



- (51) International Patent Classification:
F16L 37/12 (2006.01)
- (21) International Application Number:
PCT/US2012/029405
- (22) International Filing Date:
16 March 2012 (16.03.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/454,058 18 March 2011 (18.03.2011) US
- (71) Applicant (for all designated States except US): **A. RAY-MOND ET CIE** [FR/FR]; 115, Cours Berriat, F-38000 Grenoble (FR).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **PARKS, Brian, A.** [US/US]; 9595 Oakbrooke Lane, Apartment 12, Howell, MI 48843 (US). **LUTZKE, Matthew, D.** [US/US]; 6344 Almond Lane, Clarkston, MI 48346 (US).
- (74) Agents: **JONES, Richard, A.** et al.; Dickinson Wright PLLC, 2600 West Big Beaver Road, Troy, MI 48084 (US).

- (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, MD, 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).

- Published:
- with international search report (Art. 21(3))
 - with amended claims and statement (Art. 19(1))

(54) Title: QUICK CONNECTOR

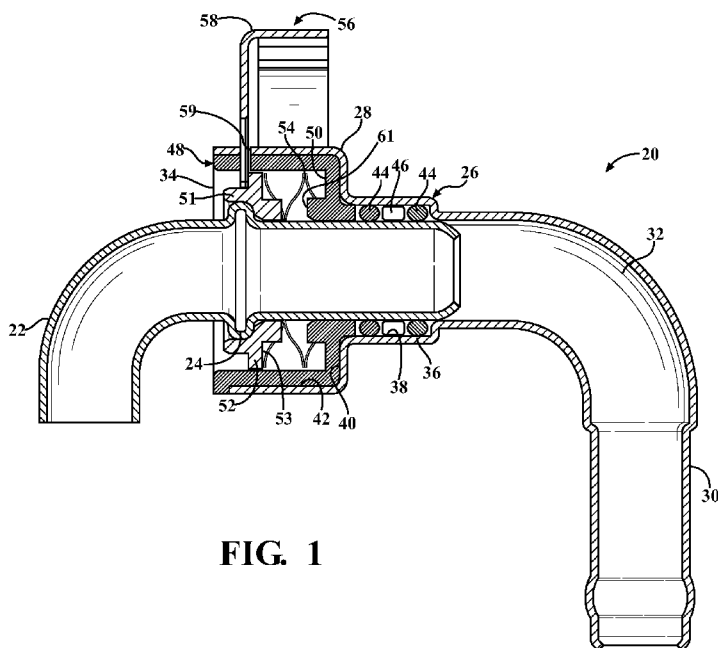


FIG. 1

(57) Abstract: A quick connector assembly for quickly connecting and establishing fluid communication between a male end form having a bead and a tube. The quick connector assembly includes a housing having a stem portion for receiving the hose and a female receiving portion for receiving the male end form. The quick connector includes a locker which is moveable between a non-engaged position for allowing the male end form to be inserted into or withdrawn from the quick connector assembly and an engaged position for trapping the male end form in the quick connector assembly. The locker includes a pair of outside legs, each having a notch, and the housing includes a pair of windows for receiving the notches when the locker is in the engaged position. The locker cannot be moved back to the non-engaged position until the outside legs are pulled outwardly, thereby disengaging the notches from the windows.



QUICK CONNECTOR

CROSS-REFERENCE TO PRIOR APPLICATION

[0001] This PCT patent application claims the benefit of U.S. Provisional Patent Application Serial No. 61/454,058 filed March 18, 2011, entitled “Quick Connector,” the entire disclosure of the application being considered part of the disclosure of this application and hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to quick connector assemblies, and more specifically, to quick connector assemblies which receive and lock with a male end form.

2. Description of the Prior Art

[0003] Quick connector assemblies are used in many different applications for quickly connecting and establishing fluid communication between a male end form and a hose or another tube. It is important that the male end form can quickly engage with the quick connector assembly to minimize assembly time and labor, e.g. on an assembly line. At the same time, the quick connector assembly must be very reliable and must establish a fluid-tight seal with the male end form which will not leak or otherwise disengage from the male end form. In the automotive industry, quick connector assemblies are often used for fuel lines, and failure of the quick connector assembly could pose a serious safety risk. To mitigate this risk, manufacturers have developed assemblies that cannot be latched down until the male end form is completely inserted into the quick connector.

[0004] One known type of quick connector assembly includes a housing having a female receiving portion for receiving a male end form and a stem portion for receiving a hose. A locker is movable between a non-engaged position for allowing insertion or

withdrawal of the male end form and an engaged position for engaging the bead to retain the male end form in the housing. The locker includes a ring that prevents the locker from moving to the engaged position until the male end form is inserted into the housing by a predetermined distance, whereupon the ring breaks to allow the male end form to be fully inserted into the housing. Once the male end form is fully inserted into the housing and the bead passes the locker, the locker may be moved downwardly into the engaged position to engage the bead and hold the male end form in a locked position within the housing. The locker may then be moved back to the non-engaged position for allowing withdrawal of the male end form. However, once the male end form is removed from the quick connector assembly, because the ring has been broken, there is nothing to prevent the locker from moving back into the engaged position, even when the male end form is not disposed in the housing. Thus, this type of quick connector assembly only prevents the locker from moving to the engaged position until the quick connector assembly first receives a male end form. Thereafter, there is no safety mechanism for preventing the locker from moving to the engaged position, even when the male end form is not inserted into the housing of the quick connector assembly. A user could accidentally move the locker to the engaged position without the male end form being properly locked within the housing.

