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(54) **Title:** OVERCENTER PIPE CLAMP AND METHOD FOR LAY FLAT TUBING

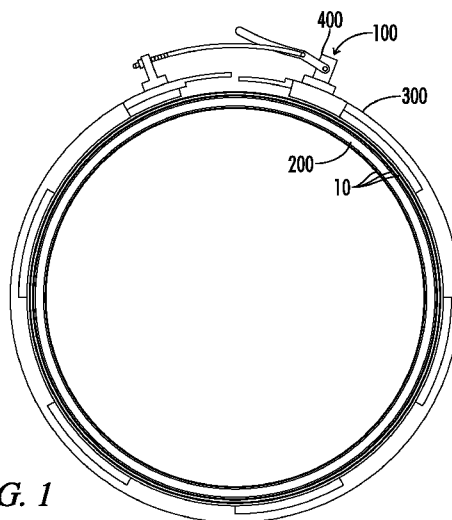


FIG. 1

(57) **Abstract:** A tubing clamp (100) and method are described using an inner ring (200) providing shape support to a lay flat tubing to provide a compression surface against which an outer split ring (300) with segmented pressure fingers can be compressed using an overcenter clamp (400) to secure a back folded first end of a piece of tubing to a second overlaid tubing end.

**DESCRIPTION****OVERCENTER PIPE CLAMP AND METHOD FOR LAY FLAT TUBING****TECHNICAL FIELD**

**[0001]**The present invention relates to improvements in a pipe clamp for a flexible lay flat tubing such as that used in row crop irrigation systems. More particularly, the invention relates to improvements particularly suited for applying appropriate pressure to the clamping area and frictionally engaging a sufficient amount of tubing without tearing or otherwise damaging the tubing.

**BACKGROUND ART**

**[0002]** As will be appreciated by those skilled in the art, pipe clamps are known in various forms to apply high amounts of pressure to pipe joints. However, it is not known how to quickly attach low pressure irrigation tubing without tearing or damaging the tubing.

**[0003]** Poly lay flat flexible irrigation tubing 10 is a polyethylene tubing used with irrigating row crops in level grade farming sold under trade names like POLYPIPE or DURAPIPE. Poly-Pipe lay-flat flexible tubing is a long, generally one thousand foot or more, seamless tube packaged flattened in convenient rolls which can be unwound from the back of a vehicle or manually. Poly-Pipe lay-flat flexible tubing is not designed to transfer water over hills or up grades. This is an extremely low cost temporary irrigation system for use in irrigating fields. Typically provided in diameters of 7, 9, 10, 12, 15, or 18 inches and a thickness of 7 or 10 mil. It is designed for high volume low pressure flows and is not designed for use in moving water uphill or over berms. Thus, unlike flexible pipes used on fire trucks, poly pipe is not designed for high pressure and is not provided with couplings or connectors because it has to be cut to length in the field. In typical applications, miles of pipe are laid in the spring and taken up and recycled each fall. Because the pipe is provided in short sections, hundreds, if not thousands of connections may have to be done each spring and then removed each fall.

**[0004]** Patents disclosing information relevant to pipe clamps include: United States Patent No. 5,722,666, issued to Sisk on March 3, 1998, entitled Pipe coupler gasket with triangular sealing ridges; United States Patent No. 5,540,465, issued to Sisk on July 30, 1996 entitled Pipe, valve and/or tee coupler; United States Patent No. 5,380,052, issued to Hendrickson on January 10, 1995 entitled Releasable handle-type fastener for pipe couplings; and United States Patent No. 5,366,263, issued to Hendrickson on November 22, 1994 entitled Releasable fastener for pipe couplings. Each of these patents is hereby expressly incorporated by reference in their entirety. From these prior references it may be seen that these prior art patents are very limited in their teaching and utilization, and an improved over center pipe clamp is needed to overcome these limitations.

**DISCLOSURE OF THE INVENTION**

[0005]The present invention is directed to an improved over center pipe clamp using an inner ring, outer ring with extending arms and compression fingers, and an over center clamp. In accordance with one exemplary embodiment of the present invention, an over center pipe clamp is provided using a clamping segments and spacing segments to provide high gripping force sufficient for use with thin wall tubing while providing a low pressure sealing force in a quick installation and quick removal pipe clamp. A method for installing the splice is taught so that the interior of the pipe flow is not impeded with flapping or exposed end sections. These and other objects and advantages of the present invention, along with features of novelty appurtenant thereto, will appear or become apparent by reviewing the following detailed description of the invention.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0006]In the following drawings, which form a part of the specification and which are to be construed in conjunction therewith, and in which like reference numerals have been employed throughout wherever possible to indicate like parts in the various views:

[0007]Figure 1 is a schematic front view of the overcenter pipe clamp with extending compression fingers of the present invention.

[0008]Figure 2 is a larger view of the overcenter pipe clamp of Figure 1 showing an open position.

[0009]Figure 3 is a larger view of the overcenter pipe clamp of Figure 1 showing a closed position.

[0010]Figure 4 is a cutaway view of the overcenter pipe clamp of Figure 1 showing the first and second pipe ends with the clamp in an open position.

[0011]Figure 5 is a side cutaway view of the overcenter pipe clamp of Figure 1 showing the first and second pipe ends with the clamp in a closed position.

[0012]Figure 6 is a larger side cutaway view of the first and second pipe ends with the clamp in an open position.

[0013]Figure 7 is a larger side cutaway view of the the first and second pipe ends with the clamp in a closed position.

[0014]Figure 8 is a top view of the outer ring.

[0015]Figure 9 is a left side view of the outer ring.

[0016]Figure 10 is a front view of the outer ring.

[0017]Figure 11 is a right side view of the outer ring.

[0018]Figure 12 is a bottom view of the outer ring.

[0019]Figure 13 is a back view of the outer ring.

[0020]Figure 14 is an isometric view of the outer ring.

[0021]Figure 15 is another angle of an isometric view of the outer ring.

[0022]Figure 16 is a top view of the inner ring.

