



- (51) **International Patent Classification:**
F16L 21/02 (2006.01) *F16L 21/06* (2006.01)
F16L 25/14 (2006.01)
- (21) **International Application Number:**
PCT/US2012/039260
- (22) **International Filing Date:**
24 May 2012 (24.05.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
13/116,176 26 May 2011 (26.05.2011) US
- (71) **Applicant (for all designated States except US):** ELIEZER KRAUSZ INDUSTRIES DEVELOPMENT LTD. [IL/IL]; 6 Hapatish Street, 66559 Tel Aviv (IL).
- (71) **Applicant (for MA only):** KLEIN, David [US/IL]; 18 Menuha VeNahala Street, 76209 Rehovot (IL).
- (72) **Inventor; and**
- (75) **Inventor/Applicant (for US only):** CHIPROOT, Avi [IL/IL]; 12 Hairis Street, 44278 Kfar-Saba (IL).
- (74) **Agent:** KLEIN, David; 18 Menuha VeNahala Street, 76209 Rehovot (IL).
- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) **Title:** MULTILAYER ANNULAR CLAMP

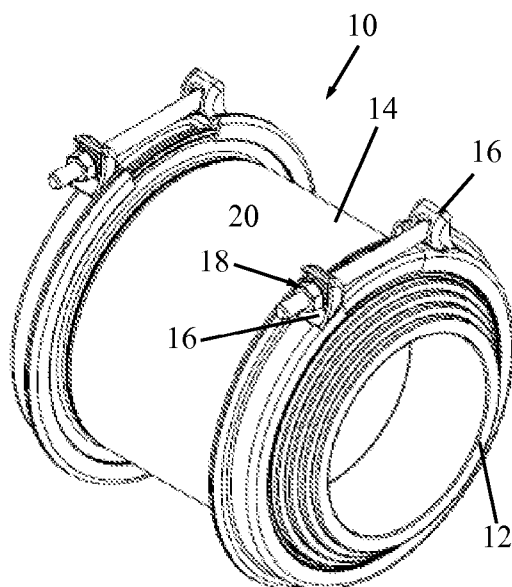


FIG. 1

(57) **Abstract:** A multilayer annular clamp (10) including a plurality of sealing rings (12) radially spaced from one another, at least two of the sealing rings (12) including L-shaped axial-plane cross-sections nested in one another, an innermost one of the sealing rings (12) being operative to contact an outer contour of a pipe (22), two clamp members (16) disposed around a portion of the sealing rings (12), and a fastener (18), including a shank (20), operative to fasten the clamp members (16) towards each other in a direction along the shank (20) so as to apply a radially-inward clamping force on the innermost sealing ring (12) that contacts the pipe (22) so that the multilayer annular clamp (10) clamps the pipe (22).



Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

MULTILAYER ANNULAR CLAMP

FIELD OF THE INVENTION

The present invention relates generally to clamps and grip rings for pipes, and particularly to a multilayer annular clamp.

BACKGROUND OF THE INVENTION

Many kinds of removable band-type couplings for pipes exist in the art. It is noted that throughout the specification and claims, the term “pipe” encompasses any kind of generally cylindrical object.

US Patent 6293556 to Krausz describes a coupling for connecting pipes of the same or different diameters. The coupling has a ring shaped seal made of rubber or other resilient material, constructed of a first ring seal seated over a second ring seal. The seals can be easily disconnecting from one another to allow sealing against different diameter pipes. For smaller diameter pipes, both the first and second ring seals are used; for larger diameters, only one seal is used.

However, in some applications, the seals are subjected to considerable axial forces due to the fluids flowing in the pipe, sealing forces, clamping forces and other factors. It would be desirable to improve the ability of the seal to withstand such axial forces.

SUMMARY OF THE INVENTION

The present invention seeks to provide an improved clamp that improves the ability of the seal to withstand such axial forces, as is described more in detail hereinbelow. In addition, the assembly of the present invention has a very wide range of handling different diameter pipes and different materials of pipes (e.g., metal and plastic).

