US006547284B2

(12) **United States Patent**
Rose et al.

(10) **Patent No.: US 6,547,284 B2**
(45) **Date of Patent: Apr. 15, 2003**

(54) **AUTOMATIC OR MANUAL QUICK RELEASE LATCH**

(75) Inventors: **Joseph Lorney Rose**, Pembroke (CA); **Anthony Joseph Francis Corriveau**, Pembroke (CA); **Kirk Alan Dobbs**, Pembroke (CA)

(73) Assignee: **Med-Eng Systems Inc.**, Ottawa (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/942,687**

(22) Filed: **Aug. 31, 2001**

(65) **Prior Publication Data**

US 2002/0024216 A1 Feb. 28, 2002

Related U.S. Application Data

(62) Division of application No. 09/288,285, filed on Apr. 8, 1999.

(51) **Int. Cl.**[7] **F16L 37/00**

(52) **U.S. Cl.** **285/1**; 285/308; 285/310; 285/124.1

(58) **Field of Search** 285/1, 2, 3, 4, 285/308, 39, 310, 311, 124.1

(56) **References Cited**

U.S. PATENT DOCUMENTS

464,386	A	* 12/1891	Patterson	285/308
1,150,420	A	* 8/1915	Davis	285/308
2,099,335	A	* 11/1937	Hansen	285/308
2,538,259	A	1/1951	Merriman	
2,628,850	A	12/1953	Summerville	
2,722,399	A	* 11/1955	Oetiker	285/308
2,930,633	A	3/1960	Ethington	
3,132,667	A	* 5/1964	Baker et al.	285/308
3,279,827	A	10/1966	Brown	
3,527,480	A	9/1970	Larson	
3,608,582	A	9/1971	Lambert	
3,719,194	A	3/1973	Anderson et al.	
3,976,099	A	8/1976	Russell	
4,023,584	A	5/1977	Rogers et al.	

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

CA	1019363	10/1977
CA	1216701	1/1987

OTHER PUBLICATIONS

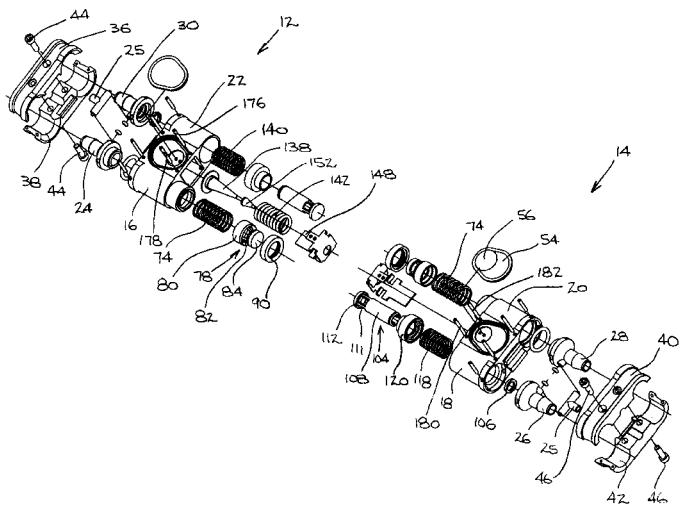
Product Literature/Drawing: HTE 8473 1/4 Twin Self Seal Coupling Socket Assembly.
Product Literature/Drawing: HTE 8145 1/4 Self Seal Coupling Nipple Assembly.
Product Literature/Drawing: Snap– Tite 9731 Coupling Assembling; No Spill.

Primary Examiner—Eric K. Nicholson
(74) *Attorney, Agent, or Firm*—Clark & Brody

(57) **ABSTRACT**

There is provided a new and useful fluid conduit coupling apparatus which allows quick connection and disconnection with substantially no introduction of ambient fluids or air into the process fluid. In one aspect of the invention there is provided a quick connect/disconnect coupling for a fluid conduit, the coupling comprising assemblies for attaching to the ends of a conduit to be connected and for subsequently mating together, each assembly comprising a normally closed channel; means for expelling fluid from between the assemblies when the assemblies are to be connected to each other; means for preventing fluid from entering the assemblies from outside when the assemblies are being connected; means for opening the normally closed channels, means operable by the connecting of the assemblies to each other; latch means for securing the assemblies together, the latch means disconnectable by means of a hand operated unlatching means or by the application of a predetermined tensile force.

12 Claims, 6 Drawing Sheets



U.S. PATENT DOCUMENTS

4,086,939	A		5/1978	Wilcox et al.	
4,105,046	A		8/1978	Sturgis	
4,166,476	A		9/1978	Porter	
4,195,865	A	*	4/1980	Martin	285/308
4,413,846	A	*	11/1983	Oetiker	285/308
4,436,125	A		3/1984	Blenkush	
4,541,457	A		9/1985	Blenkush	
4,602,658	A		7/1986	Luther	
4,646,773	A		3/1987	Klop et al.	
4,674,525	A		6/1987	Richards et al.	
4,753,268	A		6/1988	Palau	
4,763,683	A		8/1988	Carmack	
4,794,937	A		1/1989	Hofmann	
4,854,338	A		8/1989	Grantham	
4,863,201	A	*	9/1989	Carstens	285/308
4,884,591	A		12/1989	Webster	
4,911,655	A		3/1990	Pinyan	
4,917,149	A		4/1990	Grantham	
4,949,745	A		8/1990	McKeon	
4,971,096	A		11/1990	Perrine	
4,982,736	A		1/1991	Schneider	
4,991,626	A		2/1991	Grantham	
5,033,777	A		7/1991	Blenkush	
5,052,725	A		10/1991	Meyer	
5,092,364	A		3/1992	Mullins	
5,104,158	A		4/1992	Meyer	
5,126,041	A		6/1992	Weber	
5,176,162	A		1/1993	Jones et al.	
5,211,197	A		5/1993	Marrison et al.	
5,215,122	A		6/1993	Rogers et al.	
5,232,020	A		8/1993	Mason et al.	
5,316,041	A		5/1994	Ramacier, Jr. et al.	
5,323,808	A		6/1994	Shimizu	
D357,307	S		4/1995	Ramacier	
5,429,155	A		7/1995	Brzyki et al.	
5,464,042	A		11/1995	Webster	
5,494,074	A		2/1996	Ramacier	
5,529,085	A		6/1996	Richards	
D384,712	S		10/1997	Scott	
5,791,366	A		8/1998	Lo	
5,845,943	A	*	12/1998	Ramacier, Jr. et al.	285/308
5,911,403	A		6/1999	deCler et al.	
5,975,489	A		11/1999	deCler et al.	
6,024,124	A		2/2000	Braun et al.	
6,082,401	A		7/2000	Braun et al.	