[0023]Figure 17 is a left side view of the inner ring.

[0024]Figure 18 is a front view of the inner ring, the back view being the same.

[0025]Figure 19 is a right side view of the inner ring.

[0026]Figure 20 is a bottom view of the inner ring.

[0027]Figure 21 is an isometric view of the inner ring.

#### **BEST MODE FOR CARRYING OUT THE INVENTION**

[0028]As shown in Figures 1 through 7 of the drawings, one exemplary embodiment of the present invention is generally shown as a lay flat pipe quick clamp 100 for poly lay flat flexible irrigation tubing 10. Figures 1, 4, 5, 6, and 7 show the poly lay flat flexible irrigation tubing 10 with a pipe inner surface 12, non-structural collapsing pipe wall 14 with a cracking or minimum bend 15, and a pipe outer surface 16. The minimum bend 15 is the sharpest radius that may be used without cutting or tearing the tubing 10. A first tubing end 20 and second tubing end 30 are shown for clamping.

[0029]As shown in Figures 1 through 7 of the drawings the lay flat pipe quick clamp 100 is constructed from an inner shape ring 200, an outer split ring 300, and an overcenter clamp 400.

[0030]The inner shape ring 200 includes an inner flow surface 202 between a left folding edge 204 and a right folding edge 206 so that either direction of flow may be utilized in the tubing 10. Each folding edge 204, 206 has a minimum folding radius 208 greater than the minimum bend 15 of the tubing. The inner shape ring 200 also includes an outside clamping surface 210 that is used to contact the tubing 10 and compressably secure it in position. The outside clamping surface 210 defines width for the ring clamping surface 201. In this embodiment, the ring clamping surface 201 extends from the left folding edge 204 to the right folding edge 206.

[0031]The outer split ring 300 includes an inside clamping surface 302 that works with the outside clamping surface 210 of the inner ring 200 to compressably, sealably, and frictionally hold the tubing 10 in position. The outer split ring 300 includes a left capturing edge 304 and right capturing edge 306. Each capturing edge 304, 306 is shown with multiple capturing segments 308 alternating with multiple spacing segments 318 around the outer ring 300. Each capturing segment 308 includes an extending arm 310 reaching out an extending distance 311 to support a catch finger 312. Each catch finger is made with a finger depth 314 terminating at a finger tip 315 with a tip radius 316 greater than the minimum bend 15 of the tubing 10. If the left edge is provided with a capturing segment 308 then the preferred embodiment uses a spacing segment 318 on the right edge. These alternating sections and opposite alternating sides provide gripping while flexing alternating sides of the outer ring 300 to prove the downward force without harming the thin wall of the tubing 10. In this manner, only one half of

the gripping force is applied on one side of the outer ring 300 such that the tubing is not exposed to a continuous or circular point load to stress the rubbing 10.

**[0032]**The outer ring 300 is split at an adjustable joint 320. The adjustable joint 320 includes a left ring end 322 with a left clamping surface 324 and a left sliding overlap finger 326 separated by a ring gap 327 to a right ring end 328 with a right clamping surface 330 and a right sliding overlap finger 332.

**[0033]**The adjustable joint is opened, closed, and secured by an overcenter clamp 400. The overcenter clamp is built off of a base handle riser 402 connected to the right ring end 328 by rivets, glue or the other securing method. The base handle riser 402 includes a handle pivot 404 that pivotally supports a layflat pipe clamp handle 406 the is positioned to be able to provide an over center clamping force to lock the handle in position. The handle 406 includes an arm pivot 408 connecting an extending catch arm 410 with a length adjuster 412 for engaging a catch slot 416 in a catch riser 414 secured to the left ring end 322.

**[0034]**As best seen in Figures 6 and 7, the first tubing end 20 is passed through the inner flow surface 202 of the inner ring 200 to form a first pipe through section 500. The first tubing 20 is then folded back upon itself to form a first pipe rise deflection section 502 and then passes back over the ring clamping surface 201 to form a first pipe center span section 504, first pipe drop deflection section 506, and first pipe overage section 508. The second tubing end 30 is positioned over the installed first tubing end 20 to form a right pipe rise deflection section 510, a right pipe center span section 512, a right pipe drop deflection section 514, and a right pipe overage section 516. As can be noted by Figures 6 and 7, the inner ring and outer ring provide a wide clamping surface to seal and frictionally engage the tubing 10 and hold it in position with additional force provided by the capturing segments 308. The extending arm 310 allows for an flexing pressure to be absorbed and applied to the catch finger 312. The ring material for the outer ring 300 should be selected to allow for this flexible pressure to be applied to the catch finger 312 and the finger depth 314 should be selected to provide the requisite force based on the thickness of the tubing 10 to secure the tubing 10 in place without tearing the tubing 10.

**[0035]**Reference numerals used throughout the detailed description and the drawings correspond to the following elements:

- Poly lay flat flexible irrigation tubing 10
- Pipe inner surface 12
- Non-structural collapsing pipe wall 14
- Pipe outer surface 16
- First tubing end 20
- Second tubing end 30
- Lay flat pipe quick clamp 100

Inner shape ring 200  
Inner flow surface 202  
Ring clamping surface 201  
Left Folding edge 204  
Right folding edge 206  
Folding radius 208  
Outside clamping surface 210  
Outer split ring 300  
Inside clamping surface 302  
Left Capturing edge 304  
Right capturing edge 306  
Capturing segment 308  
Extending arm 310  
Extending distance 311  
Catch finger 312  
Finger depth 314  
Finger tip 315  
Tip radius 316  
Spacing segment 318  
Adjustable joint 320  
First ring end 322  
First clamping surface 324  
First sliding overlap finger 326  
Ring gap 327  
Right ring end 328  
Right clamping surface 330  
Right sliding overlap finger 332  
Overcenter clamp 400  
Handle riser 402  
Handle pivot 404  
Layflat pipe clamp handle 406  
Arm pivot 408  
Extending catch arm 410  
Length adjuster 412  
Catch riser 414  
Catch slot 416

