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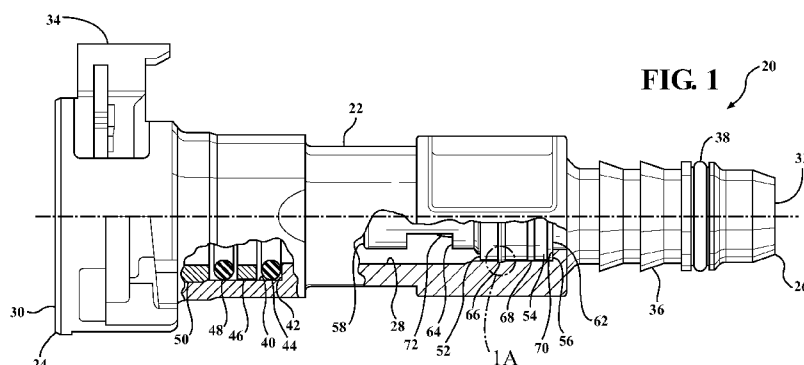
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(54) Title: CONNECTOR ASSEMBLY WITH A CHECK VALVE



(57) Abstract: A connector assembly (20) includes a coupling housing (22) extending between a first coupling end (24) and a second coupling end (26), and a fluid quick connector (34) is disposed about one of the coupling ends (24, 26). The coupling housing (22) defines a coupling passageway (28) extending between the coupling ends (24, 26) and a check valve (52) is disposed within the coupling passageway (28). The check valve (52) includes a locking barb (66) extending outwardly from a check valve housing (54) to establish a compression fit between the check valve housing (54) and the coupling housing (22) when the check valve (52) is disposed within the coupling passageway (28). The check valve (52) also includes a rib (68) extending outwardly from the check valve housing (54) and disposed in abutting relationship with the coupling housing (22) to align the check valve (52) within the coupling passageway (28).



CONNECTOR ASSEMBLY WITH A CHECK VALVE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This PCT Patent Application claims the benefit of U.S. provisional application serial number 61/625,329 filed April 17, 2012, 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] A connector assembly capable of easy assembly and installation wherein the connector assembly establishes fluid communication between a first fluid line and a second fluid line.

2. Description of the Prior Art

[0003] The connector assemblies to which the subject invention pertains are assemblies which include a coupling housing extending along a coupling axis between a first coupling end and a second coupling end with a fluid quick connector disposed about one of the coupling ends for securing a fluid line to the coupling housing. The coupling housing defines a coupling passageway extending along the coupling axis between the coupling ends to establishing fluid communication between the first and second fluid lines.

[0004] Although the prior art assemblies are able to establish fluid communication between a first fluid line and a second fluid line, there remains a need for a quick connector assembly which provides for improved control of the fluid communication between the fluid lines.

SUMMARY OF THE INVENTION

[0005] The invention provides for a check valve disposed within the coupling passageway of the connector assembly between the first coupling end and the second coupling end. One of the main advantages of the subject invention is the reduction or elimination of backflow into one of the first and second fluid lines when fluid flow from the respective fluid line ceases. The check valve also prevents fluid pressure spikes from reaching a fluid delivery system which delivers fluid to the connector assembly from the respective fluid line. The elimination of the pressure spikes helps to prevent damage to the fluid delivery system. The incorporation of a check valve into a connector assembly having a fluid quick connector disposed about one of the coupling ends also allows a check valve to be quickly and easily placed in communication with the fluid lines, leading to reduced assembly and manufacturing costs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Other 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:

[0007] Figure 1 is a partial cross-sectional view of a linear connector assembly illustrating a check valve disposed within a coupling passageway of the connector assembly;

[0008] Figure 1A is a magnified view of a portion of Figure 1;

[0009] Figure 2 is a perspective view of the linear connector assembly shown in Figure 1;

[0010] Figure 3 is an end view of the linear connector assembly shown in Figures 1 and 2;

[0011] Figure 4 is a partial cross-sectional view of an l-shaped connector assembly illustrating the check valve disposed within the coupling passageway of the connector assembly;

[0012] Figure 4A is a magnified view of a portion of Figure 4;

[0013] Figure 5 is a perspective view of the l-shaped connector assembly shown in Figure 4;

[0014] Figure 6 is an end view of the l-shaped connector assembly shown in Figures 4 and 5;

[0015] Figure 7 is a partial cross-sectional view of a linear connector assembly illustrating a reverse arrangement of the check valve arrangement shown in Figure 1;

[0016] Figure 7A is a magnified view of a portion of Figure 7; and

[0017] Figure 8 is a cross-sectional view of the check valve shown in Figures 1, 4 and 7.

DETAILED DESCRIPTION OF THE ENABLING EMBODIMENTS

[0018] Referring to the Figures, wherein like numerals indicate corresponding parts throughout the several views, a connector assembly **20** for establishing fluid communication between a first fluid line (not shown) and a second fluid line (not shown) is generally illustrated in Figures 1-7. The connector assembly **20** includes a coupling housing **22** extending along a coupling axis **A** between a first coupling end **24** and a second coupling end **26**. The coupling housing **22** defines a coupling passageway **28** extending along the coupling axis **A** between the coupling ends **24, 26**. The coupling passageway **28** has a first orifice **30** disposed adjacent the first coupling end **24** for receiving the first fluid line to dispose the first fluid line in the coupling passageway **28** and a second orifice **32** disposed adjacent the second end **26** for establishing communication with the second fluid line to move a fluid through the connector assembly **20**. Although the coupling ends **24, 26** are

illustrated as male and female type connections, the connector assembly **20** could be formed using any type of connection means for coupling a fluid line to the coupling ends **24, 26**.