* cited by examiner

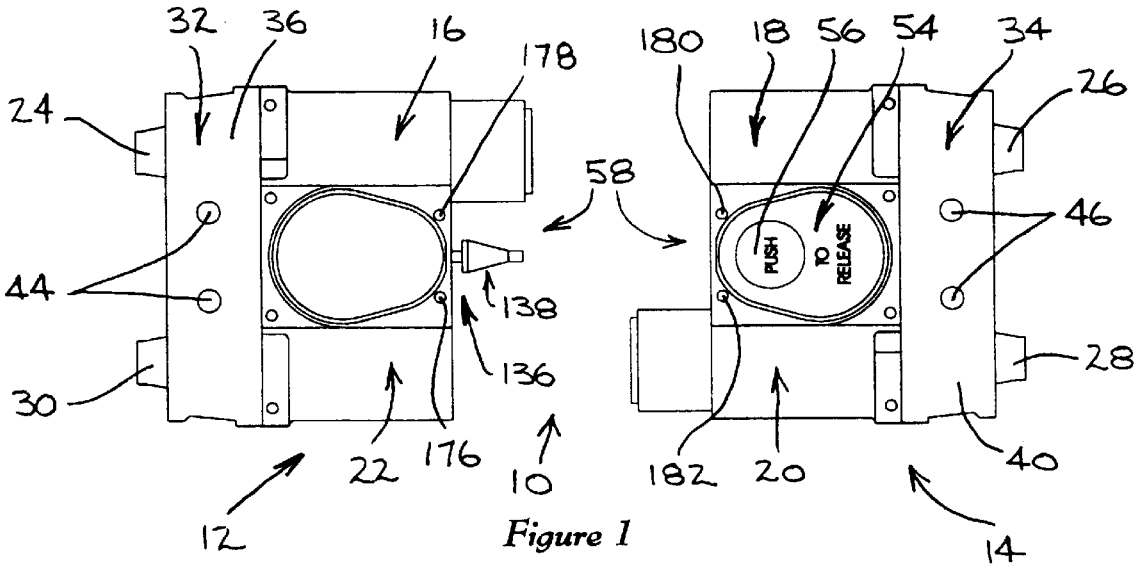


Figure 1

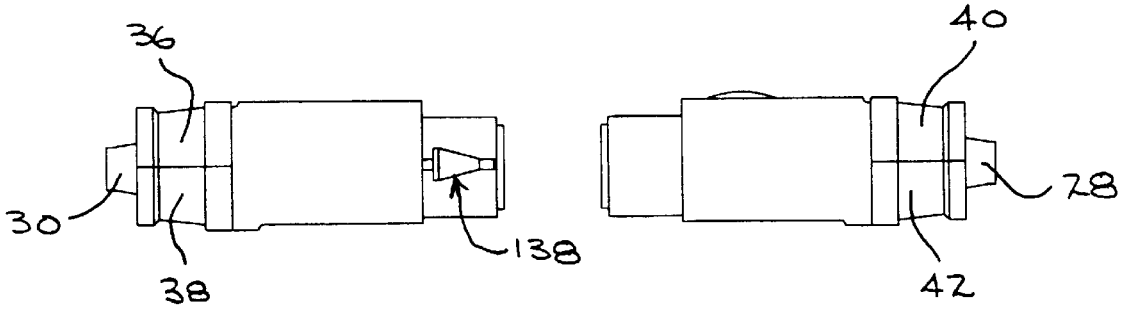


Figure 2

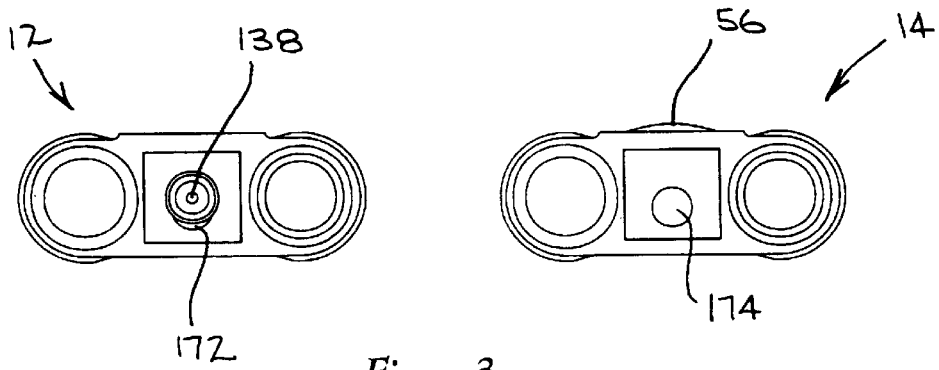


Figure 3

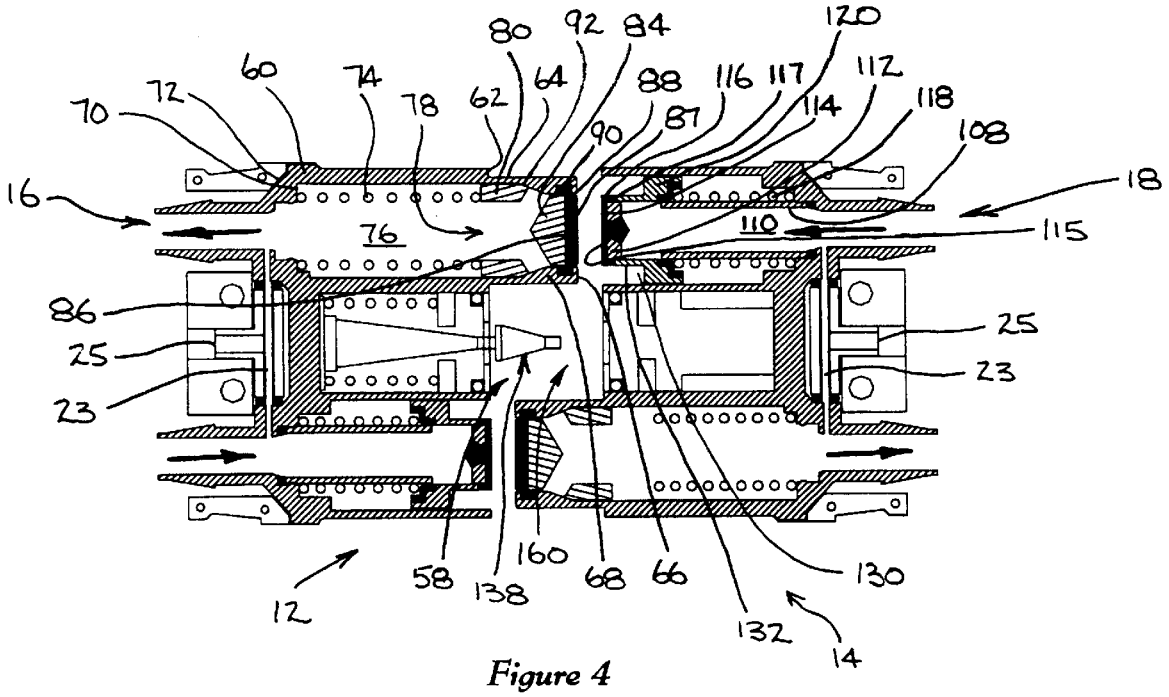


Figure 4

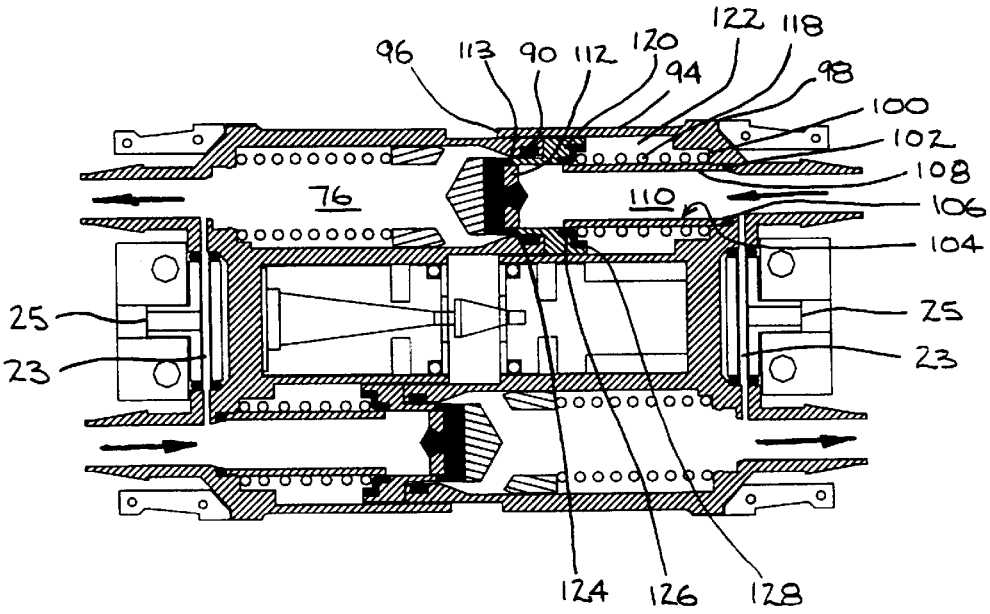


Figure 5

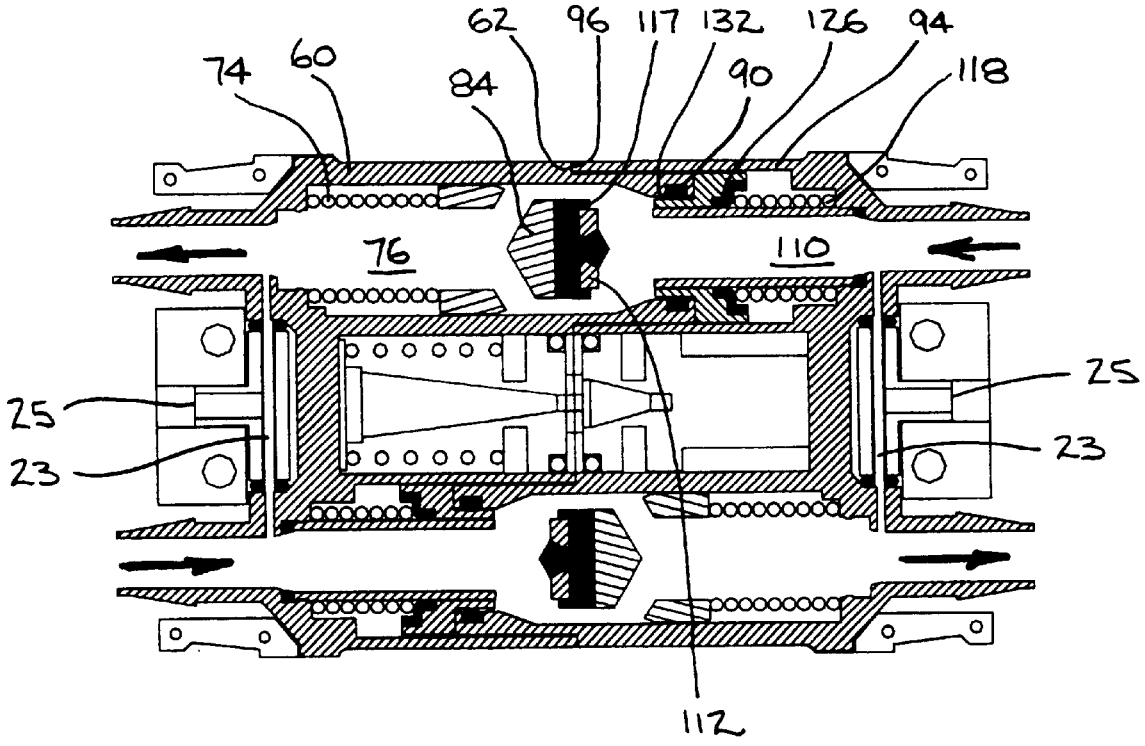


Figure 6

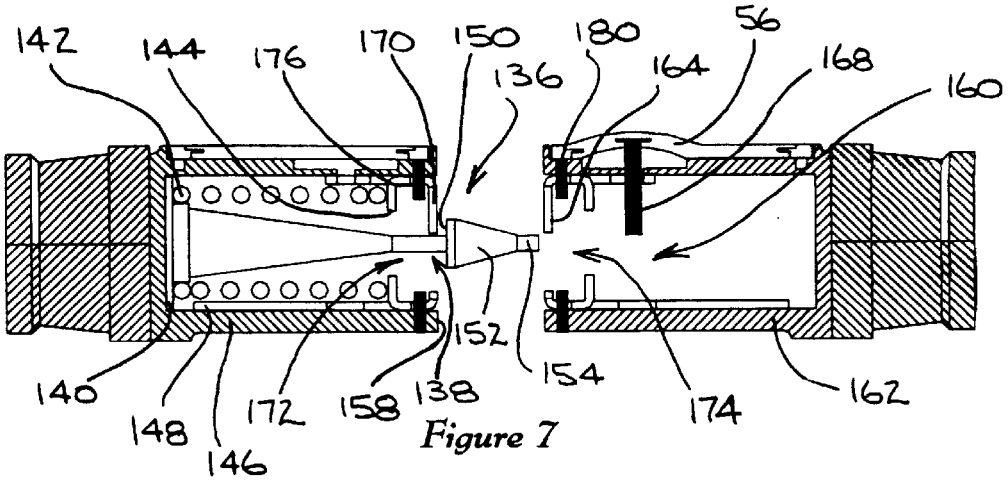


Figure 7

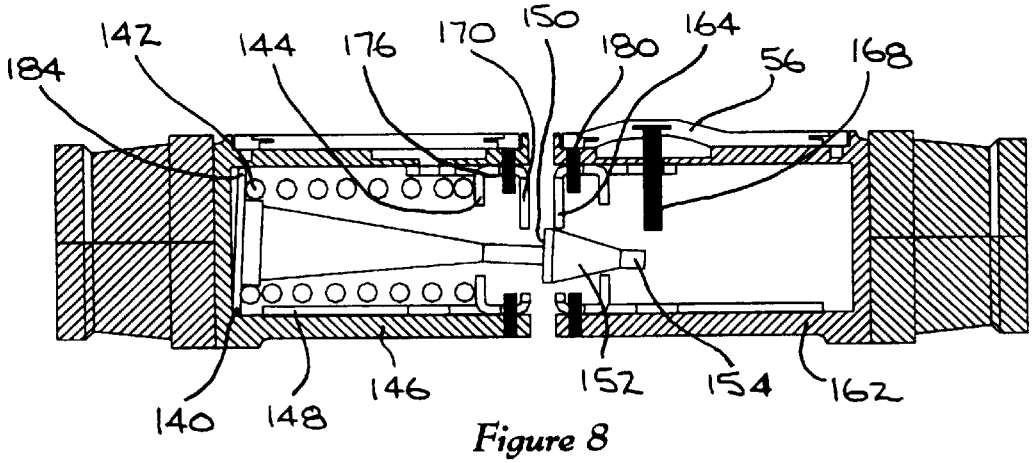


Figure 8

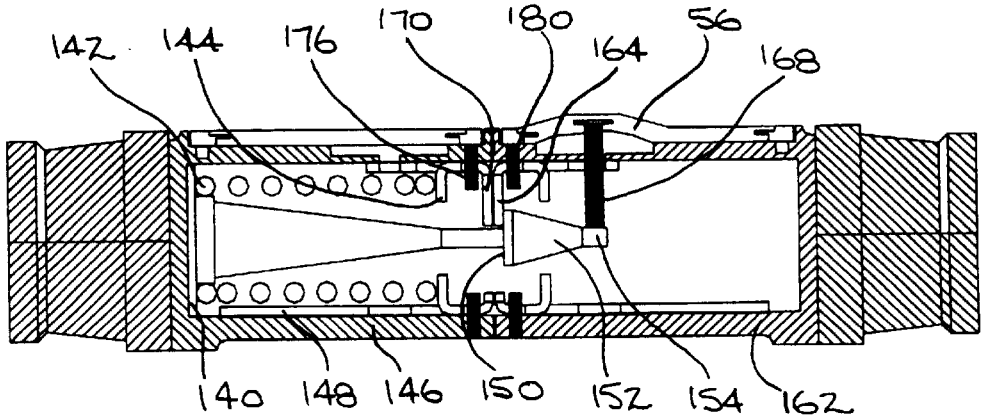


Figure 9

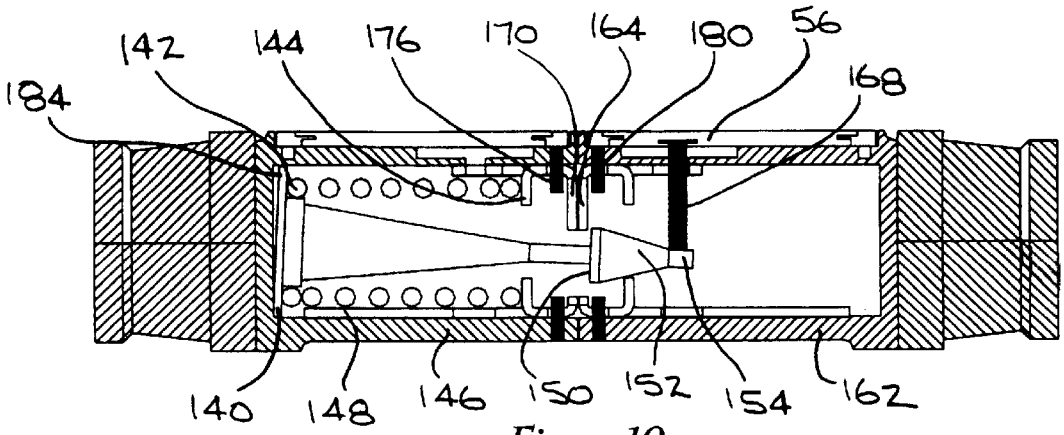


Figure 10

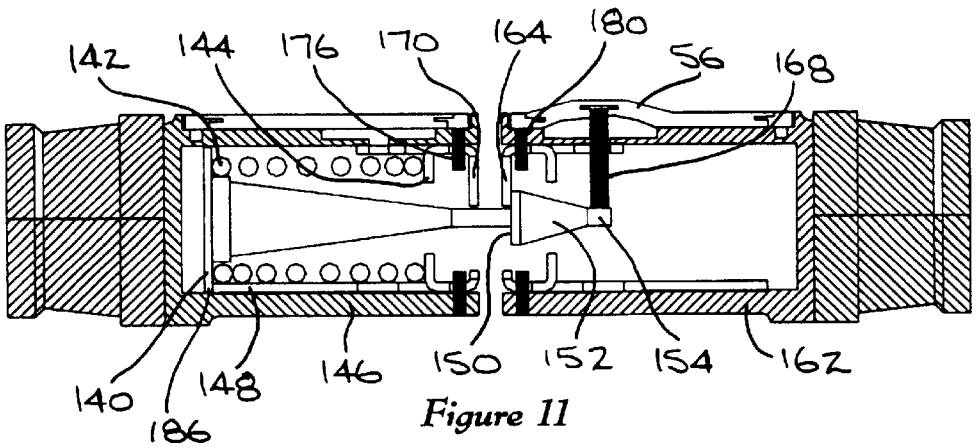


Figure 11

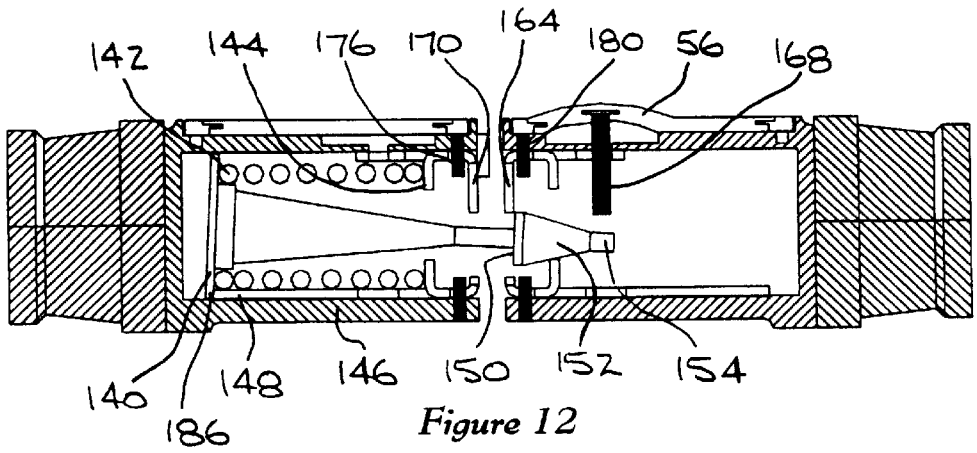


Figure 12

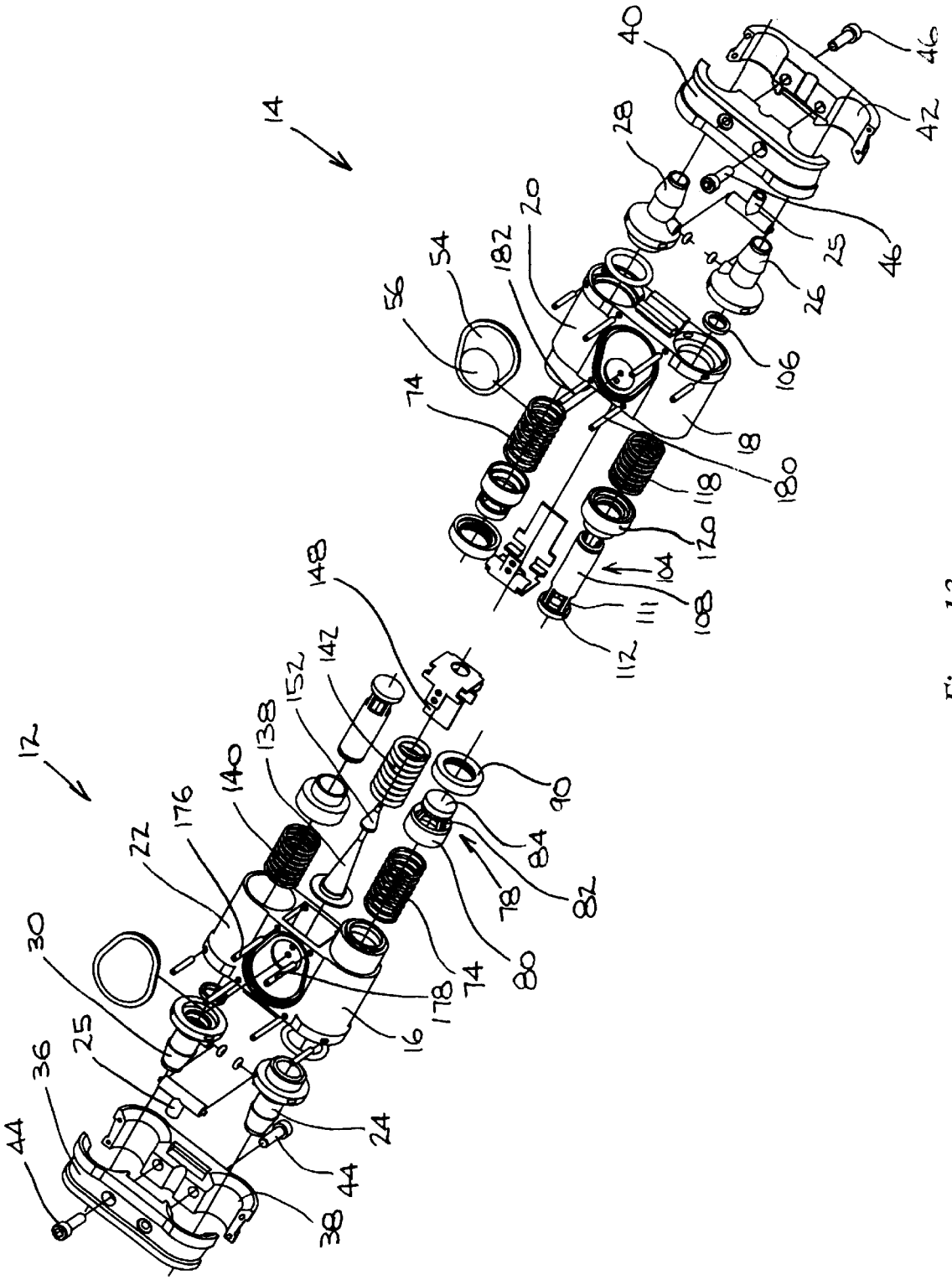

14
40
46
42
28
20
182
54
56
74
25
26
106
18
180
118
120
184
111
108
112
148
142
152
138
140
12
176
22
30
90
84
78
82
80
74
178
16
25
36
24
44
44
38

Figure 13

AUTOMATIC OR MANUAL QUICK RELEASE LATCH

This application is a divisional application of U.S. Ser. No. 09/288,285, filed Apr. 8, 1999.

FIELD OF THE INVENTION

This invention relates to a fluid conduit coupling device which allows the simultaneous coupling or uncoupling of pairs of fluid conduits substantially without the loss of process fluid or the introduction of air or ambient fluid, and which will automatically uncouple with the application of a predetermined tensile force.

BACKGROUND Of THE INVENTION

