularly away from said beam.

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8. The robotic arm of claim 1 wherein said beam includes a main beam member and an extension member at at least one end of said main beam member, said extension member extending so as to elongate said beam, and wherein at least one of said at least two electrically insulated support posts are mounted on a distal end of said extension member, distal from said main beam member.

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9. The robotic arm of claim 8 wherein said extension member at at least one end of said main beam member includes an oppositely disposed pair of said extension members, and wherein at least one of said at least two electrically insulated support posts is mounted at said distal end of each said extension member.

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10. The robotic arm of claim 9 wherein said extension members extend from a collapsed position to an extended position, and wherein said pair of support posts on said distal ends of said extension members pivot on their corresponding said second rotation couplings so as to fold along said main beam member when said extension members are in said collapsed position.

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11. The robotic arm of claim 10 wherein said extension members are telescopically mounted within said main beam member, and wherein said pair of support posts on said distal ends of said extension members pivot towards one another when pivoted about said second rotation couplings into said retracted positions.

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12. The robotic arm of claim 11 wherein a third said support post is mounted on said main beam member, and wherein said third support post is pivotable about a corresponding second rotation coupling so as to lay flush along said main beam member when in said retracted position, and when in said retracted position said third support post is substantially co-linearly aligned with and between said first and second support posts when in their corresponding said retracted positions.

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13. The robotic arm of claim 10 wherein said main beam member has opposite first and second ends at distal ends thereof and defined a beam length there-between, and wherein said first rotation coupling is adjacent said first end of said main beam member, and wherein said second end of said first actuator is mounted adjacent to said second end of said main beam member.

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- 5 14. The robotic arm of claim 13 wherein said first actuator selectively extends between a shortened length and a long length corresponding to retraction and extension of said first actuator respectively, and wherein said first and second linkage members have corresponding first and second lengths, and wherein said first or second lengths of said first and second linkage members summed with said shortened length of said first actuator,
10 is substantially no longer than said beam length.
- 15 15. The robotic arm of claim 14 wherein, when said first actuator is said retracted into said shortened length, said first actuator pulls on said first ends of said first and second linkage members so as to reduce an included angle between said first and second linkage members to thereby rotate said second end of said main beam member towards said boom mounting adaptor.
- 20 16. The robotic arm of claim 15 wherein said boom mounting adaptor is elongate and wherein first and second included angles are formed between said first end of said main beam member and said boom mounting adaptor and between said second end of said main beam member and said boom mounting adaptor respectively, and wherein said first included angle is increased and said second included angle is decreased as said second end of said
25 main beam member said rotates towards said boom mounting adaptor.
- 30 17. The robotic arm of claim 16 wherein when said first actuator is said retracted and thereby in said shortened length, said included angle between said first and second linkage members is minimized and said main beam member is rotated about said first rotation coupling so as to be substantially flush along said linkage members, said first actuator, and

said boom mounting adaptor, whereby said beam and said support posts may be compactly stowed when the boom is in a lowered position.

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Abstract of the Disclosure

A boom mountable robotic arm for includes a beam pivotally mounted on a boom mounting adaptor, at least two electrically insulated support posts mounted to and spaced apart
5 along the beam, and at least a first rotation coupling and a plurality of second rotation couplings. The first rotation coupling provides pivotal mounting of the beam on the boom mounting adaptor so as to provide selectively controllable rotation of the beam in a substantially vertical plane. The second rotation couplings provide selectively controllable rotation of the electrically insulated support posts about corresponding second axes of rotation between a retracted position
10 substantially laid flush along the beam and a pick-up position ready to receive a conductor being supported. An actuated scissor linkage is mounted to the beam and the boom mounting adaptor for selectively adjusting an angular position of the beam relative to the boom mounting adaptor.

Doc Code: Oath
Document Description: Oath or declaration filed

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63) ☒ Declaration Submitted With Initial Filing OR ☐ Declaration Submitted After Initial Filing (surcharge (37 CFR 1.16(f)) required)	Attorney Docket Number	ACE-40522
	First Named Inventor	Clifford William Devine
	COMPLETE IF KNOWN	
	Application Number	
	Filing Date	
	Art Unit	
	Examiner Name	

I hereby declare that: (1) Each inventor's residence, mailing address, and citizenship are as stated below next to their name; and (2) I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention titled:

BOOM MOUNTABLE ROBOTIC ARM

(Title of the invention)

the application of which

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) _____ as United States Application Number or PCT International Application Number _____ and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

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Claim of Foreign Priority Benefits

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			☐	☐	☐
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☐ Additional foreign application number(s) are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 2 of 3]

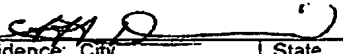
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NAME OF SOLE OR FIRST INVENTOR:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Clifford William		Devine	
Inventor's Signature		Date	
		11/3/11	
Residence: City	State	Country	Citizenship
Osoyoos	British Columbia	Canada	Canadian
Mailing Address			
10607 81 Street			
City	State	Zip	Country
Osoyoos	British Columbia	V0H 1V2	Canada
☒ Additional inventors or a legal representative are being named on the 1 supplemental sheet(s) PTO/SB/02A or 02LR attached hereto			