There is thus provided in accordance with an embodiment of the present invention a multilayer annular clamp including a plurality of sealing rings radially spaced from one another, at least two of the sealing rings including L-shaped axial-plane cross-sections nested in one another, an innermost one of the sealing rings being operative to contact an outer contour of the pipe, two clamp members disposed around a portion of the sealing rings, and a fastener, including a shank, operative to fasten the clamp members towards each other in a direction along the shank so as to apply a radially-inward clamping force on the innermost sealing ring that contacts the pipe so that the multilayer annular clamp clamps the pipe. In one embodiment, the L-shaped cross-section is a double-L-shaped (U-shaped) cross-section.

In accordance with an embodiment of the present invention at least one of the sealing rings (e.g., the outermost sealing ring) includes an outer portion folded over an

inner portion so as to define an inner space between and bounded by the inner and outer portions.

In accordance with an embodiment of the present invention at least one pair of adjacent sealing rings are connected to each other by a male and female connection.

In accordance with an embodiment of the present invention some of the sealing rings are made of different materials and/or different thicknesses.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawing in which:

Figs. 1, 2, 3 and 4 are simplified right perspective, left perspective, sectional and end-view illustrations, respectively, of a multilayer annular clamp, constructed and operative in accordance with an embodiment of the present invention, wherein Fig. 3 is taken along section lines C-C in Fig. 2; and

Figs. 5, 6 and 7 are simplified perspective, sectional and end-view illustrations, respectively, of a multilayer annular clamp, constructed and operative in accordance with another embodiment of the present invention, wherein Fig. 6 is taken along section lines B-B in Fig. 5.

DETAILED DESCRIPTION OF EMBODIMENTS

Reference is now made to Figs. 1-4, which illustrate a multilayer annular clamp 10, constructed and operative in accordance with a non-limiting embodiment of the present invention.

Clamp 10 includes a plurality of sealing rings 12 radially spaced from one another and disposed in a housing 14, which may be cylindrical. Two clamp members 16 are disposed around a portion of the sealing rings 12. A fastener 18, including a shank 20, such as a bolt and nut fastener, fastens the clamp members 16 towards each other in a direction along shank 20 so as to apply a radially-inward clamping force on the innermost sealing ring 12 that is arranged to contact (surround) a pipe 22 (shown partially in broken lines in Fig. 3) placed in clamp 10.

As seen in Fig. 3, the sealing rings 12 have L-shaped axial-plane cross-sections nested in one another. The innermost sealing ring 12 contacts an outer contour of pipe 22. In the embodiment of Figs. 1-4, the right side set of sealing rings in Fig. 3 are L-shaped in axial-plane cross-section, whereas the left side set of sealing rings in Fig. 3 are double-L-shaped (U-shaped) in axial-plane cross-section. In other words, the U-shape is another form of the L-shape, combining mirror images of two L-shapes. The L-shape (and U-

shape) may have rounded corners (inner and outer). In an alternative embodiment, the one or more of the corners (inner and/or outer) may be sharp (radius zero). The sealing rings 12 may be made of any suitable sealing material, such as but not limited to, natural or synthetic rubber.

In accordance with an embodiment of the present invention, one or more of the sealing rings (designated by numeral 12A, generally the radially outermost sealing ring) includes an outer portion 24 folded over an inner portion 26 so as to define an inner space 28 between and bounded by the inner and outer portions 24 and 26. The inner space 28 is in fluid communication with a fluid (not shown) flowing in pipe 22. The fluid enters inner space 28 and applies pressure therein to increase tightening of the seal. Some of the sealing rings 12 may be removed from or added to some of the other sealing rings 12 to accommodate different pipe diameters; it is the innermost sealing ring that contacts the outer contour of pipe 22 and is tightened thereagainst.

In accordance with an embodiment of the present invention, one or more pairs of adjacent sealing rings are connected to each other by a male and female connection 30 (such as protrusions received in grooves or ridges and the like). This may help in increasing resistance to axial forces applied by the fluid in the pipe and the sealing forces against the pipe.