[0019] The first coupling end **24** of the coupling housing **22** includes a fluid quick connector **34** being generally U-shaped and movable between an extended position and a pushed-in position for securing the first fluid line in the received position. The preferred embodiment of the quick connector **34** is the P2L[®] Quick Connector design as disclosed in U.S. Patent 7,445,249 assigned to A. Raymond & CIE. However, any variation of a quick connector can be substituted for the preferred embodiment without departing from the scope of the invention. The second coupling end **26** of the coupling housing **22** includes a barbed stem **36** for retaining the second fluid line about the second orifice **32**. The barbed stem **36** includes an o-ring **38** for sealing fluid communication between the barbed stem **36** and the second fluid line. As best shown in Figures 1-2 and 7, the barbed stem **36** is disposed along the coupling axis **A** to define a linear-shaped connector assembly **20**. However, as best shown in Figures 4-6, the barbed stem **36** can also be disposed transverse to the coupling axis **A** to define an l-shaped connector assembly **20**. Although only a linear and l-shaped connector assembly **20** are shown in the Figures, the barbed stem **36** can have a variety of other shapes to accommodate receiving and retaining the second fluid line. As a result, the connector assembly **20** can also have a variety of other shapes without departing from the scope of the subject invention.

[0020] As best shown in Figures 1, 4 and 7, the coupling passageway **22** is counterbored **40** to define a first shoulder **42** extending radially outwardly from the coupling passageway **28**. A first sealing ring **44** is disposed in the counterbore **40** and in abutting relationship with the first shoulder **42**. An intermediate ring **46** and a second sealing ring **48** are serially disposed in the counterbore **40** between the first sealing ring **44** and the receiving orifice **34** for collectively establishing sealed relationship with the first

fluid line in the received position. A housing washer **50** is disposed in the counterbore **40** next adjacent the second sealing ring **48** for securing the rings **44, 46, 48** in the counterbore **40**.

[0021] As best shown in Figures 1, 4 and 7, the connector assembly **20** includes a check valve **52** disposed within the coupling passageway **28** and aligned on the coupling axis **A** between the first coupling end **24** and the second coupling end **26**. As best shown in Figure 8, the check valve **52** includes a check valve housing **54** which extends from a first check valve end **56** to a second check valve end **58** and defines a check valve passageway **60** extending therebetween. The check valve housing **54** defines a check valve inlet **62** disposed about the first check valve end **54** and defines a check valve outlet **64** disposed between the first and second check valve ends **56, 58** for allowing fluid to move through the check valve **52**. As previously mentioned, the connector assembly **20** establishes fluid communication between a first fluid line and a second fluid line, and thus during operation, fluid moves through the connector assembly **20** along the coupling passageway **28** and through the check valve **52** along the check valve passageway **60** from the check valve inlet **62** towards the check valve outlet **64**.

[0022] When the check valve **52** is disposed within the coupling passageway **28**, the check valve housing **54** establishes a compression fit with the coupling housing **22** to secure the check valve **52** within the connector assembly **20** and prevent movement of the check valve **52** during operation. As best shown in Figures 1A, 4A, and 7A, in the preferred embodiment the check valve **52** includes a locking barb **66** extending outwardly from the check valve housing **54** and flared towards the second check valve end **54** to establish the compression fit. Although not expressly illustrated, the locking barb **66** could also be flared towards the first check valve end **54** to accommodate a different arrangement of the check valve **52** within the coupling passageway **28**. In operation, when the check valve **52** is

inserted into the coupling passageway **28**, the locking barb **66** displaces or pushes away the material which defines the coupling passageway **28** to dig the locking barb **66** into the coupling housing **22** and secure the check valve **52** within the connector assembly **20**. The locking barb **66** keeps the check valve **52** from shifting within the coupling passageway **28** along the coupling axis **A**.

[0023] As best shown in Figures 1, 4, 7, and 8, the check valve **52** also includes a rib **68** extending outwardly from the check valve housing **54** and disposed adjacent to the locking barb **66**. The rib **68** engages or is disposed in abutting relationship with the coupling housing **22** to maintain alignment of the check valve **52** about the coupling axis **A**. Put another way, the engagement of the rib **68** with the coupling housing **22** keeps the check valve **52** from shifting up or down within the coupling passageway **28** relative to the coupling axis **A**.

[0024] Although the check valve **52** is illustrated as having only one locking barb **66** and one rib **68**, the check valve **52** could also be formed using any number or combination of locking bars **66** and/or ribs **68** to establish the compression fit of the check valve **52** within the coupling passageway **28** and keep the check valve **52** along about the coupling axis **A**. Further, although the check valve housing **54** is described and shown as establishing a compression fit with the coupling housing **22**, the check valve housing **54** could also be disposed in mechanical interlocking relationship with the coupling housing **22** to secure the check valve **52** within the connector assembly **20** and prevent movement of the check valve **52** during operation.