First pipe through section 500

First pipe rise deflection section 502

First pipe center span section 504

First pipe drop deflection section 506

First pipe overage section 508

Second pipe rise deflection section 510

Second pipe center span section 512

Second pipe drop deflection section 514

Second pipe overage section 516

**[0036]**From the foregoing, it will be seen that this invention well adapted to obtain all the ends and objects herein set forth, together with other advantages which are inherent to the structure. It will also be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims. Many possible embodiments may be made of the invention without departing from the scope thereof. Therefore, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

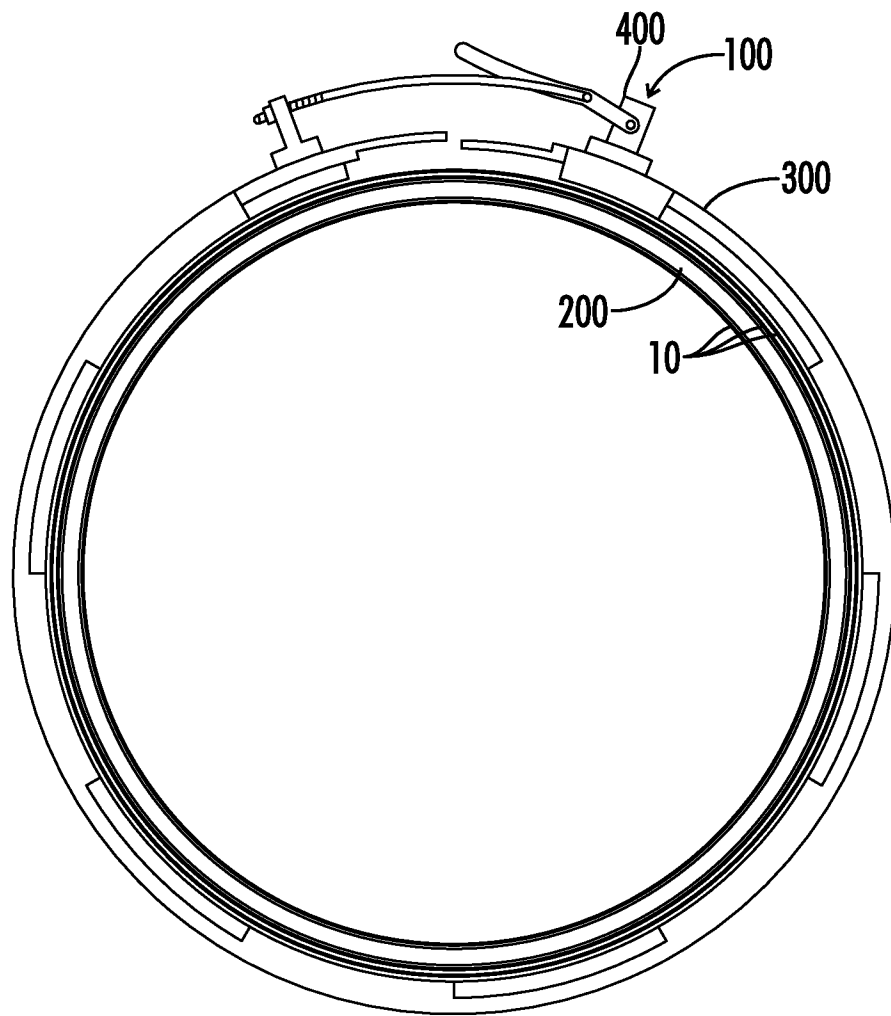
**[0037]**When interpreting the claims of this application, method claims may be recognized by the explicit use of the word 'method' in the preamble of the claims and the use of the 'ing' tense of the active word. Method claims should not be interpreted to have particular steps in a particular order unless the claim element specifically refers to a previous element, a previous action, or the result of a previous action. Apparatus claims may be recognized by the use of the word 'apparatus' in the preamble of the claim and should not be interpreted to have 'means plus function language' unless the word 'means' is specifically used in the claim element. The words 'defining,' 'having,' or 'including' should be interpreted as open ended claim language that allows additional elements or structures. Finally, where the claims recite "a" or "a first" element of the equivalent thereof, such claims should be understood to include incorporation of one or more such elements, neither requiring nor excluding two or more such elements.

**CLAIMS**

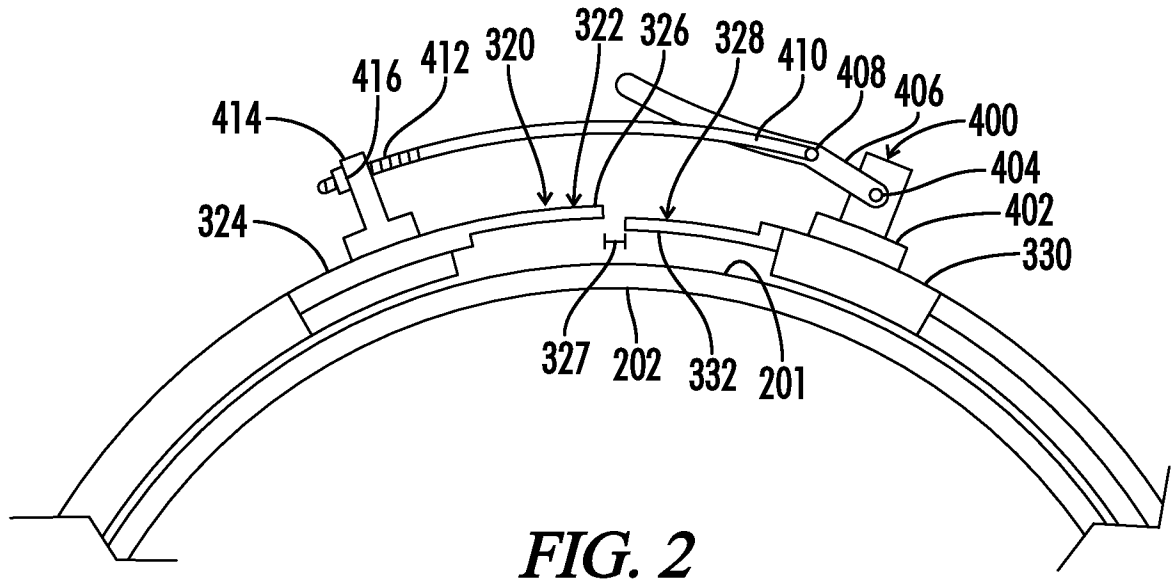
What is claimed is:

1. A lay flat pipe quick clamp apparatus for use with lay flat flexible irrigation tubing having an inner surface, a collapsing pipe wall, and an outer surface, the lay flat pipe quick clamp comprising:
  - an inner shape ring including an inner flow surface, at least one folding edge, and an outer clamping surface;
  - an outer split ring including a first ring end and a second ring end defining a ring gap, an inside clamping surface, and at least one capturing edge, the capturing edge including a catch finger; and
  - an overcenter clamp connected to the first ring end and the second ring end across the ring gap.
2. The apparatus of claim 1, the inner ring further comprising:
  - a second folding edge opposite the first folding edge.
3. The apparatus of claim 1, the inner ring further comprising:
  - a folding radius greater than the cracking radius of the tubing.
4. The apparatus of claim 1, the outer split ring further comprising:
  - a second capturing edge opposite the first capturing edge.
5. The apparatus of claim 1, the at least one capturing edge comprising both a capturing segment and a spacing segment.
6. The apparatus of claim 1, the at least one capturing edge comprising:
  - a tip radius greater than the cracking radius of the tubing.
7. A method for clamping a first end and a second end of lay flat flexible irrigation tubing together, the method comprising:
  - providing an inner shape ring, and outer shape ring, and an overcenter clamp connected to the outer shape ring;
  - feeding the first end through the inner shape ring to form a first pipe through section;
  - folding the first end back over the inner ring to form a first pipe rise section, and first pipe center span section;
  - pulling the second end over the first end on the inner ring to form a second pipe center span section; and
  - clamping the outer shape ring to the inner shape ring using the overcenter clamp.
8. The method of claim 7, further comprising:
  - providing a catch finger on one ring extending toward the other ring; and
  - deflecting the first end to form a first pipe bend section.

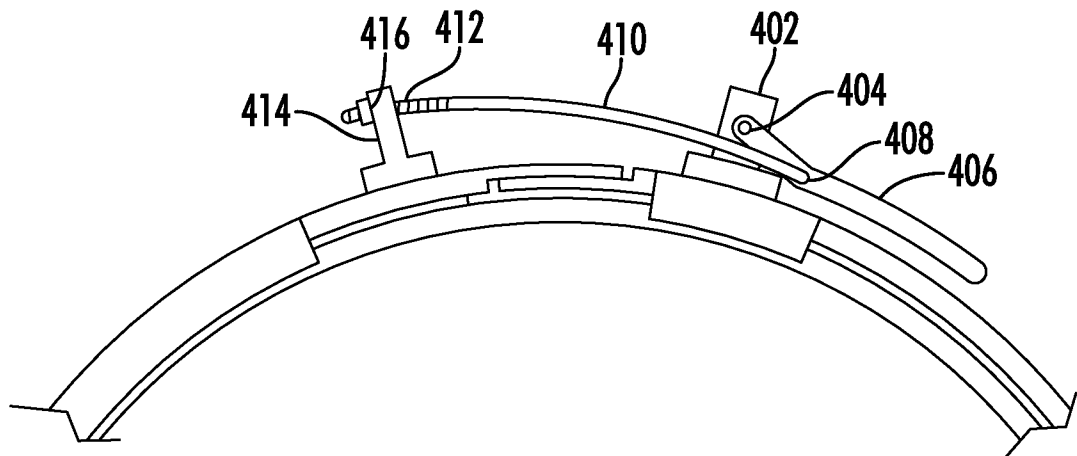
9. The method of claim 7, further comprising:  
providing a catch finger on one ring extending toward the other ring; and  
deflecting the first end to form a first pipe deflection section.
10. The method of claim 7, further comprising:  
providing a catch finger on one ring extending toward the other ring; and  
deflecting the second end to form a second pipe deflection section.
11. The method of claim 7, further comprising:  
providing a first catch finger on one side and a second catch finger on a second side of  
one ring extending toward the other ring; and  
deflecting the first end to form a first pipe deflection rise section and a first pipe  
deflection drop section.
12. The method of claim 7, further comprising:  
providing a first catch finger on one side and a second catch finger on a second side of  
one ring extending toward the other ring; and  
deflecting the second end to form a second pipe deflection rise section and a second  
pipe deflection drop section.
13. The method of claim 7, further comprising:  
extending the first end past the rings to form a first pipe overage section.
14. The method of claim 7, further comprising:  
extending the second end past the rings to form a second pipe overage section.