(Page 3 of 3)

DECLARATION	ADDITIONAL INVENTOR(S)
	Supplemental Sheet

Page 1 of 2

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
DANIEL NEIL		O'CONNELL	
Inventor's Signature <i>Daniel Neil O'Connell</i>		Date 11/3/11	
OLIVER	BRITISH COLUMBIA	CANADA	CANADIAN
Residence: City	State	Country	Citizenship
RR 2, SITE 4, COMP. 7			
Mailing Address			
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City	State	Zip	Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address			
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Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
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	Filing Date	
	First Named Inventor	CLIFFORD WILLIAM DEVINE
	Title	BOOM MOUNTABLE ROBOTIC ARM
	Art Unit	
	Examiner Name	
	Attorney Docket Number	ACE-40522

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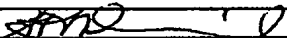
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☐	OR Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____

SIGNATURE of Applicant or Assignee of Record

Signature		Date	11/3/11
Name	Clifford William Devine	Telephone	
Title and Company			

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒	Total of <u>2</u> forms are submitted.
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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Application Number	
	Filing Date	
	First Named Inventor	DANIEL NEIL O'CONNELL
	Title	BOOM MOUNTABLE ROBOTIC ARM
	Art Unit	
	Examiner Name	
	Attorney Docket Number	ACE-40522

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

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☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

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☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____

SIGNATURE of Applicant or Assignee of Record

Signature

Name

Daniel Neil O'Connell

Date

11/3/11

Telephone

Title and Company

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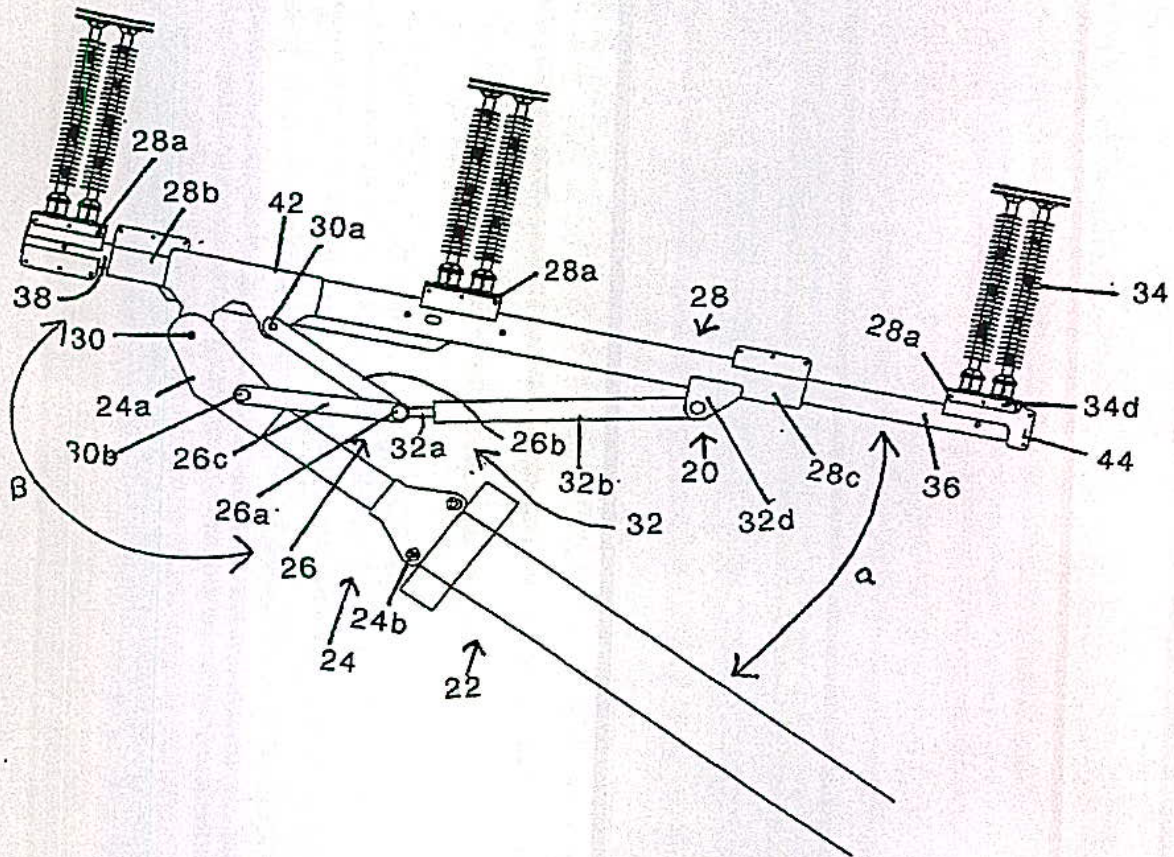