[0025] As best shown in Figures 1, 4, and 7, the coupling housing **22** defines a second shoulder **70** disposed adjacent the second coupling end **26** and which extends radially outwardly from the coupling passageway **28**, and one of the first check valve end **56** or the second check valve end **58** is disposed in abutting relationship with the second

shoulder **70** when the check valve housing **54** and the coupling housing **22** are disposed in interlocking relationship. As best shown in Figures 1 and 4, the first check valve end **56** is disposed in abutting relationship with the second shoulder **70** in one arrangement of the check valve **52** within the coupling passageway **28**. As best shown in Figure 7, the second check valve end **58** is disposed in abutting relationship with the second shoulder **70** in a reverse arrangement of the check valve **52** within the coupling passageway **28**. The second shoulder **70** acts to prevent movement of the check valve **52** during operation, particularly when the fluid flows through the connector assembly **20** from the first coupling end **24** to the second coupling end **26**. As also best shown in Figure 1, 4, and 7, at least a portion of the check valve housing **54** is disposed in abutting relationship with the coupling housing **22** along the coupling passageway **28** to establish sealed fluid communication between the coupling passageway **28** and the check valve passageway **60**. Put another way, the abutting relationship of the check valve housing **54** and the coupling housing **22** forces the fluid passing through the coupling passageway **28** to pass through the check valve passageway **60**.

[0026] In the preferred embodiment, the check valve **52** is a ball check valve. Thus, as best shown in Figure 8, the preferred embodiment of the check valve **52** also includes a ball **72** disposed within the check valve passageway **60** and a spring **74** is disposed between the second check valve end **58** and the ball **72** for urging the ball **72** towards the first check valve end **56** to block the check valve outlet **64** and establish a seal of the check valve **52**. In the preferred embodiment, a check valve washer **76** is disposed adjacent the second check valve end **58** to secure the spring **74** between the ball **72** and the second check valve end **58**. During operation, as fluid enters the coupling passageway **28** of the connector assembly **20** from one of the first and second fluid lines, the fluid will fill and thus pressurize the coupling passageway **28**. This fluid and fluid pressure will also fill the check

valve passageway **60** and act upon the ball **72** of the check valve **52** such that the check valve **52** will open and allow fluid to pass along the check valve passageway **60**. Put another way, the fluid pressure within the coupling passageway **28** and the check valve passageway **60** will urge the ball **72** towards the second check valve end **58** to compress the spring **74** and allow fluid to pass serially through the check valve inlet **62**, the check valve passageway **60** and the check valve outlet **64**. When entry of fluid from one of the first and second fluid lines ceases, the fluid pressure within the coupling passageway **28** will also correspondingly reduce and thus cause the spring **74** to urge the ball **72** back toward the first check valve end **56** to block the check valve outlet **64** and seal the check valve **52**.

Accordingly, the check valve **52** reduces or eliminates backflow of the fluid when flow ceases, and also prevents pressure spikes within the fluid lines. Since one of the first and second fluid lines is connected to a fluid delivery system (not shown), the reduction or prevention of pressure spikes in the fluid lines also effectively prevents the pressure spikes from reaching the fluid delivery system and thus prevents damage to the fluid delivery system.

[0027] As noted above, the entry of fluid into the connector assembly **20** occurs from either the first or the second fluid lines, and thus fluid enters the connector assembly **20** either at the first coupling end **24** or the second coupling end **26** respectively. If entry of fluid into the connector assembly **20** is to occur at the first coupling end **24**, the check valve **52** is disposed in the coupling passageway **28** such that the check valve inlet **62** is disposed adjacent the first coupling end **24** of the connector assembly **20** and the second check valve end **58** is disposed adjacent the second coupling end **26** of the connector assembly **20**. This arrangement of the check valve **52** is best shown in Figure 7. If entry of fluid into the connector assembly **20** is to occur at the second coupling end **28**, the check valve **52** is disposed in the coupling passageway **28** such that the check valve inlet **62** is disposed

adjacent the second coupling end **28** of the connector assembly **20** and the second check valve end **58** is disposed adjacent the first coupling end **26** of the connector assembly **20**.

This arrangement of the check valve **52** is best shown in Figures 1 and 4.

[0028] The disposition of the check valve **52** in the coupling passageway **28** of the connector assembly **20** is effective at maintaining and controlling fluid pressure within the coupling passageway **28** between the first and second fluid lines, and thus provides for improved control of the fluid communication between the first fluid line and the second line. In addition, the incorporation of the check valve **52** into the connector assembly **20** reduces assembly time and manufacturing costs. For example, the incorporation of a check valve **52** into a connector assembly **20** which has a fluid quick connector **34** disposed about one of the coupling ends **24, 26** facilitates the quick and easy placement of the check valve **52** in communication with the fluid lines. Further, the incorporation of the check valve **52** into the connector assembly **20** eliminates the need for a manual installation of a check valve into one of the first and second fluid lines. Additionally, since additional parts or assembly operations are not required to place a check valve **52** in communication with the fluid lines, over costs are reduced for the customer.

[0029] 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. These antecedent recitations should be interpreted to cover any combination in which the inventive novelty exercises its utility.

CLAIMS

What is claimed is:

Claim 1. A connector assembly for establishing fluid communication between a first fluid line and a second fluid line, said assembly comprising:

a coupling housing extending between a first coupling end and a second coupling end;

a fluid quick connector disposed about one of said coupling ends;

said coupling housing defining a coupling passageway extending between said coupling ends; and

a check valve disposed within said coupling passageway for controlling fluid communication along said coupling passageway between said coupling ends.

Claim 2. A quick connector assembly as set forth in claim 1 wherein said check valve includes a check valve housing extending from a first check valve end to a second check valve end and said check valve includes a locking barb extending outwardly from said check valve housing to establish a compression fit between said check valve housing and said coupling housing.

Claim 3. A quick connector assembly as set forth in claim 2 wherein said locking barb is flared towards said second check valve end.