It is desirable to have a means of coupling and uncoupling fluid conduits such as hoses without the need to drain the hoses prior to coupling or risk fluid loss. Moreover, it is desirable to have a means to couple fluid conduits without introducing contaminants such as ambient fluids and air into the process fluid. In situations where it is foreseeable that it might be necessary to uncouple the fluid conduits very quickly, or under other circumstances preventing the use of a manually actuated release, it is desirable to have a means of disconnecting the fluid conduits by the application of a predefined amount of tensile force on the fluid conduits, preferably without damage to the conduits or the coupling, and in a manner allowing rapid recoupling without the need for prior repair. Such decoupling should occur without fluid leakage from the conduits.

Such quick-connect/quick disconnect dry-break connectors are especially desirable for use with liquid-circulating personal temperature maintenance systems, particularly when such devices are used by those piloting or driving vehicles from which rapid ejection, possibly followed by reconnection, may become necessary.

Numerous detachable fluid conduit coupling systems are known in the prior art. Many such devices employ spring-loaded ball-type valves which may reduce the loss of process fluid upon uncoupling. Such systems are described in U.S. Pat. No. 4,105,046 of Sturgis, and U.S. Pat. No. 5,092,364 of Mullins, both of which describe detachable fluid couplings. However, systems of this type fail to provide a means to substantially prevent the introduction of contaminants such as air and ambient fluids into the process fluid upon coupling. This is because the spring-loaded ball type valves lack a means to expel potentially contaminating materials from the valve surfaces prior to joining.

U.S. Pat. No. 4,794,937 of Hoffman describes a plug and socket-type plug coupling designed for application in high pressure systems. The design of this coupling necessitates the use of gaskets recessed within the coupling apparatus and does not provide a means of expelling ambient fluids or air prior to coupling.

Most fluid coupling systems are not adapted to allow damage-free separation of the connector ends upon the application of tensile force when a manual release mechanism has not been actuated. This can result in the loss of significant quantities of process fluid due to conduit rupturing when emergency separation becomes necessary. In situations where the process fluid is potentially dangerous, this can pose a substantial hazard. Moreover, should separation not occur under conditions where it is necessary the device through which fluid was being circulated may be dragged behind or into the fluid source device, resulting in injury and property damage.