[0005] There remains a significant and continuing need for an improved quick connector assembly which is both reliable and reusable.

SUMMARY OF THE INVENTION

[0006] At least one aspect of the present invention provides for a quick connector assembly for mating with a male end form including a housing having an exterior surface and an inner bore for receiving the male end form. A locker having a pair of outside legs slidably engages the exterior surface of the housing. The locker is moveable between a non-engaged position for allowing the male end form to be inserted into or withdrawn from

the inner bore and an engaged position for trapping the male end form in the inner bore. Either the outside legs of the locker or the exterior surface includes at least one notch and the other includes at least one window for receiving the notch when the locker is in the engaged position. Thus, the locker can only be moved from the engaged position to the non-engaged position only after the outside legs of the locker are pulled away from the housing to disengage the notches from the windows. This is as a safety mechanism which prevents the locker from accidentally moving out of the engaged position. Additionally, when the locker is moved into the engaged position, thereby trapping the male end form, the springing of the notches into the windows may produce an audible sound which may indicate to a person, e.g. an assembly line worker or a mechanic, that the locker is in the proper engaged position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] These and other features and advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0008] Figure 1 is a cross-sectional view of the exemplary embodiment of the quick connector assembly with the locker in a non-engaged position;

[0009] Figure 2 is a cross-sectional view of the exemplary embodiment of the quick connector assembly with the locker in an engaged position;

[0010] Figure 3 is a perspective and elevation view of the exemplary embodiment of the quick connector assembly with the locker in the engaged position; and

[0011] Figure 4 is a perspective and sectional view of the exemplary embodiment of the quick connector assembly with the locker in the engaged position.

DETAILED DESCRIPTION OF THE ENABLING EMBODIMENTS

[0012] Referring to the Figures, wherein like numerals indicate corresponding parts throughout the several views, an exemplary quick connector assembly **20** for establishing fluid communication between a male end form **22** and another hose or tube (not shown) is generally shown in Figures 1-4. The male end form **22** is preferably of metal, has a generally tubular shape with a bead **24** and extends forwardly of the bead **24** to a tube end. However, it should be appreciated that the male end form **22** could be of any desirable material and could have any desirable shape.

[0013] The exemplary quick connector assembly **20** includes a housing **26**, generally indicated, presenting a female receiving portion **28** for receiving the aforementioned male end form **22** and a stem portion **30** for receiving and establishing fluid communication with a hose or any other type of tube (not shown). In the exemplary embodiment, the housing **26** is formed of metal and is shaped through a deep drawing process. However, it should be appreciated that the housing **26** could be of any desirable type of formable material including, for example, polymeric materials or composites. The housing **26** could also be shaped through any desirable process, such as machining, injection molding, stamping, etc.

[0014] The housing **26** has an inner bore **32** which extends in an axial direction between the female receiving portion **28** and the stem portion **30** for conveying a fluid from the male end form **22** to the tube or hose (not shown) mating with the stem portion **30**. The female receiving portion **28** presents an inlet orifice **34** for receiving the male end form **22** into the inner bore **32**. The inner bore **32** of the female receiving portion **28** is twice-counterbored to present a first shoulder **36** opening up to a first section **38** having a first diameter and a second shoulder **40** opening up to a larger second section **42** having a second diameter which is larger than the first diameter. The exemplary stem portion **30** extends

through a right angle. However, it should be appreciated that the stem portion **30** could have a range of different shapes.

[0015] A pair of sealing rings **44** is disposed in the first section **38** of the inner bore **32** with one of the sealing rings **44** abutting the first shoulder **36**, and a spacer **46** is sandwiched in the first section **38** of the bore **32** between the sealing rings **44**. The sealing rings **44** are preferably O-rings which could be made of a variety of elastic materials depending on the fluid and operating temperatures of the quick connector assembly **20**. The exemplary spacer **46** is of a thermoplastic material and is produced through an injection molding process; however, the spacer **46** could be of any desirable material and could be formed through any desirable process. It should also be appreciated that the first section **38** could include any number (including zero) of sealing rings **44**.

[0016] The quick connector assembly **20** of the exemplary embodiment further includes a generally cylindrically shaped bushing **48** disposed in the second section **42** of the inner bore **32** and extending between the second shoulder **40** and the inlet orifice **34**. The bushing **48** also extends radially inwardly along the second shoulder **40** of the housing **26** to present a first spring seat **50** (discussed in further detail below) and axially into the first section **38** to abut the first sealing ring **44** for retaining the first and second sealing rings **44** and the spacer **46** in the first section **38** of the inner bore **32**. The exemplary bushing **48** is of a thermoplastic material and is produced through an injection molding process. However, it should be appreciated that the bushing **48** can be of any desirable material and could be produced using any desirable forming process.