Claim 4. A quick connector assembly as set forth in claim 2 wherein said locking barb is flared towards said first check valve end.

Claim 5. A quick connector assembly as set forth in claim 2 wherein said check valve includes a rib extending outwardly from said check valve housing and disposed in abutting relationship with said coupling housing.

Claim 6. A quick connector assembly as set forth in claim 1 wherein said check valve is a ball check valve.

Claim 7. A quick connector assembly as set forth in claim 2 wherein first check valve end of said check valve housing defines a check valve inlet.

Claim 8. A quick connector assembly as set forth in claim 7 wherein said first check valve end of said check valve is disposed adjacent said first coupling end of said connector assembly.

Claim 9. A quick connector assembly as set forth in claim 7 wherein said first check valve end of said check valve is disposed adjacent said second coupling end of said connector assembly.

Claim 10. A quick connector assembly as set forth in claim 2 wherein said coupling housing defines a shoulder disposed adjacent said second coupling end and one of said first check valve end or said second check valve end of said check valve is disposed in abutting relationship with said shoulder.

Claim 11. A quick connector assembly as set forth in claim 1 further comprising a barbed stem disposed about said other of said coupling ends.

Claim 12. A quick connector assembly as set forth in claim 11 wherein said coupling housing and said barbed stem extend along a coupling axis.

Claim 13. A quick connector assembly as set forth in claim 11 wherein said coupling housing extends along a coupling axis and said barbed stem is disposed transverse to said coupling axis.