U.S. Pat. No. 5,529,085 of Richards et al teaches a breakaway hose coupling designed to limit the loss of process fluid upon the separation of the coupling. This design relies on the breakage of shear pins to effect release of the coupled hoses. Thus, while an emergency release system is provided, it is not a quick-connect/quick release system. Moreover, design is not adapted to exclude ambient fluid and air upon hose coupling.

The most common commercially available fluid quick-connector types known to the inventors are those produced by Colder Products Company of Minnesota, U.S.A. Features of these connectors are detailed in U.S. Pat. Nos. 4,436,125, 4,541,457, 4,911,655, 5,033,777, 5,052,725, 5,104,158, 5,126,041, 5,494,074, 5,845,943, and D357,307 and D384, 712. Some connectors manufactured by Colder Products Company purport to have self-sealing valves. However, due to design factors, a substantial amount of process fluid is typically lost when these valves are uncoupled, and a substantial amount of ambient fluid or air is introduced into the process fluid upon coupling. Moreover, no Colder Products Company valve is known to the inventors which uncouples automatically upon the application of a predetermined tensile force.

SUMMARY OF THE INVENTION

It is thus an object of the present invention to provide a fluid conduit coupling apparatus which allows quick connection and disconnection with substantially no introduction of ambient fluids or air into the process fluid.

In one aspect of the invention there is provided a quick connect/disconnect coupling for a fluid conduit, the coupling comprising assemblies for attaching to the ends of a conduit to be connected and for subsequently mating together, each assembly comprising a normally closed channel; means for expelling fluid from between the assemblies when the assemblies are to be connected to each other; means for preventing fluid from entering the assemblies from outside when the assemblies are being connected; means for opening the normally closed channels, means operable by the connecting of the assemblies to each other; latch means for securing the assemblies together, the latch means disconnectable by means of a hand operated unlatching means or by the application of a predetermined tensile force.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other advantages of the invention will become apparent upon reading the following detailed description and upon referring to the drawings in which:

FIG. **1** is a top view of a preferred form of a coupler according to the invention, in a disconnected state;

FIG. **2** is a side view of the coupler of FIG. **1**;

FIG. **3** is an end view of the coupler of FIG. **1**, illustrating the two ends of the coupler which are juxtaposed in FIG. **2**;

FIG. **4** is a cross-sectional top view of the coupler of FIG. **1** in a completely disconnected state;