[0017] The quick connector assembly **20** also includes a plunger **52** having a generally annular shape and slidably disposed within the bushing **48** in the second section **42** of the inner bore **32**. The plunger **52** has a front section **51** with a large diameter for receiving the bead **24** of the male end form **22** and a rear section **55** having a small diameter

for receiving the portion of the male end form **22** in front of the bead **24**. The plunger **52** also includes a radially extending portion **57** which is sized similarly to the opening of the bushing **48** for guiding movement of the plunger **52** within the bushing **48**.

[0018] The plunger **52** also has a second spring seat **53** which faces the above-discussed first spring seat **50** of the bushing **48**. A spring **54** is disposed in the second section **42** of the inner bore **32** and extending between the first spring seat **50** of the bushing **48** and the second spring seat **53** of the plunger **52** for biasing the plunger **52** toward the inlet orifice **34** and into a resting position, which is shown in Figure 1 and discussed in further detail below. The spring **54** of the exemplary embodiment is a wave spring **54** formed of stainless steel stock material; however, it should be appreciated that any other type of compression spring **54** could alternately be used. The plunger **52** is preferably of a thermoplastic material and is produced through an injection molding process. However, the plunger **52** could be of any desirable material and may be produced using any desirable forming method.

[0019] The quick connector assembly **20** also includes a locker **56** which is movable between an engaged position (Figure 1) for retaining the male end form **22** in the housing **26** and a non-engaged position (Figures 2-4) for allowing the male end form **22** to be inserted into or removed from the housing **26**. The locker **56** includes a base **58** and a pair of inside legs **60** extending downwardly into the inner bore **32** through at least one upper gap **59** in the female receiving portion **28** of the housing **26** and the bushing **48**. As best shown in Figure 3, each of the inside legs **60** has an upper section **62** and a different lower section **64**. The upper sections **62** are spaced from one another by a distance that is slightly greater than the diameter of the male end form **22**, and the lower sections **64** are spaced by a distance that is greater than the diameter of the bead **24** of the male end form **22** but less than the diameter of the plunger **52**. Thus, when the locker **56** is in the non-engaged

position shown in Figure 1, the spring **54** biases the plunger **52** against the lower sections **64** of the inside legs **60**, and this position is hereinafter referred to as a “resting position”.

Because of the larger spacing of the lower sections **64** of the inside legs **60**, when the locker **56** is in the non-engaged position, the bead **24** of the male end form **22** may be inserted into the housing **26** past the inside legs **60** of the locker **56** to the position shown in Figures 2-4.

After the bead **24** clears the inside legs **60**, the locker **56** can be moved downwardly into the engaged position of Figures 2-4. With the locker **56** in the engaged position, the bead **24** of the male end form **22** is trapped between the upper sections **62** of the inside legs **60** and the radially extending portion **57** of the plunger **52**. With that, the male end form **22** has

successfully been locked and sealed with the quick connector assembly **20**. Additionally,

the plunger **52** is biased against the bead **24** of the male end form **22**, and therefore,

movement of the male end form **22** relative to the housing **26** is restricted, even if the quick connector assembly **20** is vibrated, such as when a vehicle is travelling down a bumpy road.

The bushing **48** may also have a flange **61** extending toward the plunger **52** for contacting

the plunger **52** when the male end form **22** is locked in the quick connector assembly **20**, i.e.

the flange **61** defines how far the plunger **52** can be pushed into the inner bore **24**.

[0020] The bushing **48** further includes a pair of circumferentially spaced shelves

66, and each of the inside legs **60** of the locker **56** presents an outwardly extending lip **67**

corresponding with one of the shelves **66** and a tapered section **68** leading to the lip **67**.

When the locker **56** is initially installed onto the housing **26**, the tapered sections **68** of the

inside legs **60** engage the bushing **48** to flex the inside legs **60** inwardly. Once the lips **67**

clear the shelves **66**, then the inside legs **60** flex back outwardly to their unstressed

positions. If a user attempts to remove an already installed locker **56** from the housing **26**,

the lips **67** on the inside legs **60** will engage the shelves **66** of the bushing **48** to prevent the

locker **56** from being removed from the housing **26**. Preferably, the lip **67** and shelves **66** are strong enough to withstand a force of up to ninety (90) Newtons.

[0021] As shown in Figure 3, when the locker **56** is in the engaged position, the lower sections **64** of the inside legs **60** extend downwardly through lower gaps in the bushing **48** and the housing **26** to provide evidence that the locker **56** is in the engaged position. This is advantageous because it provides a visual cue to a person, e.g. an assembly line worker or a mechanic, that the locker **56** has reached the engaged position and the male end form **22** is properly locked and sealed with the quick connector assembly **20**.

[0022] The locker **56** also includes a pair of outside legs **70** extending downwardly from the base **58** for engaging the exterior surface of the female receiving portion **28** of the housing **26**. The outside legs **70** are spaced from one another and each has a first arc-shaped section **72** having the same curvature as the exterior surface of the housing **26**, a second arc-shaped section **74** also having the same curvature as the exterior surface of the housing **26** and a flared section **76** flaring outwardly from the second arc-shaped section **74**. When the locker **56** is installed onto the female receiving portion **28** of the housing **26** during assembly of the quick connector assembly **20**, the flared sections **76** of the outside legs **70** help guide the outside legs **70** onto the housing **26**. The locker **56** is then pushed downwardly to flex the outside legs **70** outwardly until the second arc-shaped sections **74** engage the housing **26**. At this point, the locker **56** is in the non-engaged position shown in Figure 1. To move the locker **56** downwardly into the engaged position of Figures 2-4, a downward force must be applied to the base **58** to flex the outside legs **70** outwardly until the first arc-shaped sections **72** engage the housing **26**. The shape of the outside legs **70** only allows the locker **56** to remain in either the non-engaged position or the engaged position, and thus, the locker **56** of the exemplary embodiment cannot be moved into a partially-engaged position from which the male end form **22** could accidentally detach from

the quick connector assembly **20**. This is yet another important safety feature of the quick connector assembly **20**.