In accordance with an embodiment of the present invention some of the sealing rings are made of different materials, such as but not limited to, having different hardnesses, resilience, chemical resistance and other properties. In accordance with another embodiment of the present invention, some of the sealing rings may have different thicknesses.

Figs. 5-7 illustrate an almost identical multilayer annular clamp 40, wherein all the sealing rings are double-L-shaped (U-shaped) in axial-plane cross-section.

CLAIMS

What is claimed is:

1. A multilayer annular clamp (10) characterised by:
a plurality of sealing rings (12) radially spaced from one another, at least two of said sealing rings (12) comprising L-shaped axial-plane cross-sections nested in one another, an innermost one of said sealing rings (12) being operative to contact an outer contour of a pipe (22);
two clamp members (16) disposed around a portion of said sealing rings (12); and
a fastener (18), comprising a shank (20), operative to fasten said clamp members (16) towards each other in a direction along said shank (20) so as to apply a radially-inward clamping force on the innermost sealing ring (12) that contacts the pipe (22) so that said multilayer annular clamp (10) clamps the pipe (22).
2. The multilayer annular clamp (10) according to claim 1, wherein said L-shaped cross-section comprises a double-L-shaped (U-shaped) cross-section.
3. The multilayer annular clamp (10) according to claim 1, wherein at least one of said sealing rings (12) comprises an outer portion (24) folded over an inner portion (26) so as to define an inner space (28) between and bounded by said inner and outer portions (24, 26).
4. The multilayer annular clamp (10) according to claim 3, wherein said sealing ring (12) that comprises said outer portion (24) folded over said inner portion (26) is the outermost sealing ring (12A).
5. The multilayer annular clamp (10) according to claim 1, wherein at least one pair of adjacent sealing rings (12) are connected to each other by a male and female connection (30).
6. The multilayer annular clamp (10) according to claim 1, wherein one or more of said sealing rings (12) are made of different materials.
7. The multilayer annular clamp (10) according to claim 1, wherein one or more of said sealing rings (12) have different thicknesses.