FIG. 2

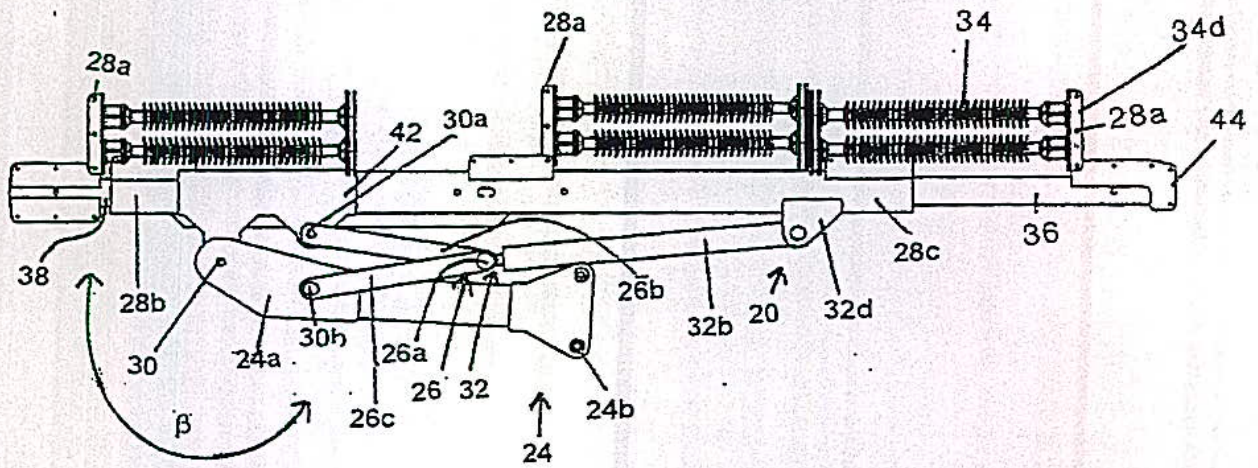
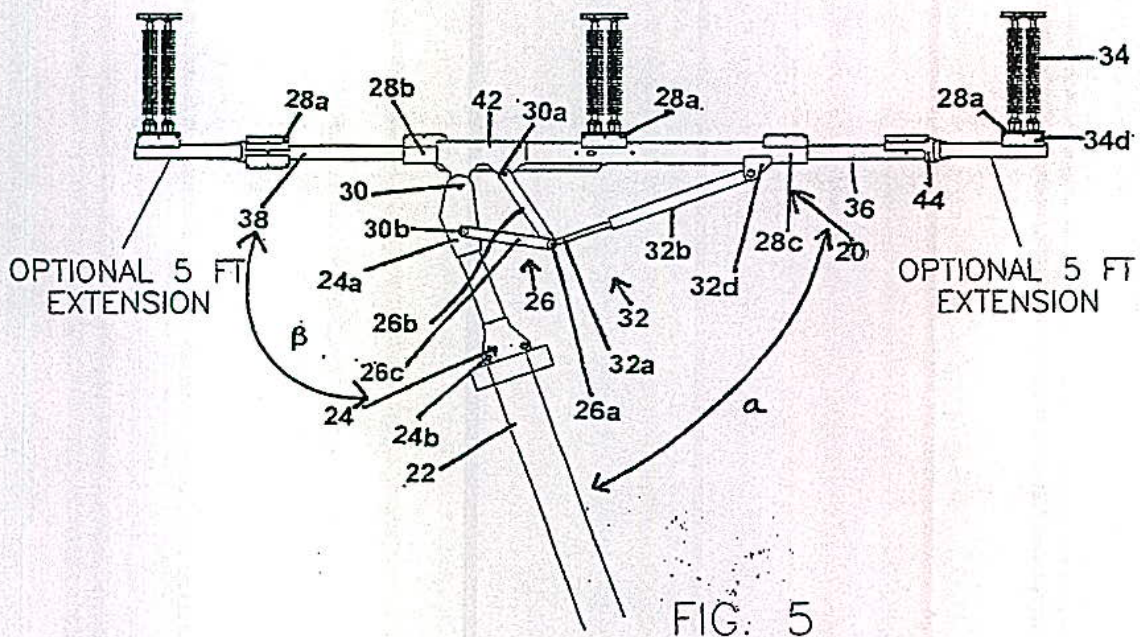