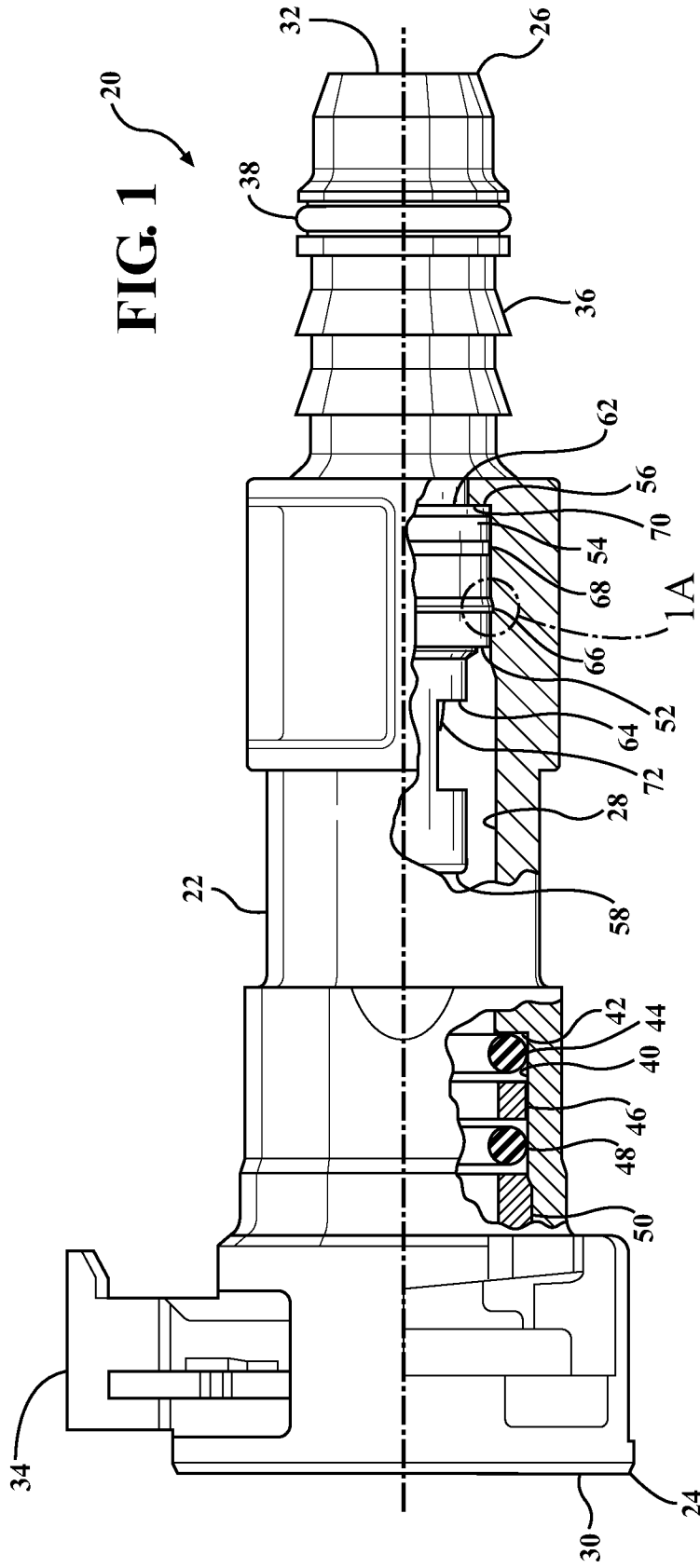


FIG. 1

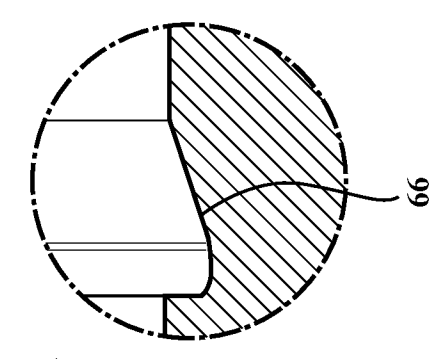


FIG. 1A

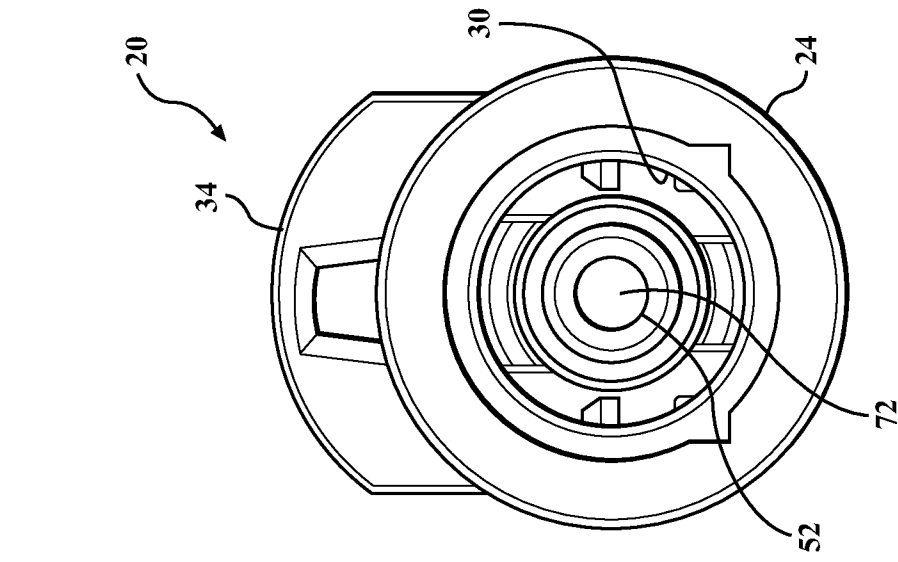