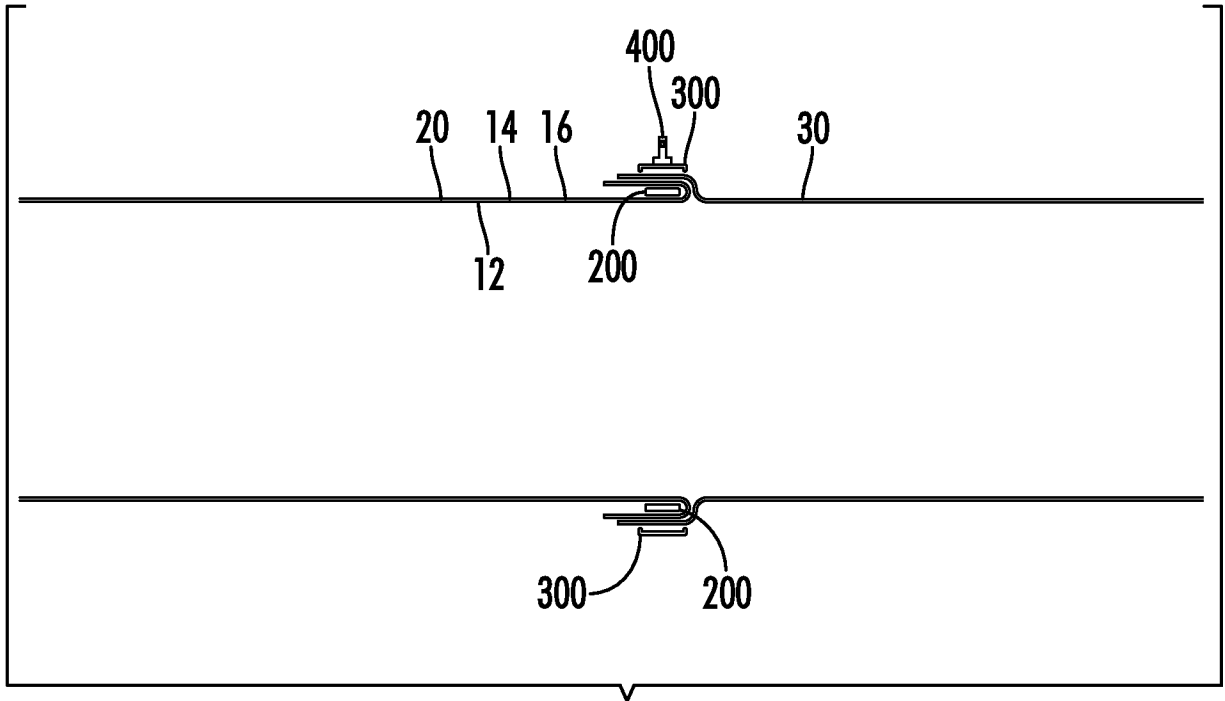
*FIG. 1*



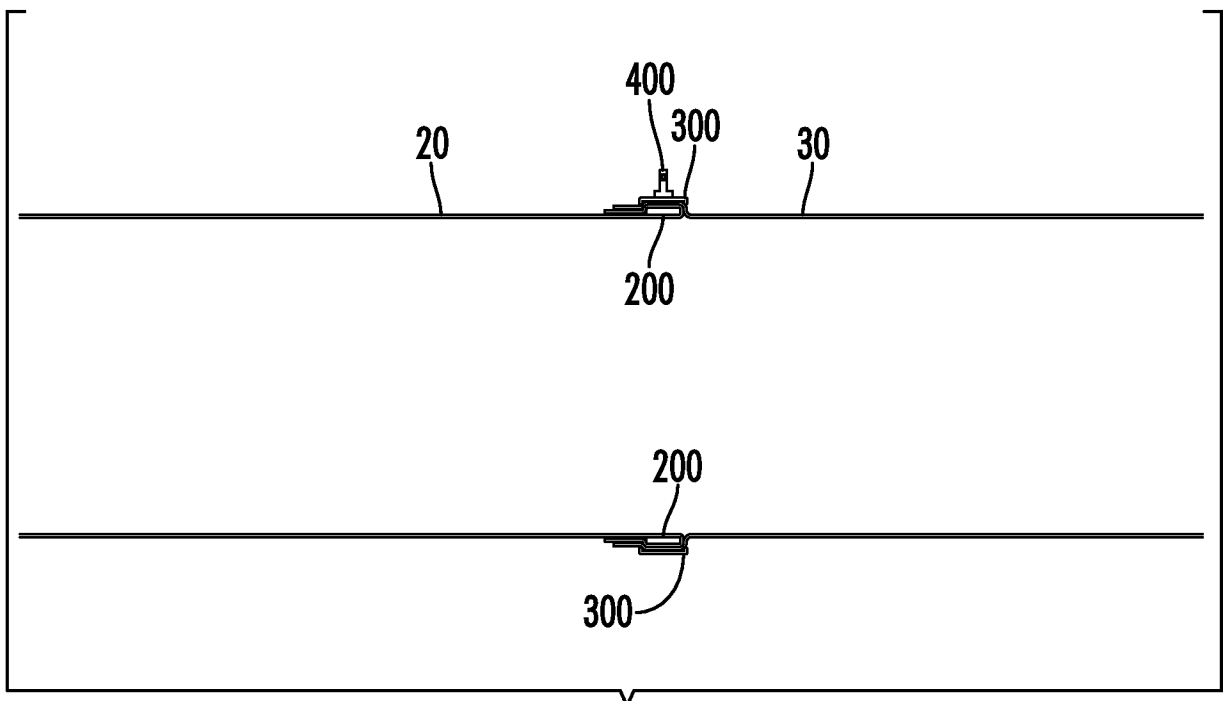
*FIG. 2*



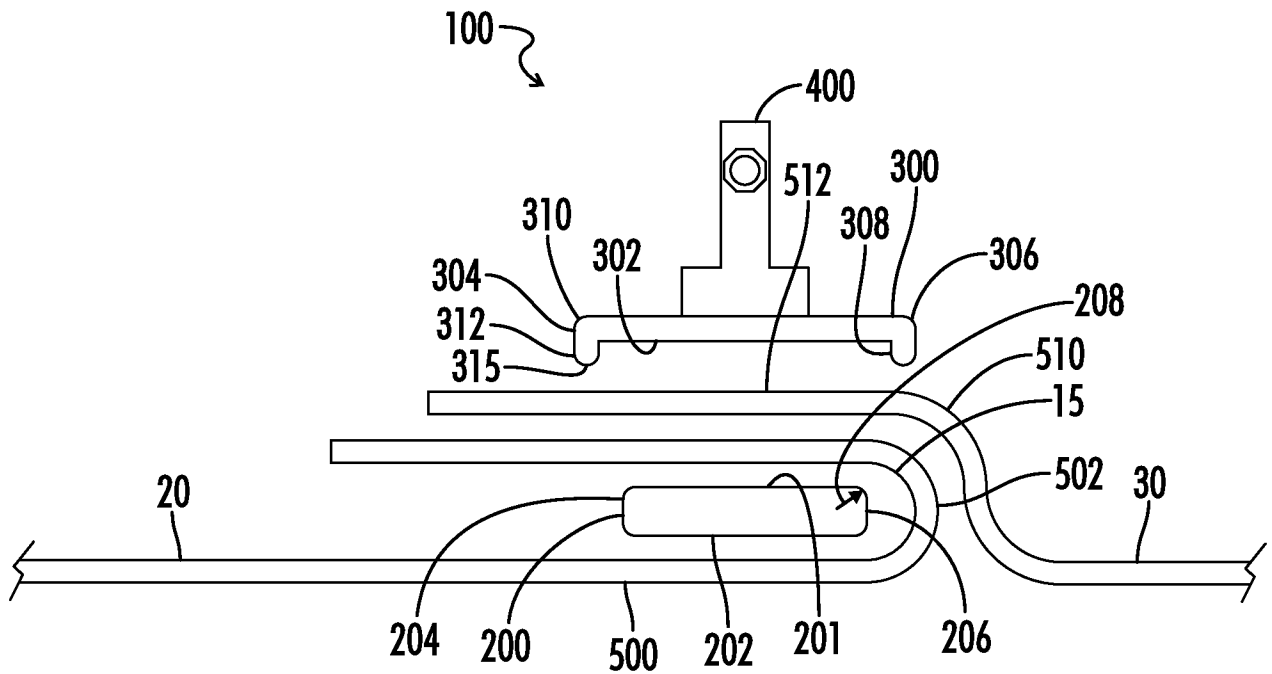
*FIG. 3*



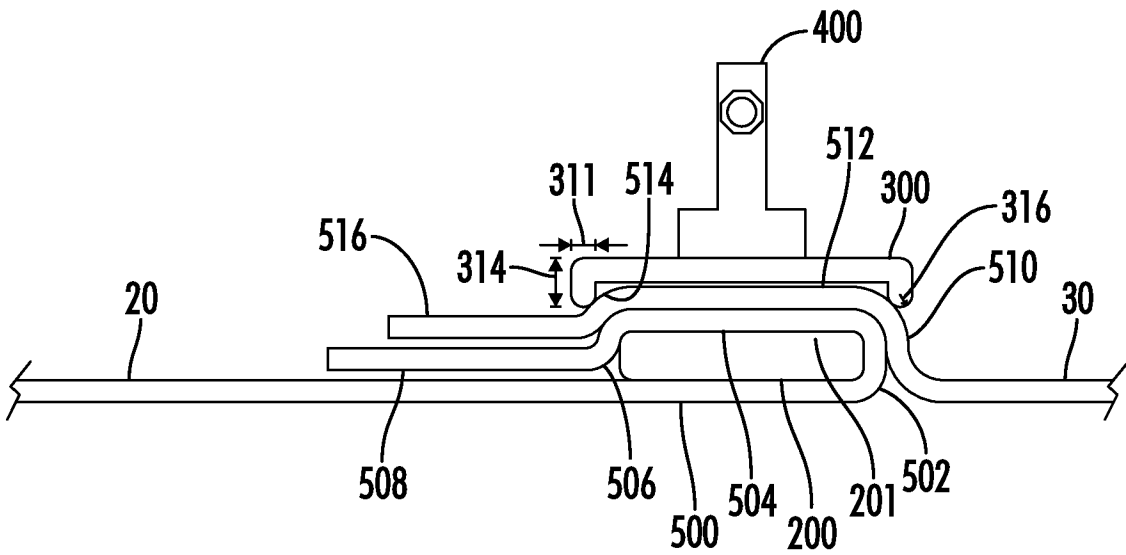
*FIG. 4*



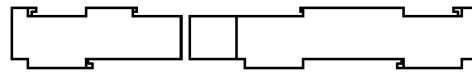
*FIG. 5*



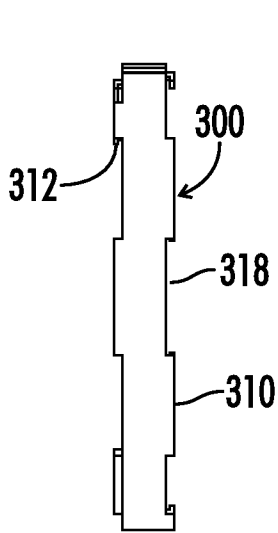
**FIG. 6**



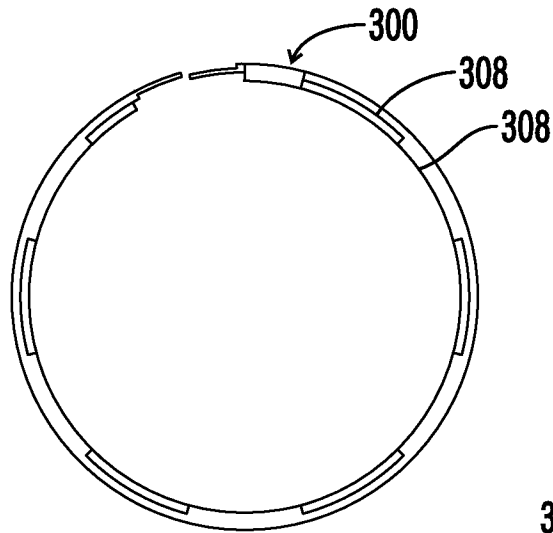
**FIG. 7**



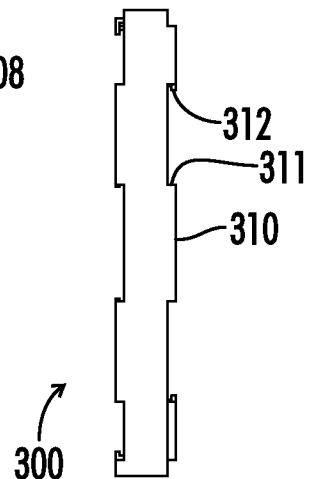
**FIG. 8**



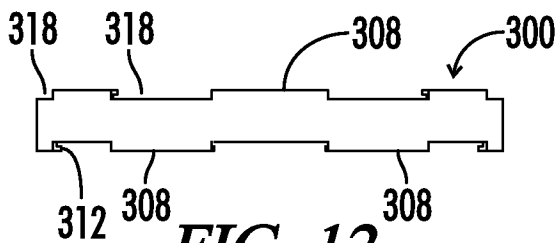
**FIG. 9**



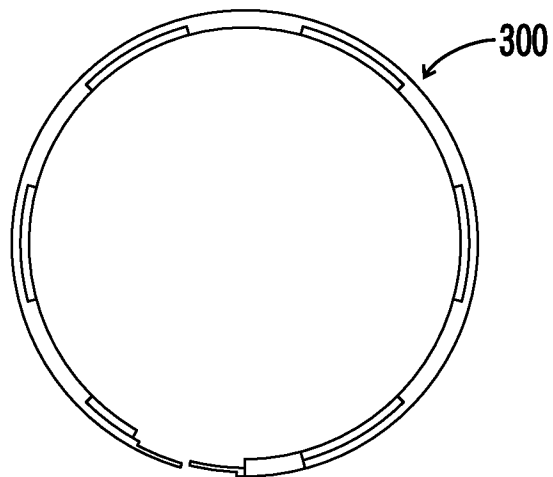
**FIG. 10**



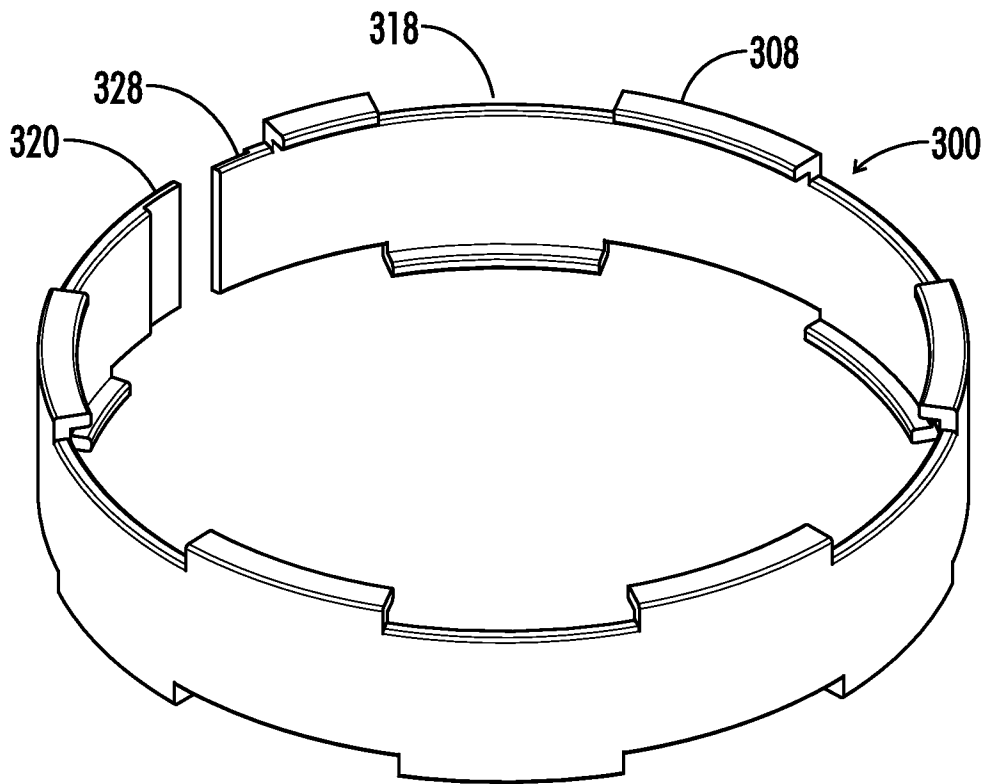
**FIG. 11**



**FIG. 12**

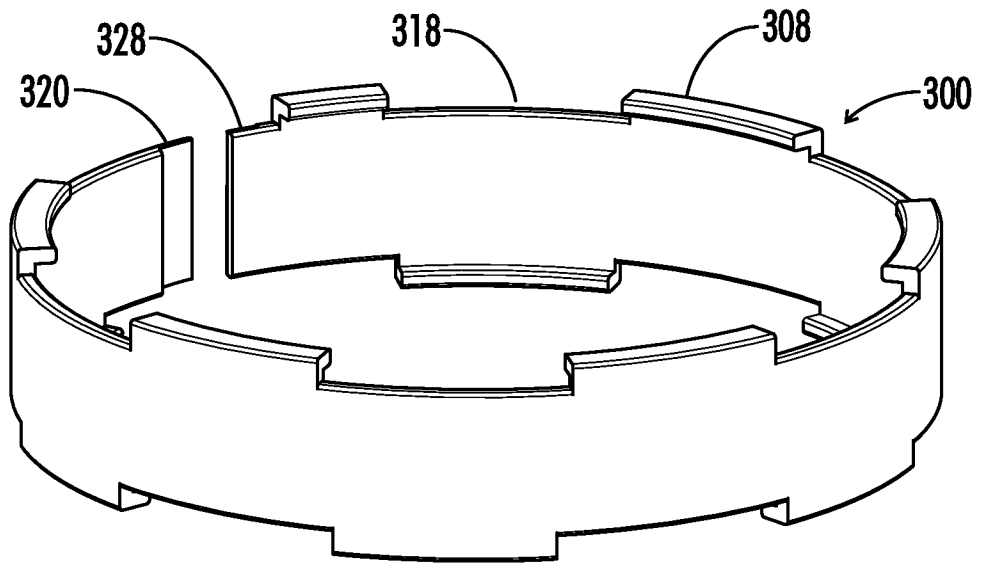