[0023] As shown in Figures 3 and 4, each of the outside legs **70** of the locker **56** also includes at least one notch **78** extending radially inwardly from its first arc-shaped section **72**. In the exemplary embodiment, the notch **78** is formed by cutting a small slit in the locker **56** and bending the material of the locker **56** at the slit. This is a quick process which adds very little cost or labor to the fabrication of the locker **56**. As best shown in the sectional view of Figure 4, the housing **26** presents a window **80** for receiving and engaging the notch **78** of the locker **56** when the locker **56** is in the engaged position with the first arc-shaped sections **72** of the outside legs **70** engaging the housing **26**. The connection of the notches **78** of the locker **56** with the windows **80** of the housing **26** prevents the locker **56** from being moved out of the engaged position with only an upward force being applied on the locker **56**. Rather, outside legs **70** must be pulled apart to disengage the notch **78** from the window **80** before the locker **56** can be moved out of the engaged position. This safety mechanism provides further protection to ensure that the locker **56** does not accidentally move out of the engaged position. It should be appreciated that the notches **78** could alternately be formed on the housing **28** and the windows **80** could be formed on the outside legs **70**.

[0024] As best shown in Figure 3, when the locker **56** of the exemplary embodiment is in the engaged position, the base **58** is raised relative to the top of the housing **26**, and the inside legs **60** extend downwardly from either side of the base **58**. This arrangement presents an opening between the base **58** and the housing **26** for receiving a regular screwdriver, or a similar tool, which can be inserted into this opening and used to pry the locker **56** upwardly to the non-engaged position. Alternatively, the flared sections **76** of the outside legs **70** of the locker **56** could be pulled outwardly and upwardly to move the locker

56 from the engaged position to the non-engaged position. Thus, only a deliberate action by the user can move the locker **56** into the non-engaged position. This is still another safety feature of the quick connector assembly **20**.

[0025] As best shown in Figure 4, when the locker **56** of the exemplary embodiment is in the engaged position, the base **58** is raised relative to the housing **26**, and the inside legs **60** extend downwardly from one side of the base **58**. This arrangement presents an opening on the opposite side of the base **58** from the inside legs **60**. A regular screw-driver, or a similar tool, can be inserted into this opening and used to pry the locker **56** upwardly to the non-engaged position only after the outside legs **70** have been pulled apart to disengage the notches **78** of the outside legs **70** from the windows **80** of the housing **26**. Alternatively, the flared sections **76** of the outside legs **70** of the locker **56** can be pulled apart to separate the notches **78** from the windows **80** and pushed upwardly without the need for a tool to move the locker **56** from the engaged position to the non-engaged position.

[0026] In operation, the quick connector assembly **20** starts with the locker **56** in the non-engaged position and the plunger **52** in the resting position. As discussed above, in this position, the plunger **52** is biased forwardly by the wave spring **54** against the lower sections **64** of the inside legs **60** of the locker **56**. This contact between the inside legs **60** and the plunger **52** prevents the locker **56** from moving downwardly to the engaged position and prevents the plunger **52** from escaping the housing **26**. The male end form **22** is then urged in an axial direction into the bore **32** of the housing **26** through the receiving inlet **34**, and the front of the male end form **22** is sealed to the housing **26** through the sealing rings **44** to prevent fluid from escaping the quick connector assembly **20**. Once the male end form **22** has been inserted far enough into the bore **32**, the bead **24** of the male end form **22** will engage the plunger **52**. Further insertion of the male end form **22** will overcome the biasing force from the wave spring **54** to move the plunger **52** backwardly. Once the bead

24 clears the inside legs **60**, the locker **56** can be urged downwardly into the engaged position to trap the bead **24** of the male end form **22** between the plunger **52** and the upper sections **62** of the inside legs **60** of the locker **56**. It should be noted that it is only after the male end form **22** has been inserted sufficiently far into the bore **32** of the housing **26** for the bead **24** to clear the inside legs **60** that the locker **56** can be moved into the engaged position. This feature, when combined with the visible cue that the locker **56** has been successfully moved into the engaged position ensures that the male end form **22** can only be properly locked and sealed with the quick connector assembly **20**.

[0027] To remove the male end form **22** from the quick connector assembly **20**, a user must first disengage the notches **78** of the locker **56** from the windows **80** of the housing **26**, then he or she can either use a regular screwdriver to pry the base **58** of the locker **56** upwardly or push the outside legs **70** of the locker **56** outwardly. Once the locker **56** reaches the non-engaged position, the wave spring **54** and plunger **52** automatically ejects the male end form **22** from the bore **32** of the housing **26**. Because of the lips **67** of the inside legs **60** and the shelves **66** of the bushing **48**, the locker **56** cannot be completely removed from the housing **26**.