FIG. **5** is a cross-sectional top view of the coupler of FIG. **1** in a partially disconnected state;

FIG. **6** is a cross-sectional top view of the coupler of FIG. **1** in a completely connected state;

FIG. **7** is a cross-sectional side view of the coupler of FIG. **1** showing a preferred latch assembly in a completely uncoupled state;

FIG. **8** is a cross-sectional side view of the coupler of FIG. **7** showing the latch assembly in an intermediate state just prior to complete coupling or complete uncouplings;

FIG. **9** is a cross-sectional side view of the coupler of FIG. **7** showing the latch assembly in its completely coupled state;

FIG. **10** is a cross-sectional side view of the coupler of FIG. **7** showing the latch assembly in an intermediate state immediately prior to uncoupling using the manual release button; and

FIG. **11** is a cross-sectional side view of the coupler of FIG. **1** showing the securing device in a completely coupled state experiencing a moderate tensile force;

FIG. **12** is a cross-sectional side view of the coupler of FIG. **1** showing the latch assembly in an intermediate state immediately preceding complete automatic uncoupling;

FIG. **13** is an exploded perspective view of two halves of a coupler according to FIG. **1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description, similar features in the drawings have been given similar reference numerals. The drawings illustrate a double or twin coupling for connecting together two pairs of conduits or for inserting at an intermediate point in a pair of conduits. It should be noted that the coupling can equally be constructed for use as a single coupling in a single conduit. In that case one flow passage or channel is either not present or not used. The coupling can also be constructed as a multiple coupling for a group of conduits.

With reference to FIGS. **1** to **3**, there is illustrated one preferred form of the coupler according to the invention. Thus, the coupler **10** comprises first and second parts **12** and **14** respectively which are configured to meet together, as will be discussed, and as illustrated in cross section in FIG. **6**.

Each of parts **12** and **14** are provided with flow passage or channel assemblies **16**, **18**, **20** and **22**. The channels provide flow passages through parts **12** and **14** but the flow is interruptible, as will be discussed.

Each of parts **12** and **14** may include a bypass channel **23**, a primary purpose of which is to allow some circulation for maintenance of temperature uniformity in the system. Where not necessary, the bypass channels may simply be blocked or omitted. Where the coupling is constructed for use in a single conduit, no bypass will be present.

Hose barbs **24**, **26**, **28** and **30** provide for the securing of respective conduit ends to parts **12** and **14**. Tail clamps **32** and **34**, consisting of identical parts **36** and **38**, and **40** and **42**, respectively, are secured together by means of fasteners such as screw pairs **44** and **46** to securely clamp the conduit ends to the hose barbs. In applications where safety precludes the use of screws, pins or rivets may be used.

The tail clamps serve not only to secure the conduits to the coupling but may also to relieve strain as between the conduits and the channel assemblies, to provide a protective shield over bypasses **23**, and to provide a thermal and/or pressure sensor receptacle through the thermal well **25**.

Part **12** includes the latch pin **138** which, upon connecting together parts **12** and **14** of coupler **10**, is inserted into a receptacle assembly **160** (refer to FIG. **7**) which contains a latch plate **164**. As will be described later, the latch pin **138** locks with the latch plate **164** to secure a coupler in a connected state.

The part **14** includes a manual release assembly **54** which, on application of pressure to the release button **56** causes the latch pin **138** to unlock from latch plate **164**.

FIGS. **4** to **6** illustrate the flow channel assemblies in detail. As with all of the series of figures, the coupler is shown in a double configuration for insertion between two pairs of conduit ends. More particularly, the figures illustrate a form of the coupler which is preferably used as part of a supply and return system, whereby a fluid supply flows in one direction through one side of the coupler and in the opposite direction to the other side of the coupler. Thus, FIGS. **4** to **6** illustrate direction of flow by means of the arrows. Furthermore, the figures progressively illustrate the coupler in a disconnected state in FIG. **4**, a partially connected state in FIG. **5**, and a connected state in FIG. **6**.

The parts **12** and **14** of coupler **10** are the same insofar as the channel assemblies are concerned, and differ only in latch assembly **58**, in that part **12** includes latch pin **138** and associated parts, and part **14** includes receptacle assembly **160**. Since the two flow channels through the coupler are the same, it is necessary to describe in detail one side only.

Thus, channel assembly **16** in part **12** comprises a channel wall **60** which houses the assembly components. Channel wall **60** is stepped on the outside thereof at **62** to provide a length **64** of decreased outside diameter extending to the end **66** of wall **60**.

The inside of wall **60** is profiled to provide a part **68** of decreased inside diameter.

Channel wall **60** is also stepped internally to provide a shoulder **70** adjacent end **72** of channel wall **60**.

A coil spring **74** is seated within channel **76** against shoulder **70**.

Closure means comprising a shuttle **78** (refer to FIG. **13**) comprises a base ring **80**, a series of struts **82** and a plug **84**. Plug **84** includes a leading surface **86**.

A sealing ring **88** is disposed around plug **84**, and a complimentary sealing ring **90** is fitted within area **68** of channel wall **60**.

In the preferred configuration the leading surface **86** is overlaid by an elastomeric cap comprising a face seal **87** and integral sealing ring **88**.

In the normal disconnected position of the coupling, as illustrated in FIG. **4**, shuttle **78** is biased by spring **74** to close off the opened end of the channel. In that condition the sealing rings **88** and **90** combine to prevent fluid leakage. The face seal **87** of shuttle **78** is substantially flush with the end **66** of channel wall **60** and is held in that position by the abutment of base ring **80** against the narrowing interior of channel wall **60** at **92**.

The shuttle **78** is free to move within the channel wall **60** against the force of spring **74** when sufficient force is applied to the leading surface **86** of shuttle **78**.

Turning to the complimentary part **14**, the channel wall **94** has an inside diameter at end **96** which is matched to the outside diameter of channel wall **60** of part **12** at area **64**.

Toward opposite end **98** of channel wall **94** the wall is stepped to form shoulders **100** and **102**. A side vent tube **104** (refer to FIG. **13**) is seated against shoulder **102** and fixed to channel wall **94**. Seal **106** provides sealing as between tube **104** and shoulder **102** of channel wall **94**. Seal **106** may be omitted where side vent tube **104** is welded directly to shoulder **102**.