FIG. 3

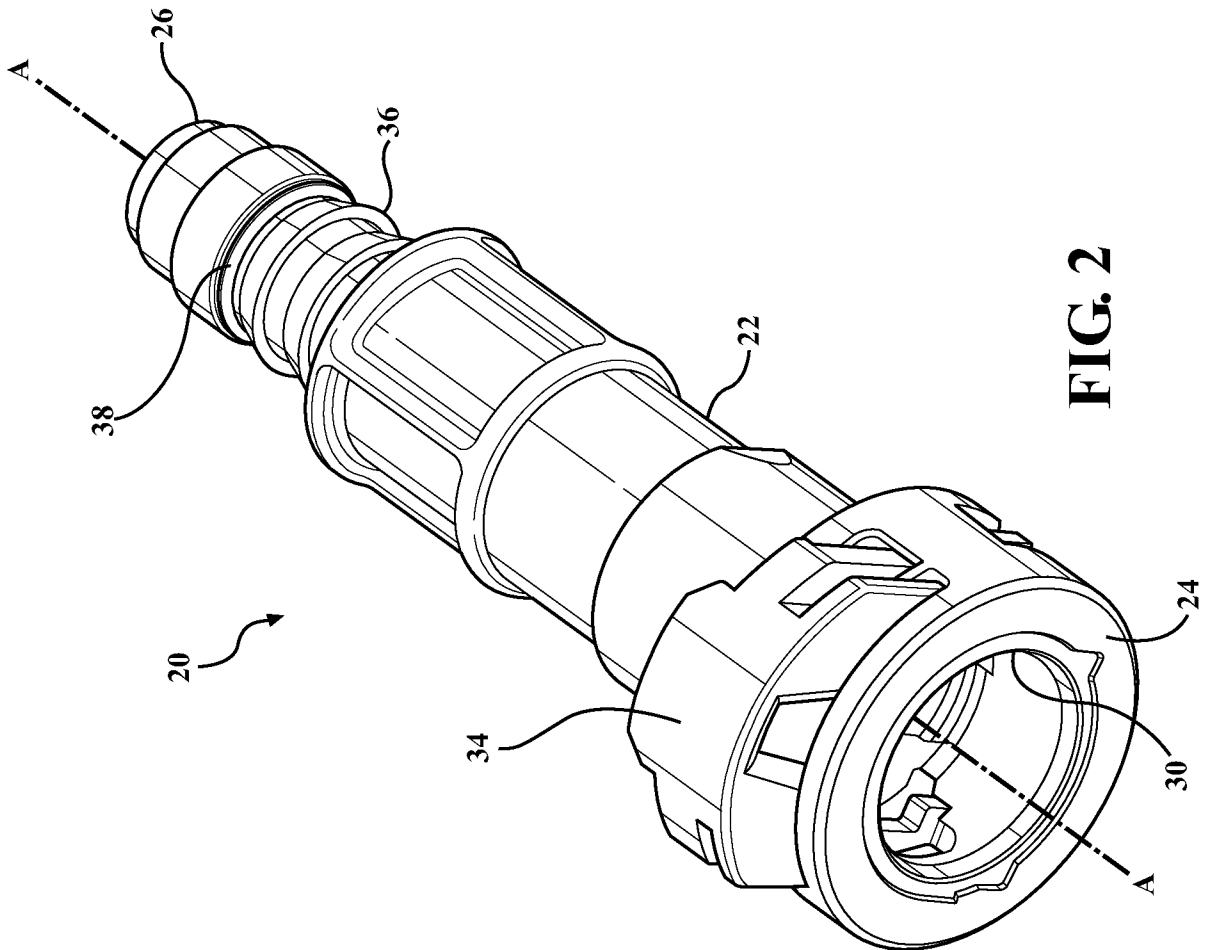


FIG. 2

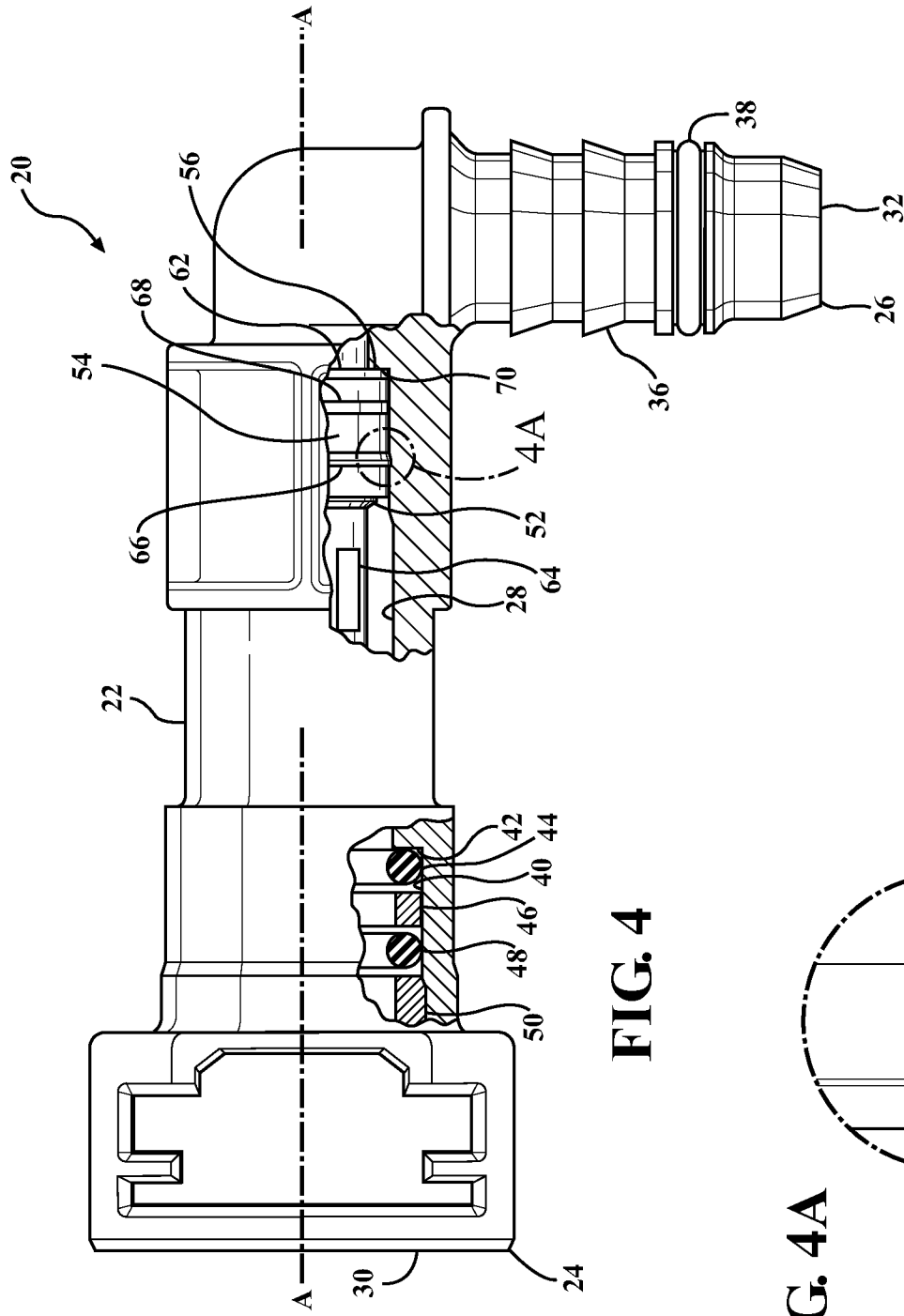


FIG. 4