[0028] Obviously, many modifications and variations of the present invention are possible in light of the above teachings and may be practiced otherwise than as specifically described while within the scope of the appended claims.

CLAIMS

What is claimed is:

Claim 1. A quick connector assembly for mating with a male end form comprising:

a housing having an exterior surface and an inner bore for receiving the male end form;

a locker having a pair of outside legs slidably engaging said exterior surface of said housing and wherein said locker is movable between a non-engaged position for allowing the male end form to be inserted into and withdrawn from said inner bore and an engaged position for trapping said male end form in said inner bore; and

at least one of said outside legs of said locker or said exterior surface of said housing including a window and the other of said outside legs of said locker and said housing including a notch for engaging said window and wherein said locker is movable from said engaged position to said non-engaged position only in response to the associated outside leg being pulled away from said housing to disengage said notch from said window.

Claim 2. The quick connector assembly as set forth in claim 1 wherein each of said legs has a notch and wherein said exterior surface of said housing has a pair of windows.

Claim 3. The quick connector assembly as set forth in claim 1 wherein each of said outside legs has a first arc-shaped section having a curvature similar to said exterior surface of said housing and a second arc-shaped section having a curvature similar to said exterior surface of said housing.

Claim 4. The quick connector assembly as set forth in claim 3 wherein said notches are disposed on said first arc-shaped sections of said outside legs.

Claim 5. The quick connector assembly as set forth in claim 3 wherein said locker is in said engaged position when said first arc-shaped sections of said outside legs engage said exterior surface of said housing.

Claim 6. The quick connector assembly as set forth in claim 5 wherein said locker is in said non-engaged position when said second arc-shaped sections of said outside legs engage said exterior surface of said housing.

Claim 7. The quick connector assembly as set forth in claim 1 further including a plunger slidably disposed within said inner bore of said housing and a spring engaging said plunger and biasing said plunger in a first direction toward a resting position.

Claim 8. The quick connector assembly as set forth in claim 7 wherein said locker is movable from said non-engaged position to said engaged position only in response to the male end form being inserted into said bore of said housing to slide said plunger away from said resting position.

Claim 9. The quick connector assembly as set forth in claim 1 wherein said locker further includes a pair of inside legs.

Claim 10. The quick connector assembly as set forth in claim 9 wherein each of said inside legs has an upper section and a different lower section.

Claim 11. The quick connector assembly as set forth in claim 10 wherein said upper sections of said inside legs are spaced from one another by a distance that is slightly greater than the diameter of the male end form and wherein said lower sections of said inside legs are spaced from one another by a distance that is slightly greater than the diameter of the bead of the male end form.

Claim 12. The quick connector assembly as set forth in claim 9 further including a bushing disposed within said housing.

Claim 13. The quick connector assembly as set forth in claim 12 wherein each of said inside legs includes an outwardly extending lip and wherein said bushing includes a pair of shelves for engaging said lips to prevent said locker from being removed from said quick connector assembly.

Claim 14. The quick connector assembly as set forth in claim 13 wherein said housing includes a pair of lower gaps through which said inside legs extend when said locker is in said engaged position.

Claim 15. A method of removing a male end form from a quick connector assembly having a housing with an exterior surface and a locker with a pair of outside legs, comprising the steps of:

moving at least one of the outer legs outwardly from the housing to separate a notch on the exterior surface of the housing or the outer leg from a window on the other of the exterior surface of the housing and the outer leg; and

moving the locker from the engaged position to the non-engaged position only after the notch is separated from the window.

AMENDED CLAIMS**received by the International Bureau on 14 August 2012 (14.08.2012)**

1. A quick connector assembly for mating with a male end form comprising:
 - a housing having an exterior surface and an inner bore for receiving the male end form;
 - a locker having a pair of outside legs slidably engaging said exterior surface of said housing and wherein said locker is movable between a non-engaged position for allowing the male end form to be inserted into and withdrawn from said inner bore and an engaged position for trapping said male end form in said inner bore; and
 - at least one of said outside legs of said locker or said exterior surface of said housing including at least two windows and the other of said outside legs of said locker and said housing including at least two notches for engaging said windows and wherein said locker is movable from said engaged position to said non-engaged position only in response to said outside legs being pulled away from one another to disengage said notches from said windows.
2. The quick connector assembly as set forth in claim 1 wherein each of said legs has a notch and wherein said exterior surface of said housing has a pair of windows.
3. The quick connector assembly as set forth in claim 1 wherein each of said outside legs has a first arc-shaped section having a curvature similar to said exterior surface of said housing and a second arc-shaped section having a curvature similar to said exterior surface of said housing.

4. The quick connector assembly as set forth in claim 3 wherein said notches are disposed on said first arc-shaped sections of said outside legs.
5. The quick connector assembly as set forth in claim 3 wherein said locker is in said engaged position when said first arc-shaped sections of said outside legs engage said exterior surface of said housing.
6. The quick connector assembly as set forth in claim 5 wherein said locker is in said non-engaged position when said second arc-shaped sections of said outside legs engage said exterior surface of said housing.
7. The quick connector assembly as set forth in claim 1 further including a plunger slidably disposed within said inner bore of said housing and a spring engaging said plunger and biasing said plunger in a first direction toward a resting position.
8. The quick connector assembly as set forth in claim 7 wherein said locker is movable from said non-engaged position to said engaged position only in response to the male end form being inserted into said bore of said housing to slide said plunger away from said resting position.
9. The quick connector assembly as set forth in claim 1 wherein said locker further includes a pair of inside legs.