FIG. 3



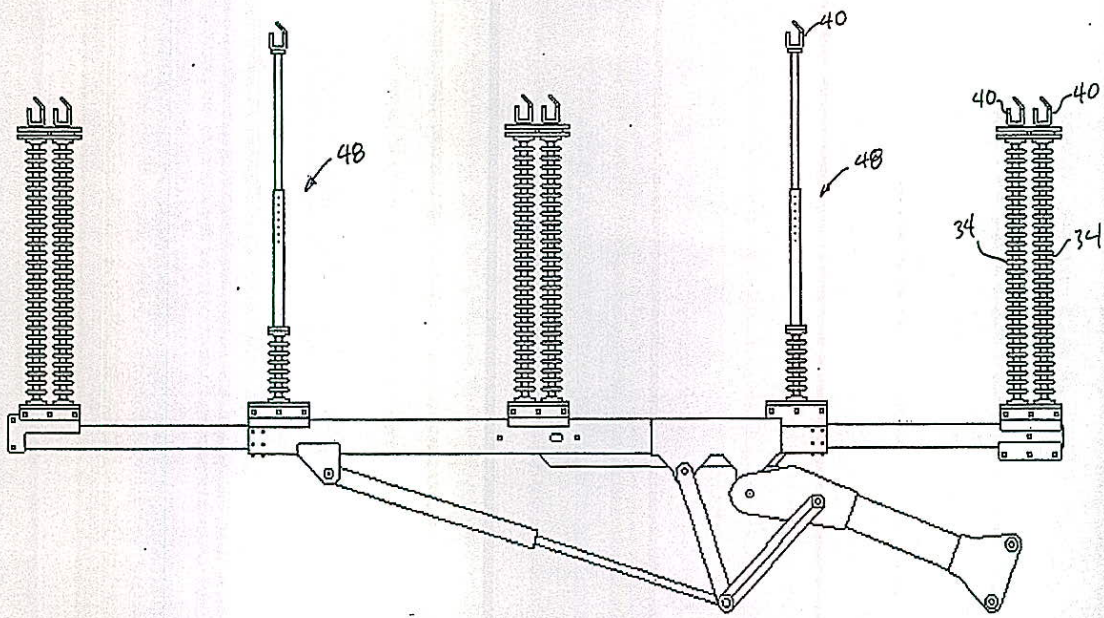


Figure 6

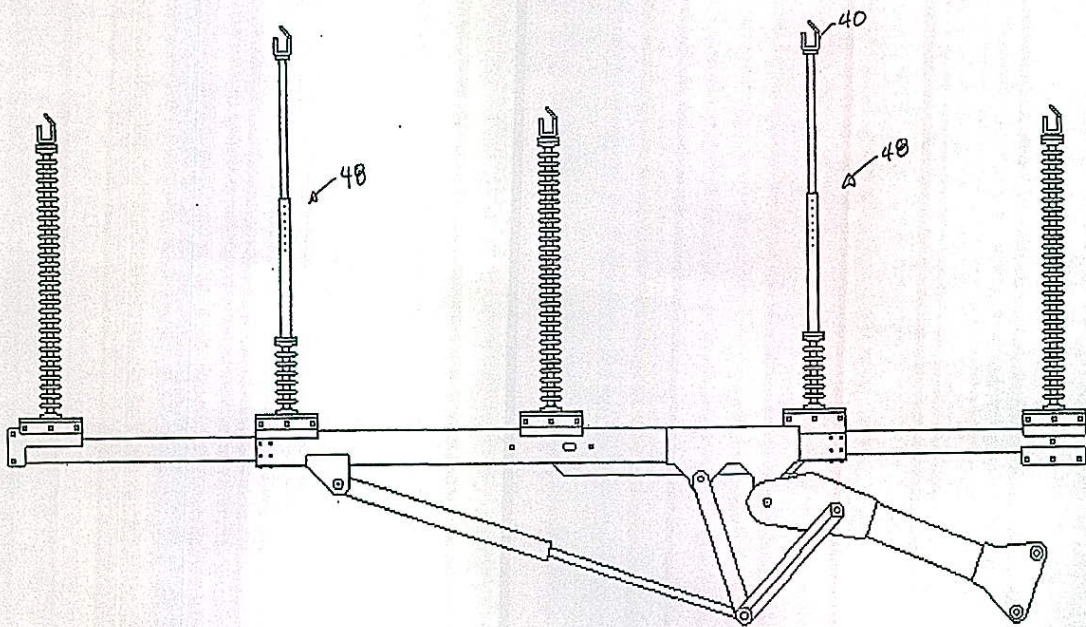


Figure 7

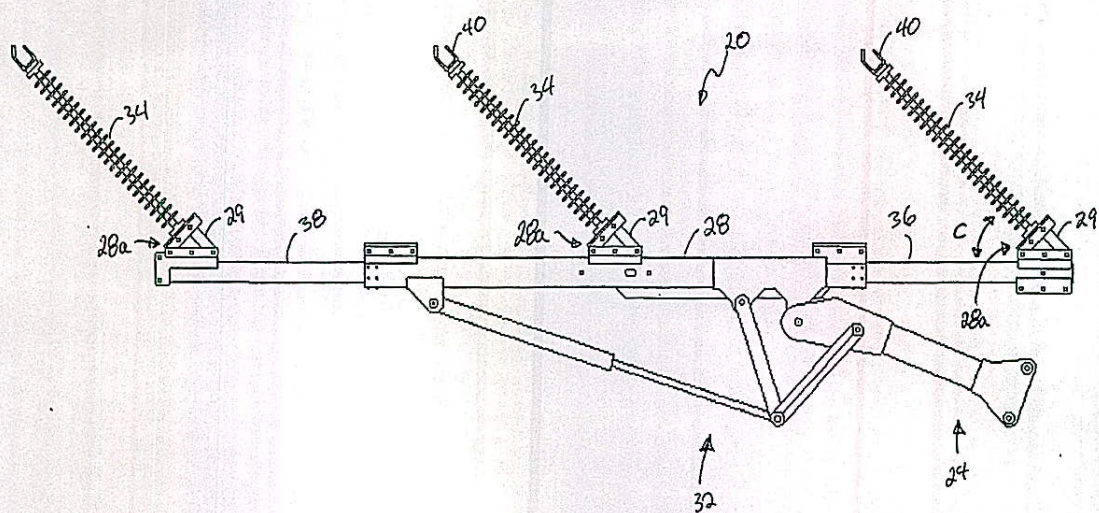


Figure 8

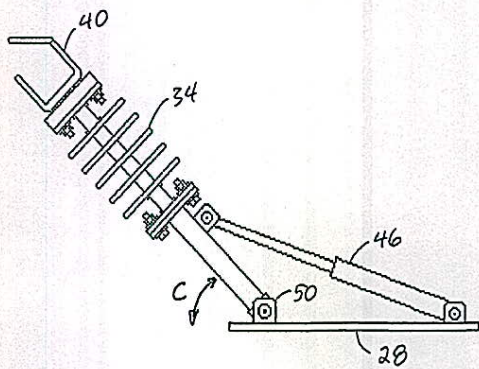


Figure 9b

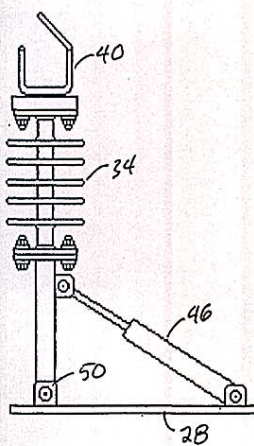


Figure 9a

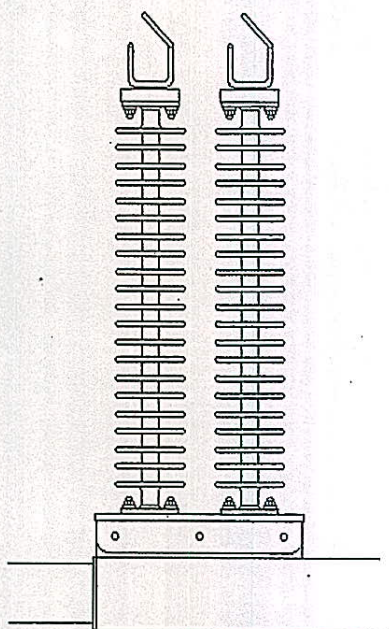


Figure 10a

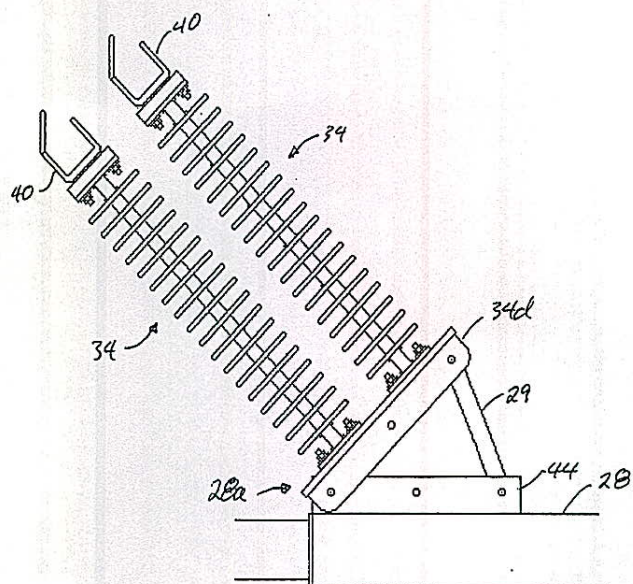


Figure 10b

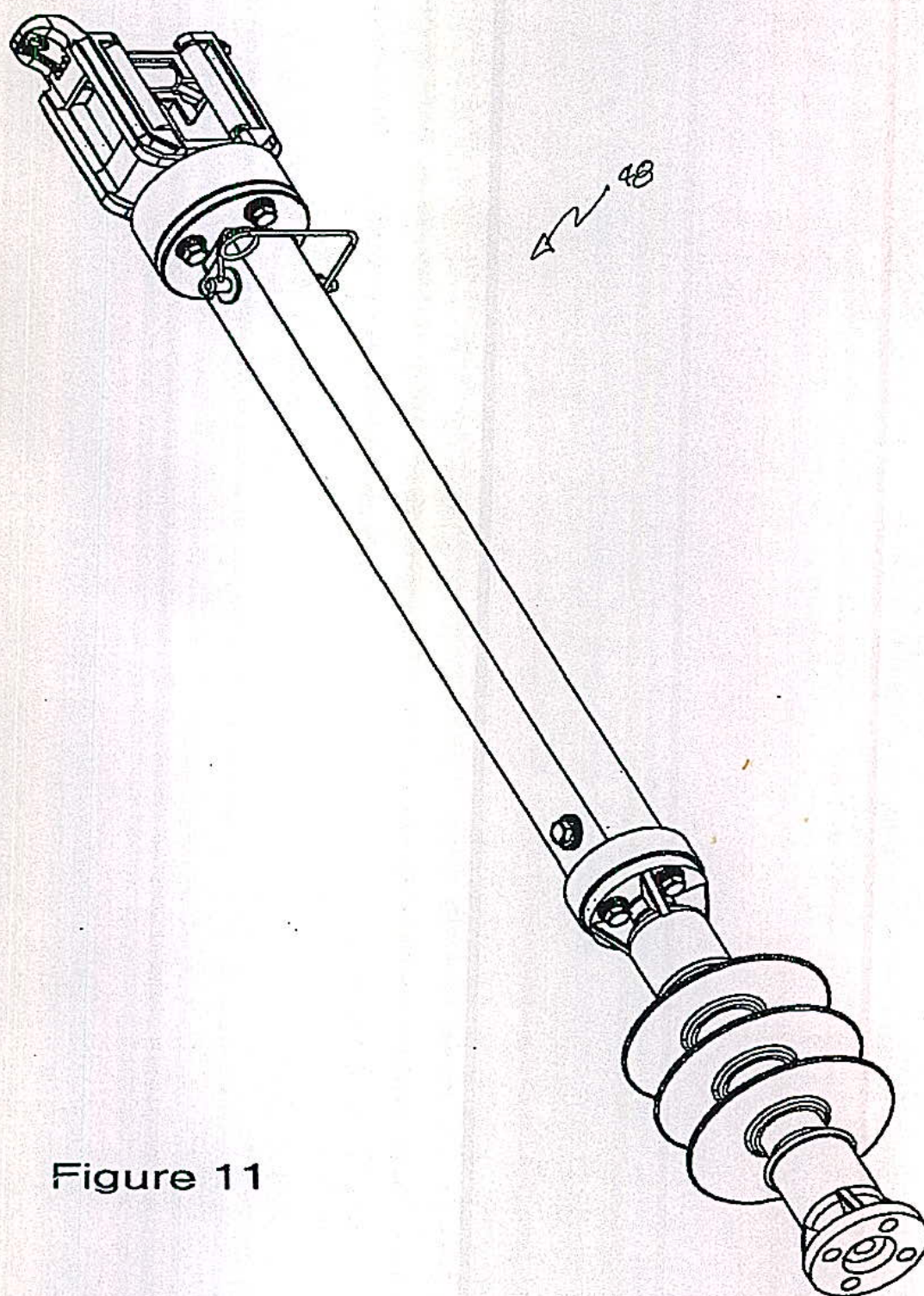


Figure 11

TRADUCCIÓN SIMPLE REALIZADA POR SHARON BENREY PACHECO DE UN DOCUMENTO ESCRITO ORIGINALMENTE EN INGLÉS.