**FIG. 13**

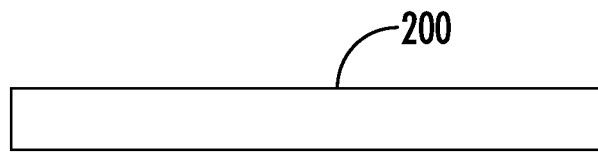


**FIG. 14**

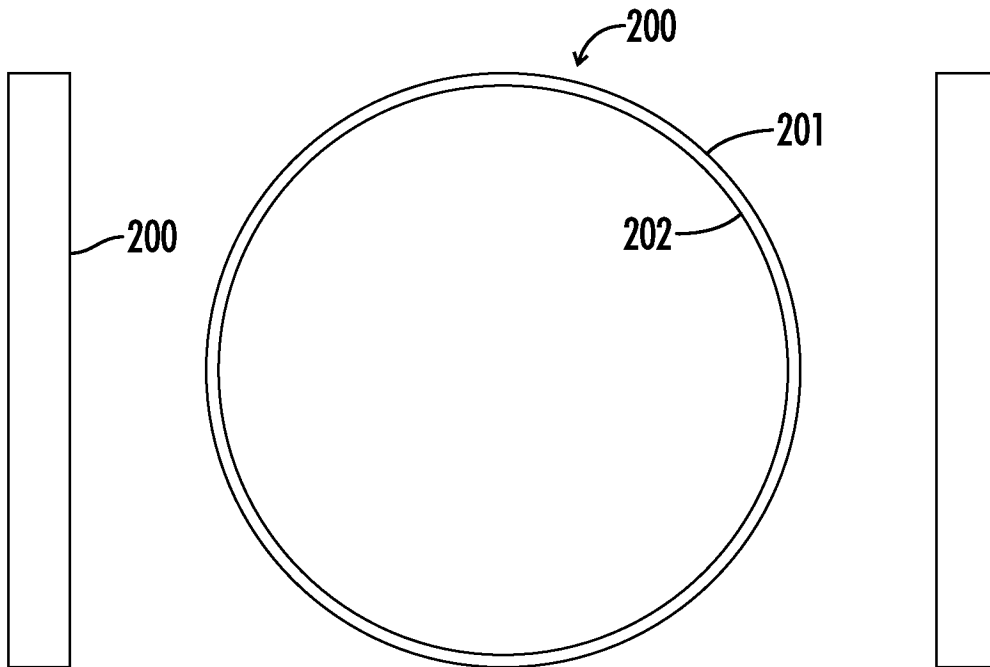
7/9



*FIG. 15*



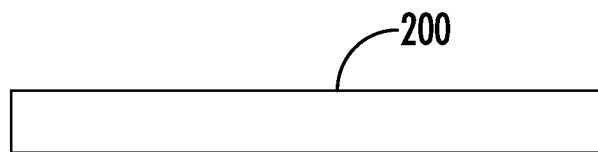
*FIG. 16*



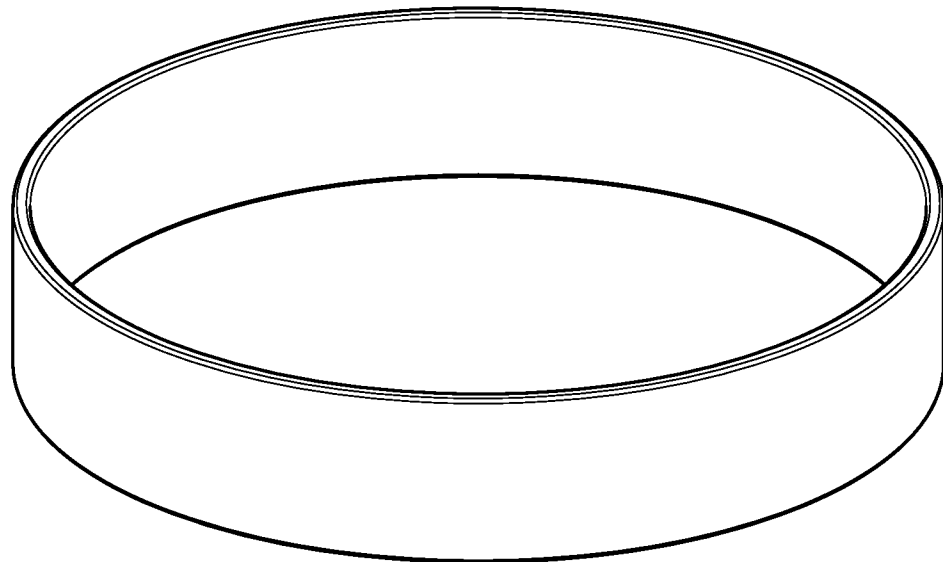
*FIG. 17*

*FIG. 18*

*FIG. 19*



*FIG. 20*



*FIG. 21*

**A. CLASSIFICATION OF SUBJECT MATTER**

F16L 33/02(2006.01)i, F16L 33/12(2006.01)i, F16B 2/08(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
F16L 33/02; F16L 33/12; B65D 63/00; F16B 2/08; F16J 15/02; F16L 17/025; F16L 33/08Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean utility models and applications for utility models  
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKOMPASS(KIPO internal) & keywords: lay flat tubing, pipe clamp, inner ring, outer split ring, folding, deflecting, and catch finger**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-265031 A (KYODO K.K.) 29 September 2005 See abstract, paragraphs [0014]-[0016], claim 1, and figures 1, 5.	1-14
A	KR 10-1999-0013478 A (RASMUSSEN GMBH) 25 February 1999 See abstract, page 3, lines 3-57, claim 1, and figure 1.	1-14
A	US 5157815 A (DYER, EDWARD P.) 27 October 1992 See abstract, column 2, line 10 - column 3, line 32, and figure 6.	1-14
A	US 5722666 A (SISK, DAVID E.) 03 March 1998 See abstract, claim 1, and figures 5, 7, 9.	1-14
A	US 2008-0098572 A1 (KRAUSS, MATHIAS) 01 May 2008 See paragraphs [0026]-[0033] and figure 1.	1-14

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

18 August 2015 (18.08.2015)

Date of mailing of the international search report

18 August 2015 (18.08.2015)

Name and mailing address of the ISA/KR


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 Korean Intellectual Property Office  
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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2015/024639**

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