10. The quick connector assembly as set forth in claim 9 wherein each of said inside legs has an upper section and a different lower section.

11. The quick connector assembly as set forth in claim 10 wherein said upper sections of said inside legs are spaced from one another by a distance that is slightly greater than the diameter of the male end form and wherein said lower sections of said inside legs are spaced from one another by a distance that is slightly greater than the diameter of the bead of the male end form.

12. The quick connector assembly as set forth in claim 9 further including a bushing disposed within said housing.

13. The quick connector assembly as set forth in claim 12 wherein each of said inside legs includes an outwardly extending lip and wherein said bushing includes a pair of shelves for engaging said lips to prevent said locker from being removed from said quick connector assembly.

14. The quick connector assembly as set forth in claim 13 wherein said housing includes a pair of lower gaps through which said inside legs extend when said locker is in said engaged position.

15. A method of removing a male end form from a quick connector assembly having a housing with an exterior surface and a locker with a pair of outside legs, comprising

the steps of:

moving at least one of the outer legs outwardly and away from one another separate at least two notches on the exterior surface of the housing or the outer legs from at least two windows on the other of the exterior surface of the housing and the outer legs; and

moving the locker from the engaged position to the non-engaged position only after the notches are separated from the windows.

STATEMENT UNDER ARTICLE 19 (1)

Applicant has amended Claims 1 and 15.

Applicant respectfully submits that the amendments made herein have no impact on the description or drawings.

It is respectfully submitted that the claimed invention, as amended, is novel and involves an inventive step over the documents cited in the International Search Report. Further and favorable consideration of the subject application is hereby requested.