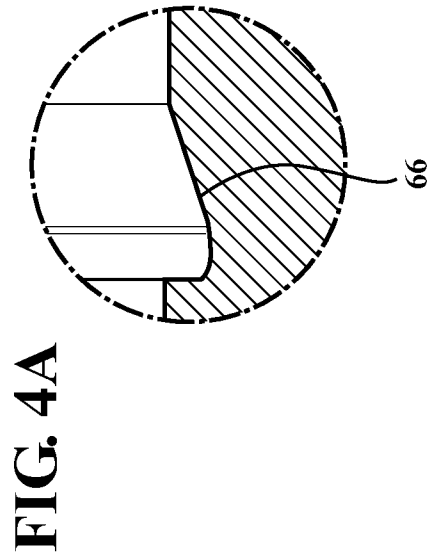


FIG. 4A

FIG. 5

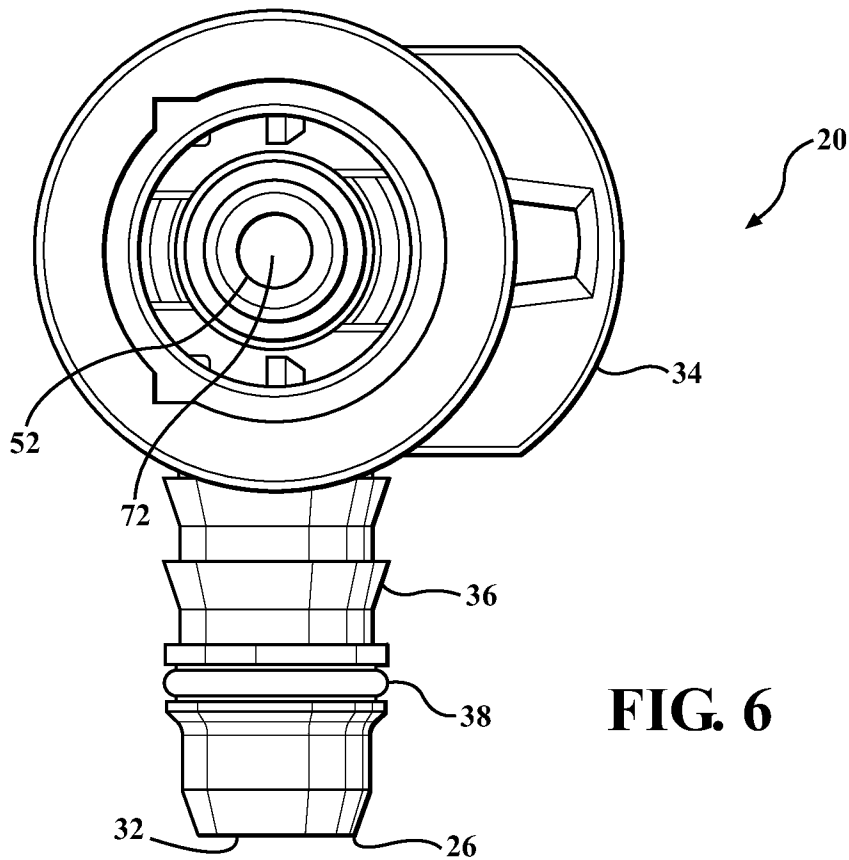
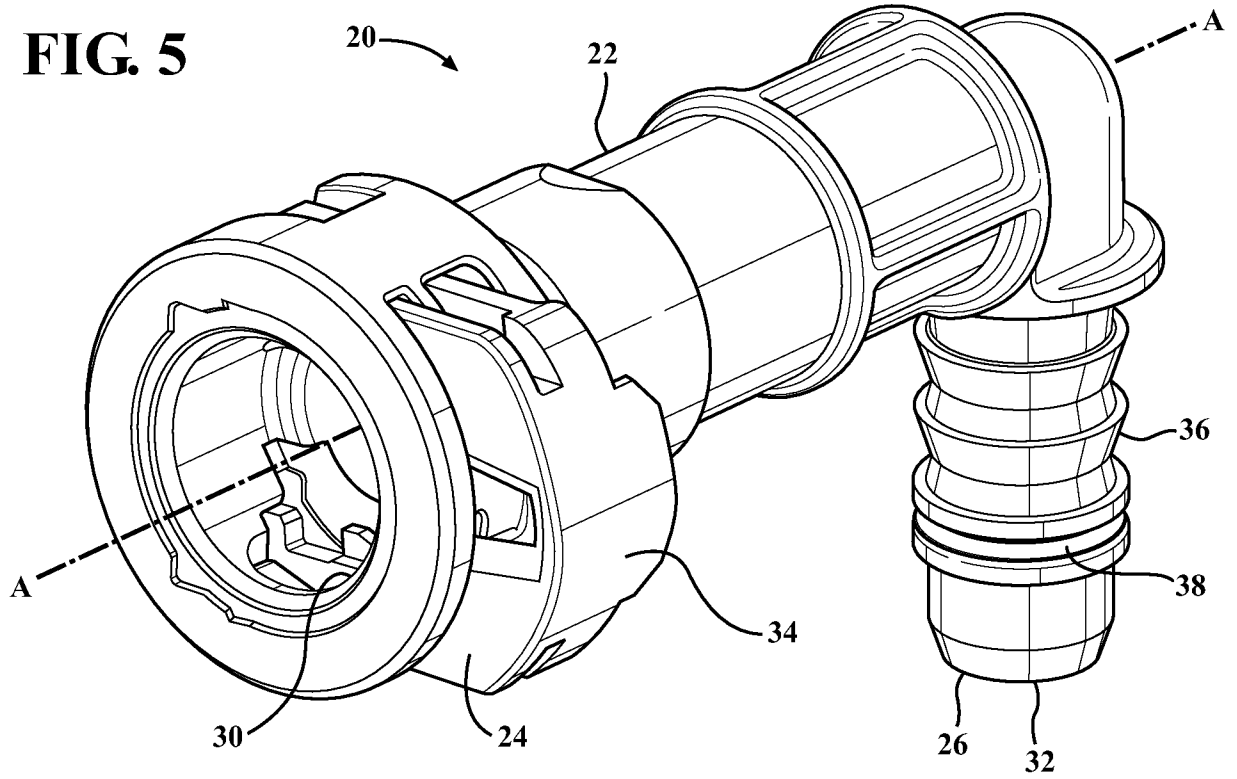