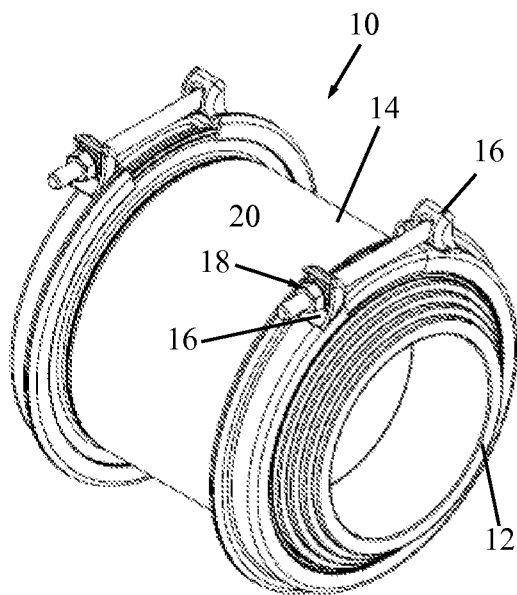


FIG. 1

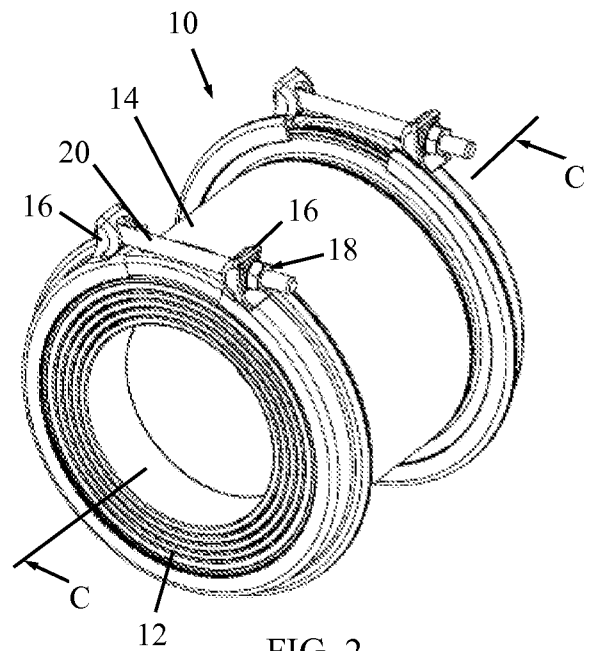


FIG. 2

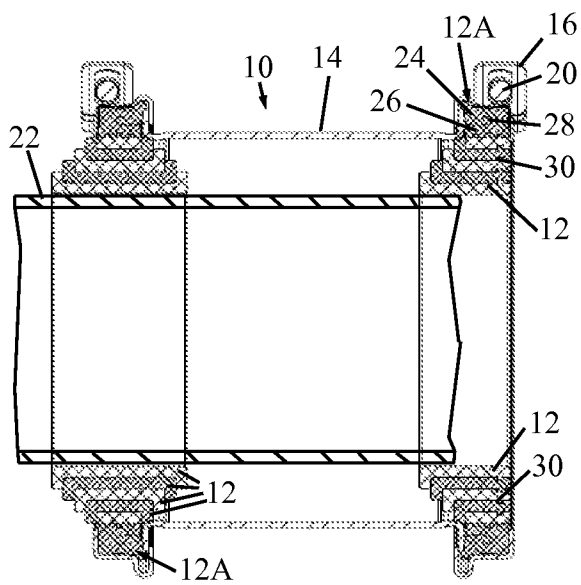


FIG. 3

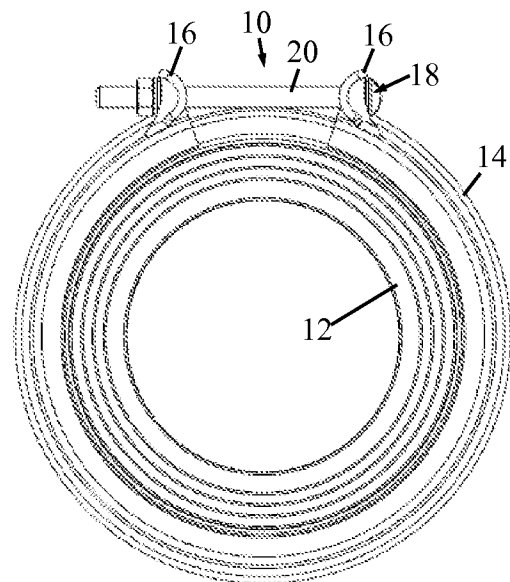


FIG. 4

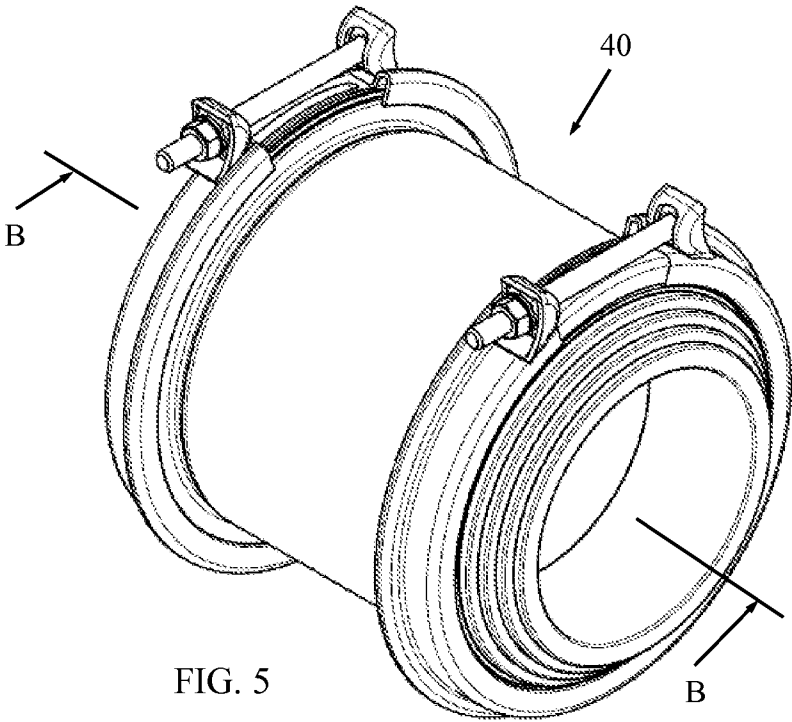


FIG. 5

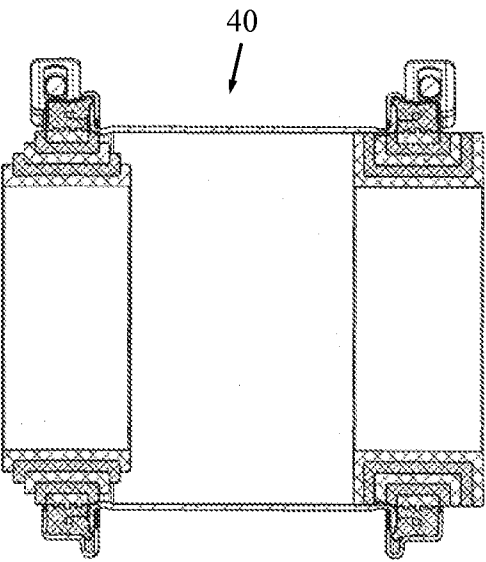


FIG. 6

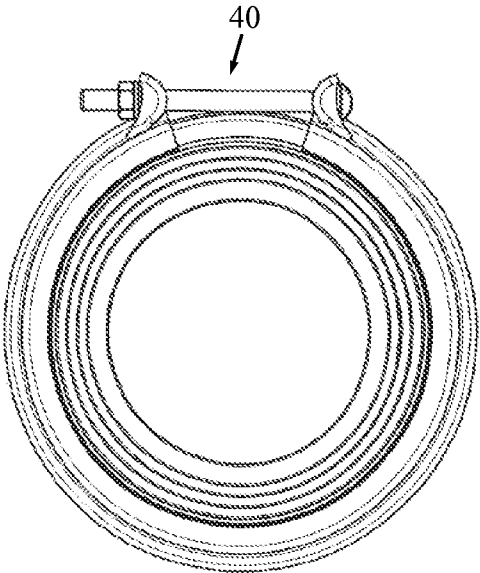


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/039260

A. CLASSIFICATION OF SUBJECT MATTER INV. F16L21/02 F16L25/14 F16L21/06 ADD.		
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		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IL 150 324 A (KRAUSZ ELIEZER [IL]; KRAUSZ METAL IND LTD [IL]; CHIPROOT AVI) 13 April 2008 (2008-04-13) the whole document	1-7
A	EP 1 970 613 A1 (KRAUSZ IND DEV LTD [IL]) 17 September 2008 (2008-09-17) the whole document	1-7
A	US 4 480 860 A (FORESTA ANTHONY J [US] ET AL) 6 November 1984 (1984-11-06) the whole document	1-7
A	US 6 293 556 B1 (KRAUSZ ELIEZER [IL]) 25 September 2001 (2001-09-25) cited in the application the whole document	1-7
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 10 September 2012		Date of mailing of the international search report 24/09/2012
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Fromentel, Henri

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/039260

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
IL 150324	A	13-04-2008	NONE
EP 1970613	A1	17-09-2008	EP 1970613 A1 17-09-2008
		US 2008224464	A1 18-09-2008
US 4480860	A	06-11-1984	CA 1197274 A1 26-11-1985
		DE 3431599	A1 14-03-1985
		FR 2551175	A1 01-03-1985
		GB 2145790	A 03-04-1985
		JP 1732757	C 17-02-1993
		JP 4020114	B 31-03-1992
		JP 60095296	A 28-05-1985
		US 4480860	A 06-11-1984
US 6293556	B1	25-09-2001	AT 283441 T 15-12-2004
		DE 59812304	D1 30-12-2004
		EP 0909915	A2 21-04-1999
		ES 2234059	T3 16-06-2005
		IL 121796	A 14-06-2001
		JP 11159672	A 15-06-1999
		US 6293556	B1 25-09-2001