FIG. 1

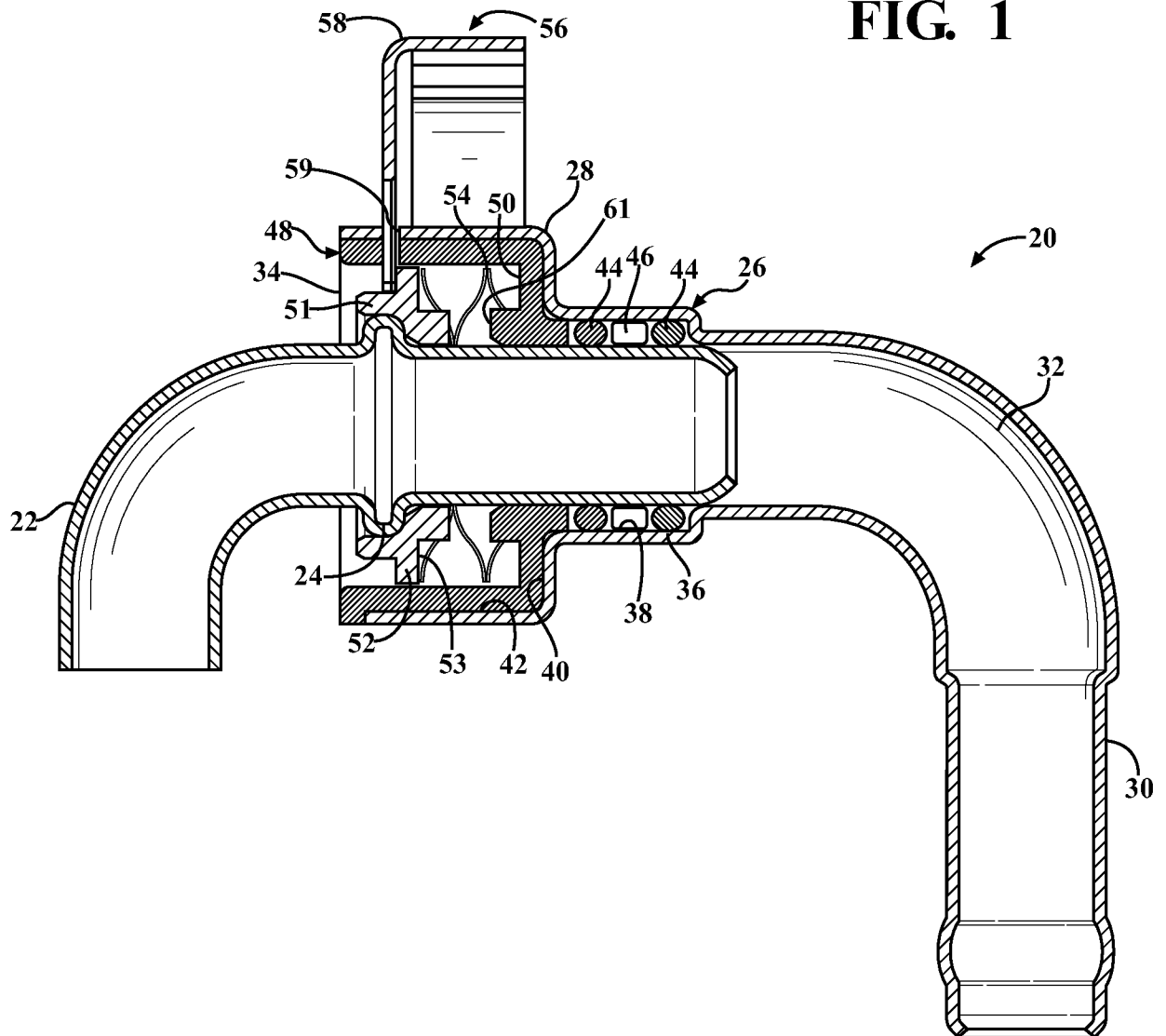


FIG. 2

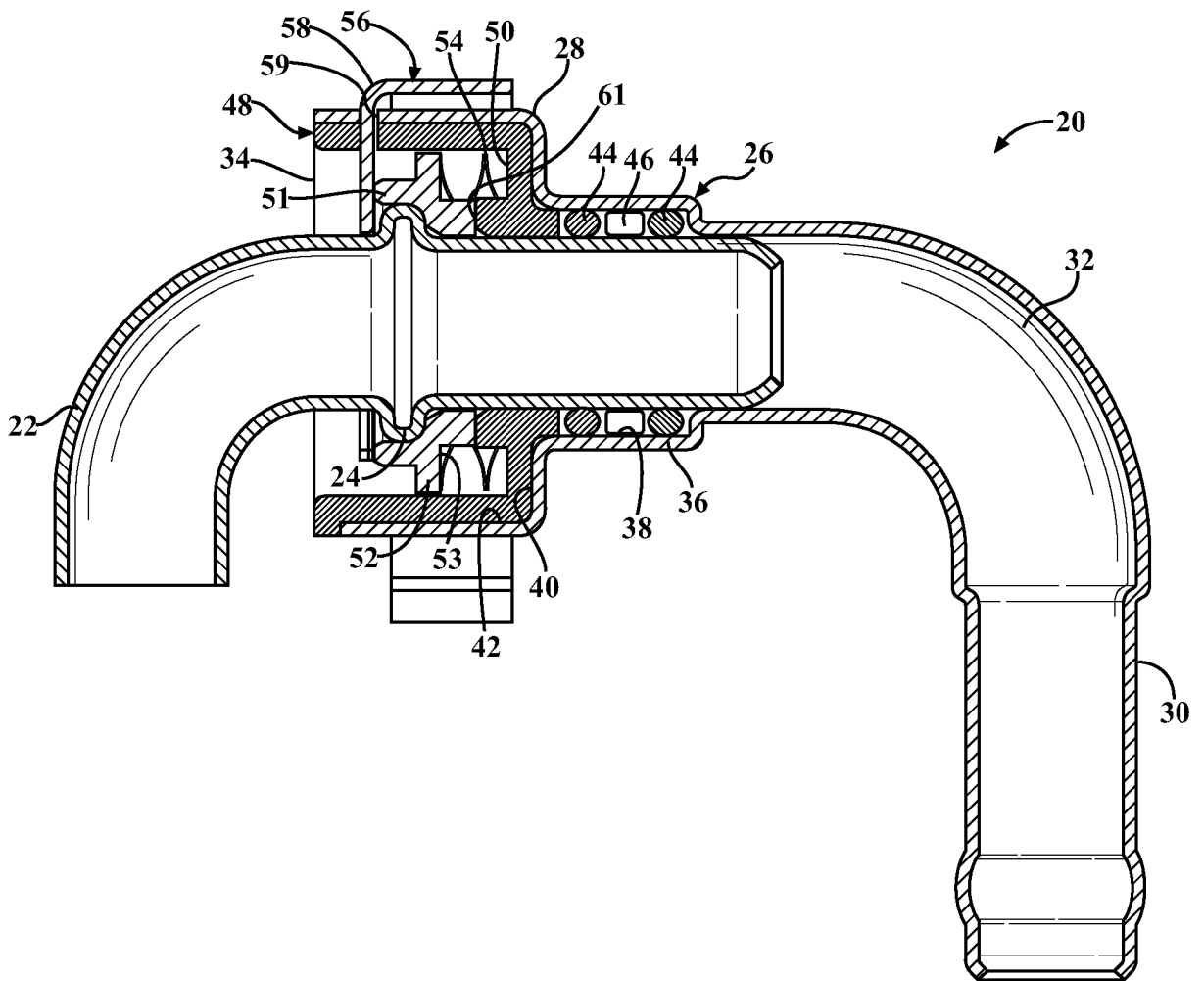


FIG. 3

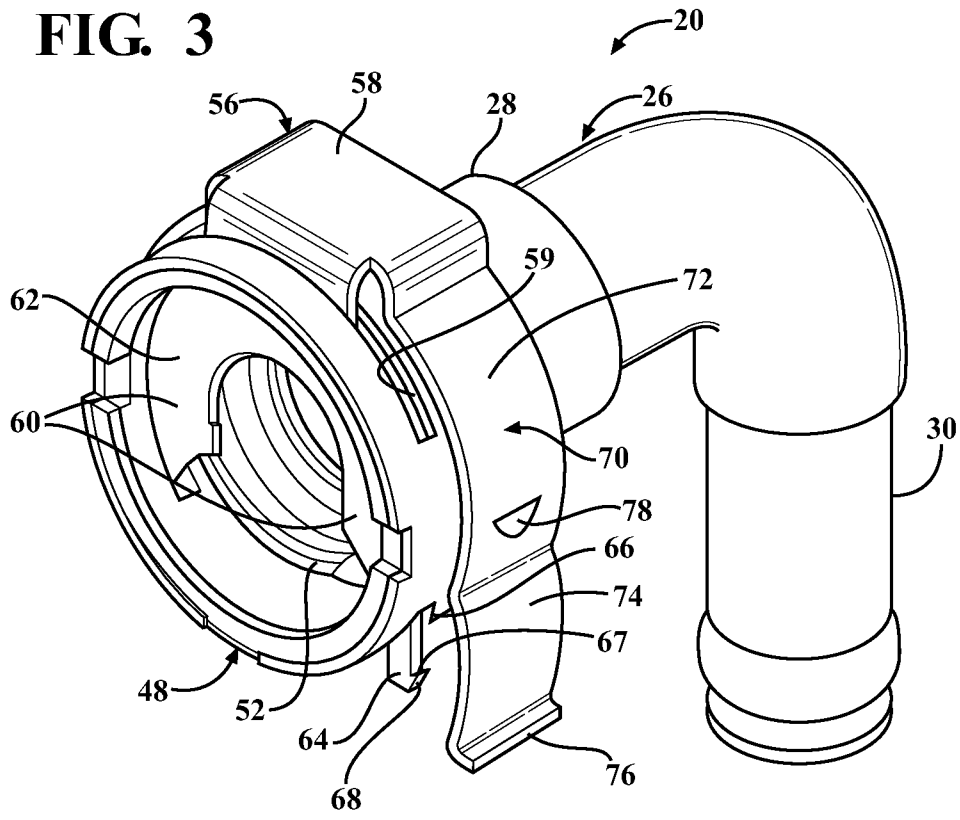
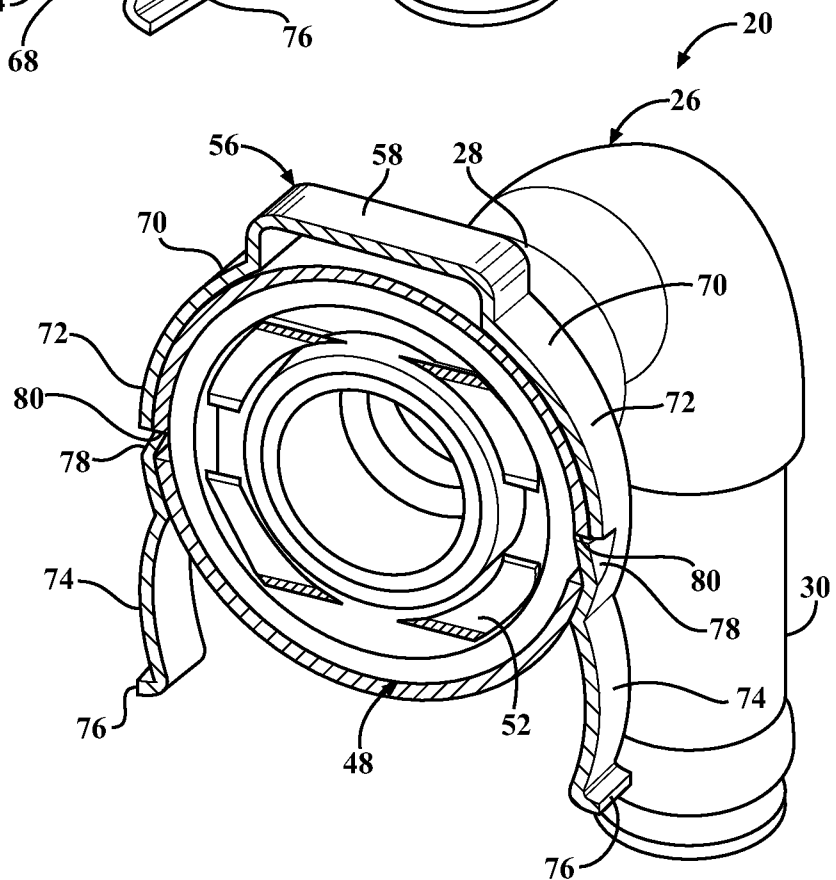


FIG. 4



INTERNATIONAL SEARCH REPORT

PCT/US2012/029405

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) - F16L 37/12 (2012.01)
 USPC - 285/319
 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)
 IPC(8) - F16L 37/00, 37/098, 37/12 (2012.01)
 USPC - 285/37, 39, 317, 319

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)
 PatBase, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/0261582 A1 (GAUDIN) 22 October 2009 (22.10.2009) entire document	15
Y		1-14
Y	US 4,471,978 A (KRAMER) 18 September 1984 (18.09.1984) entire document	1-14
Y	US 4,311,328 A (TRUCHET) 19 January 1982 (19.01.1982) entire document	7-8
Y	US 2002/0117853 A1 (BARTHOLOMEW) 29 August 2002 (29.08.2002) entire document	9-14

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance	“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
“E” earlier application or patent but published on or after the international filing date	“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
“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)	“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
“O” document referring to an oral disclosure, use, exhibition or other means	“&” document member of the same patent family
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 01 June 2012	Date of mailing of the international search report 14 JUN 2012
---	--

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
---	---