LOS ESTADOS UNIDOS DE AMÉRICA
A TODOS LOS QUE LA PRESENTE VIEREN, SABED:
DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS
Oficina de Marcas y Patentes de los Estados Unidos

31 de diciembre de 2012

POR MEDIO DE LA PRESENTE SE CERTIFICA QUE EL DOCUMENTO QUE FIGURA EN ANEXO ES UNA COPIA FIEL TOMADA DE LOS ARCHIVOS DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS, DE AQUELLOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA A CONTINUACIÓN QUE CUMPLIÓ CON LOS REQUISITOS PARA OTORGÁRSELE UNA FECHA DE PRESENTACIÓN BAJO 35 USC 111.

NÚMERO DE SOLICITUD: 13/374,057

FECHA DE PRESENTACIÓN: 09 de diciembre de 2011

EL CÓDIGO DEL PAÍS Y EL NÚMERO DE SU SOLICITUD DE PRIORIDAD, A USARSE PARA LA PRESENTACIÓN EN EL EXTRANJERO BAJO LA CONVENCION DE PARÍS, ES US13/374,057

Con autorización del
Subsecretario de Comercio para la Propiedad Intelectual y
Director de la Oficina de Marcas y Patentes de los Estados Unidos

(Firma ilegible)

R. PONDEXTER

Oficial de Registro

Sello:

OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS
DEPARTAMENTO DE COMERCIO

Id.239020/WPC19746

NOVEDAD DE LA INVENCION

REIVINDICACIONES

- 5 1.- Un brazo robótico montable en una pluma para soportar temporalmente un conductor alargado que comprende: una viga montada en pivote en un adaptador de montaje de pluma, dicho adaptador de montaje de pluma se monta en un extremo superior de una pluma, al menos dos postes de soporte eléctricamente aislados montados a y separados a lo largo de
- 10 dicha viga, al menos un primer acoplamiento de rotación y segundos acoplamientos de rotación, en donde dicho primer acoplamiento de rotación proporciona dicho montaje en pivote de dicha viga en dicho adaptador de montaje de pluma para proporcionar rotación selectivamente controlable de dicha viga alrededor de un primer eje de rotación, en donde el primer eje de
- 15 rotación se extiende lateralmente de y entre dicha viga y un extremo superior de dicho adaptador de montaje de pluma para rotación de dicha viga con relación a dicho adaptador de montaje de pluma en un plano sustancialmente vertical, y en donde dichos segundos acoplamientos de rotación proporcionan rotación selectivamente controlable de al menos dos postes de soporte
- 20 eléctricamente aislados alrededor de los segundos ejes de rotación correspondientes, y en donde dichos segundos ejes de rotación incluyen ejes de rotación que se extienden sustancialmente en forma lateral a través de dicha viga en los extremos base de dichos postes de soporte para rotación de cada uno de los postes de soporte con relación a y sustancialmente a lo largo
- 25 de dicha viga, por lo que las posiciones de dichos postes de soporte se ajustan selectivamente entre una posición replegada sustancialmente nivelada a lo largo de dicha viga y una posición de recolección lista para recibir a un conductor que se soporta, y en donde cada poste de al menos dos postes de

soporte eléctricamente aislados se adaptan para soportar temporalmente un conductor eléctrico energizado, y en donde un primer accionador selectivamente accionable se monta para cooperar entre, dicha viga y una conexión de tijera montada a dicha viga y dicho adaptador de montaje de pluma para ajustar selectivamente una posición angular de dicha viga con relación a dicho adaptador de montaje de pluma en donde dicha conexión de tijera incluye primeros y segundos miembros lineales, cada dicho primer y segundo miembros de conexión tienen, respectivamente, primeros y segundos extremos opuestos, dichos primeros extremos de dicho primer y segundo miembros de conexión conectados en pivote entre sí, dichos segundos extremos de dicho primer y segundo miembros de conexión montados en pivote a, respectivamente, dicha viga y dicho adaptador de montaje de pluma, dicho primer accionador montado en pivote en un primer extremo del mismo a dichos primeros extremos de dicho primer y segundo miembros de conexión, y un segundo extremo de dicho primer accionador, opuesto a dicho primer extremo de dicho primer accionador, montado a dicha viga.

2.- El brazo robótico montable en una pluma de conformidad con la reivindicación 1, caracterizado además porque dicha pluma se mueve en pivote en un desplazamiento angular alrededor de dicho primer acoplamiento de rotación sustancialmente 160 grados con relación a dicho adaptador de montaje de pluma, y en donde dicho desplazamiento angular incluye una orientación sustancialmente horizontal y una orientación sustancialmente vertical.

3.- El brazo robótico montable en una pluma de conformidad con la reivindicación 2, caracterizado además porque dicha viga incluye extensiones de viga telescópica y un segundo accionador que coopera entre dicha viga y dichas extensiones de viga para alargamiento selectivo dicha

viga, y en donde dichos postes de soporte se montan en extremos distales de dichas extensiones de viga.

4.- El brazo robótico montable en una pluma de conformidad con la reivindicación 1, caracterizado además porque dicha viga es una viga sustancialmente lineal y en donde al menos dos postes de soporte eléctricamente aislados incluyen un par de postes de soporte aislados montados uno en cada uno de los extremos opuestos de dicha viga en un par correspondiente de dichos segundos acoplamientos de rotación en dichos extremos opuestos de dicha viga, dichos segundos acoplamientos de rotación tienen correspondientemente paralelos en forma sustancial dichos segundos ejes de rotación que permiten que los extremos distales de dicho par de postes de soporte, distales de la viga, giren en un plano sustancialmente vertical en dichas posiciones replegadas.

5.- El brazo robótico montable en una pluma de conformidad con la reivindicación 4, caracterizado además porque dichos segundos acoplamientos de rotación cada uno incluye una articulación montada a dicha viga.

6.- El brazo robótico montable en una pluma de conformidad con la reivindicación 5, caracterizado además porque cada articulación incluye al menos una placa de articulación, cada placa de articulación tiene una pluralidad de agujeros en la misma para asegurar un par correspondiente de postes de soporte eléctricamente aislados en la misma.

7.- El brazo robótico montable en una pluma de conformidad con la reivindicación 6, caracterizado además porque dicha articulación incluye una placa de articulación que tiene un sujetador para asegurar al menos una placa de articulación en una posición de operación en donde dichos postes de soporte eléctricamente aislados se extienden en dicha posición de recolección y sustancialmente en forma perpendicular lejos de dicha viga.