FIG. 6

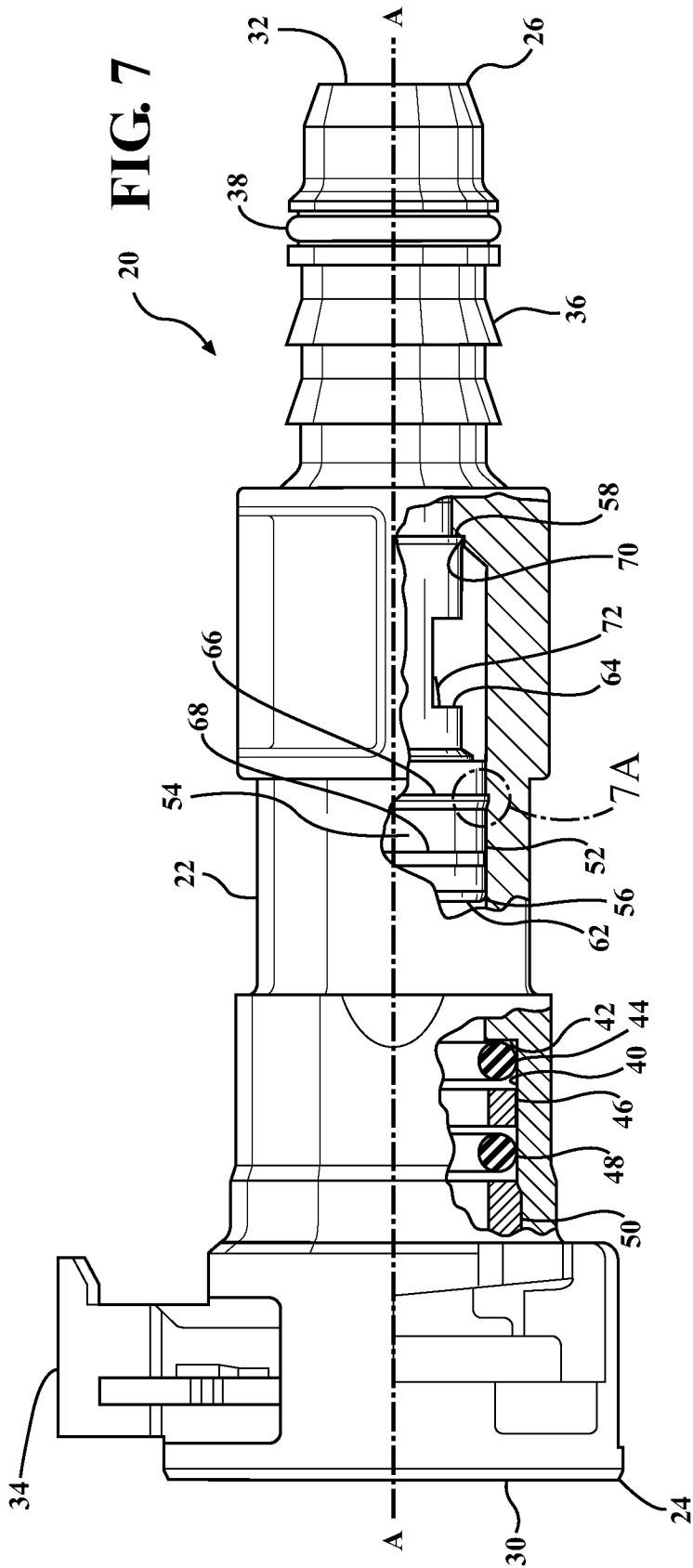


FIG. 7

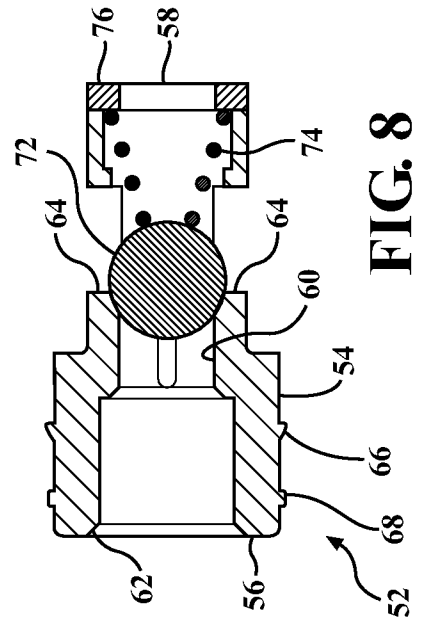
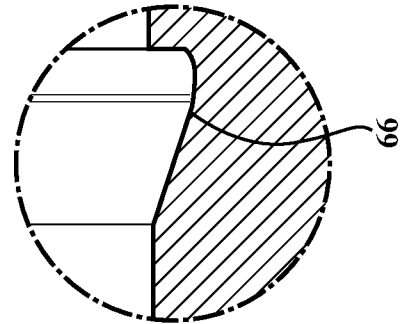


FIG. 8

FIG. 7A



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/036058

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F16L 37/28 (2013.01)

USPC - 137/511

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) - F16K 15/00, 15/02, 15/04; F16L 37/00, 37/28, 37/30, 37/32, 37/33, 37/34, 37/35, 37/40 (2013.01)

USPC - 137/511, 515, 519.5, 599.18; 251/149, 149.1, 149.6; 285/305

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC - F16K 15/00, 15/02, 15/025; F16L 37/28, 37/33, 37/40, 37/407 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Patbase, Google Patent, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2006/0196557 A1 (NIKI et al) 07 September 2006 (07.09.2006) entire document	1, 11, 12 ----- 2-10, 13
Y	US 7,931,253 B1 (PACZONAY) 26 April 2011 (26.04.2011) entire document	2-5, 7-10
Y	US 2008/0145250 A1 (IWAMASA) 19 June 2008 (19.06.2008) entire document	5
Y	US 2002/0078998 A1 (SZABO et al) 27 June 2002 (27.06.2002) entire document	6, 13
Y	US 5,277,402 A (SZABO) 11 January 1994 (11.01.1994) entire document	7-9

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Date of the actual completion of the international search

26 June 2013

Date of mailing of the international search report

19 JUL 2013

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