8.- El brazo robótico de conformidad con la reivindicación 1, caracterizado además porque dicha viga incluye un miembro de la viga principal y un miembro de extensión en al menos un extremo de dicho miembro de la viga principal, dicho miembro de extensión se extiende para
5 alargar dicha viga, y en donde al menos uno de dichos al menos dos postes de soporte eléctricamente aislados se monta en un extremo distal de dicho miembro de extensión, distal desde el miembro de la viga principal.

9.- El brazo robótico de conformidad con la reivindicación 8, caracterizado además porque el miembro de extensión al menos en un
10 extremo de dicho miembro de la viga principal incluye un par opuestamente colocado de dichos miembros de extensión, y en donde al menos uno de dichos al menos dos postes de soporte eléctricamente aislados se monta en un extremo distal de cada dicho miembro de extensión.

10.- El brazo robótico de conformidad con la reivindicación 9,
15 caracterizado además porque dichos miembros de extensión se extienden desde una posición colapsada a una posición extendida, y en donde dicho par de postes de soporte en dichos extremos distales de dichos miembros de extensión se mueven en pivote en sus segundos acoplamientos de rotación correspondientes para plegarse a lo largo de dicho miembro de la viga
20 principal cuando dichos miembros de extensión están en dicha posición colapsada.

11.- El brazo robótico de conformidad con la reivindicación 10, caracterizado además porque dichos miembros de extensión se montan telescópicamente dentro de dicho miembro de la viga principal, y en donde
25 dicho par de postes de soporte en dichos extremos distales de dichos miembros de extensión se mueven en pivote uno hacia el otro cuando se mueven en pivote alrededor de dichos segundos acoplamientos de rotación en dichas posiciones replegadas.

12.- El brazo robótico de conformidad con la reivindicación 11, caracterizado además porque dicho tercer poste de soporte se monta en dicho miembro de la viga principal, y en donde dicho tercer poste de soporte se mueve en pivote alrededor de un segundo acoplamiento de rotación correspondiente para permanecer nivelado a lo largo de dicho miembro de la viga principal cuando está en la posición replegada, y cuando en dicha posición replegada dicho tercer poste de soporte se alinea sustancialmente en forma colineal con y entre dicho primer y segundo postes de soporte cuando están en sus posiciones replegadas correspondientes.

10 13.- El brazo robótico de conformidad con la reivindicación 10, caracterizado además porque dicho miembro de la viga principal tiene primeros y segundos extremos opuestos en los extremos distales del mismo y definen una longitud de la viga entre los mismos, y en donde dicho primer acoplamiento de rotación está adyacente a dicho primer extremo de dicho miembro de la viga principal, y en donde dicho segundo extremo de dicho primer accionador se monta adyacente a dicho segundo extremo de dicho miembro de la viga principal.

14.- El brazo robótico de conformidad con la reivindicación 13, caracterizado además porque dicho primer accionador se extiende selectivamente entre una longitud acortada y una longitud larga que corresponde al repliegue y extensión de dicho primer accionador respectivamente, y en donde dicho primer y segundo miembros de conexión tienen primeras y segundas longitudes correspondientes, y en donde dichas primeras y segundas longitudes de dicho primer y segundo miembros de conexión se integran con dicha longitud acortada de dicho primer accionador, no son sustancialmente más largas que dicha longitud de la viga.

15.- El brazo robótico de conformidad con la reivindicación 14, caracterizado además porque, cuando dicho primer accionador es replegado

en dicha longitud acortada, dicho primer accionador se jala en dichos primeros extremos de dicho primer y segundo miembros de conexión para reducir un ángulo incluido entre dicho primer y segundo miembros de conexión para hacer girar así dicho segundo extremo de dicho miembro de la viga principal hacia dicho adaptador de montaje de pluma.

16.- El brazo robótico de conformidad con la reivindicación 15, caracterizado además porque dicho adaptador de montaje de pluma se alarga y en donde los primeros y segundos ángulos incluidos se forman entre dicho primer extremo de dicho miembro de la viga principal y dicho adaptador de montaje de pluma y entre dicho segundo extremo de dicho miembro de la viga principal y dicho adaptador de montaje de pluma respectivamente, y en donde dicho primer ángulo incluido se incrementa y dicho segundo ángulo incluido disminuye a medida que dicho segundo extremo de dicho miembro de la viga principal gira hacia dicho adaptador de montaje de pluma.

17.- El brazo robótico de conformidad con la reivindicación 16, caracterizado además porque cuando dicho primer accionador es replegado y de esta manera está en dicha longitud acortada, dicho ángulo incluido entre dicho primer y segundo miembros de conexión se reduce al mínimo y dicho miembro de la viga principal se hace girar alrededor de dicho primer acoplamiento de rotación para nivelarse sustancialmente a lo largo de dichos miembros de conexión, dicho primer accionador, y dicho adaptador de montaje de pluma, por lo que dicha viga y dichos postes de soporte pueden estibarse de manera compacta cuando la pluma está en una posición hacia abajo.