Side vent tube **104** consists of lower tubular part **108** which actually defines within it a part of channel **110**. From the end of tubular part **108**, a group of struts **111** support plugs **112**. The struts **111** are preferably extended along the length of tubular part **108** to form reinforcing ribs. Plug **112** includes a leading surface **114**, a peripheral seal **116** and a

sealing ring **117**. Preferably the leading surface **114** is flush with the end **96** of channel wall **94**.

In the preferred configuration, the leading surface **114** is overlaid by an elastomeric cap which forms a face seal **115** integral with peripheral seal ring **116** and sealing ring **117**. The plug **112** preferably includes a shoulder **113** into which sealing ring **117** is molded.

A coil spring **118** is disposed about tubular part **108** and seated against shoulder **100** of channel wall **94**.

To complete the closure means in the channel assembly **18**, an annular slider **120** is disposed about side vent tube **104** and is freely slidable in the annulus **122** between the channel wall **94** and the tubular part **108**. Slider **120** is provided with a sealing surface **124** at one end and a sealing ring **126** at the other end. Slider **120** also includes a shoulder **128** which seats against spring **118**. When the channel **110** is in the normally closed position when the parts **12** and **14** are disconnected, as illustrated in FIG. **4**, slider **120** is biased by spring **118** to a position where sealing surface **124** seals against sealing ring **117** of plug **112**, and sealing ring **126** seals against tubular part **108** to thereby prevent leakage into or out of channel **110**.

Axial force exerted against the slider **120** will permit the slider to move against the biasing force of spring **118**.

Without considering for the moment the latch assemblies **58**, the operation of the channel assemblies will be described with reference to the three positions illustrated in FIGS. **4** to **6**. FIG. **4** illustrates the coupler in a disconnected state in which the springs **74** and **118** respectively bias the shuttle **78** and the slider **120** into positions in which the channels are closed to the outside, so that no leakage can occur either inwardly or outwardly.

When the two parts **12** and **14** are moved together axially as illustrated in FIG. **5**, the first contact will be between the leading surfaces **86** and **114** of shuttle **78** and side vent tube **104** respectively. When this contact is made, any ambient fluid, whether liquid or atmospheric air, will be substantially expelled from the area between the surfaces.

As parts **12** and **14** are further overlapped by additional axially movement, the end **66** of channel wall **60** moves into the annular space **130** between channel wall **94** and the leading land **132** of slider **120**. At the same time, plug **112** is forcing shuttle **78** into channel **76** against the bias of spring **74**, resulting in sealing ring **90** in channel wall **60** to be first transferred to peripheral seal **116** of plug **112** and then to engagement with the leading land **132** of slider **120**. The movement of the shuttle thus opens a flow path between struts **82** of shuttle **78** and the wall **60**. However during this motion the channels **76** and **110** are effectively sealed against inward or outward leakage at their interface by the sealing rings **90**, **117** and **126**.

As further axial movement occurs, the end **66** of channel wall **60** abuts against shoulder **134** of slider **120**. As parts **12** and **14** are forced into the connected state, the end **66** of channel wall **60** forces slider **120** to move against the bias of spring **118**. This movement of slider **120** opens the flow path between the struts **111** of side vent tube **104**, so that fluid can begin to flow through the side vents. This thus opens flow between channels **76** and **110** and effectively seals against inward and outward leakage to the ambient. At the same time, the shuttle **78** remains restrained by leading surface **114** of plug **112** and is moved further within channel wall **60** against the force of spring **74**.

As is clear from FIG. **6**, a flow path is also opened around the outside of plug **84** and plug **112** of shuttle **78** and side vent tube **104** respectively.

When fully coupled, end **96** of channel wall **94** abuts shoulder **62** of channel wall **60**.

The coupler has thus been connected in a way which prevents leakage either into or out of the unit.

In disconnecting, the process is simply reversed, so that shuttle **78** and slider **120** are caused by springs **74** and **118** respectively to return to their initial positions to close off the channels to again prevent leakage in the disconnect step.

Turning to FIGS. **7** to **12**, the latch assemblies **58** are illustrated in detail.

The pin assembly **136** comprises latch pin **138** having a base plate **140**. A spring **142** is disposed around latch pin **138** and is seated against base plate **140**. Spring **142** is held under compression by spring retainer **144**. Thus spring **142** maintains a constant bias against base plate **140**.

Base plate **140** and latch pin **138** are together slidable within the latch pin housing **146**. However, the extent of sliding movement of base plate **140** is limited on one side of housing **146** by plate **148**. Plate **148** thus acts as a stop for one side of base plate **140**.

Latch pin **138** includes a shoulder **150** which is preferably formed by positioning a cone-shaped part **152** on latch pin **138**. Latch pin **152** is then extended at **154** beyond the end of cone-shaped part **152**.

As is evident from the drawings, the forward area of the latch pin **138**, particularly including the shoulder **150** extends beyond the end **158** of latch pin housing **146**.

Turning to receptacle assembly **160**, the receptacle housing **162** includes a latch plate or striker plate **164** which extends down into the interior of housing **162**.

A manual release button **56**, disposed on the outside of receptacle housing **162**, has fixed thereto a manual release pin **168**. Button **56** is biased toward the upward position shown in FIGS. **7** to **9** and **11** to **12** in which the manual release pin **168** may be said to be in a rest position.

The outer part **170** of spring retainer **144** and the latch plate **164** leave openings **172** and **174** at the entries to latch pin housing **146** and receptacle housing **162** respectively. Openings **172** and **174** are configured such that latch pin **138** can be tilted relative to the axis of the housings.

The spring retainer **144** and latch plate **164** are secured in position by shear pins **176** and **178**, and **180** and **182** respectively.

The operation of the latch assembly **58** is illustrated sequentially in FIGS. **7** to **12**. Those figures illustrate both manual and automatic disconnection and also illustrate a safety feature provided by the shear pins.

When the parts **12** and **14** of coupler **10** are brought together, latch pin **138** extends out of the opening **172** in latch pin housing **146** and through the opening **174** in receptacle housing **162**. As the parts are moved more closely together, as illustrated in FIG. **8**, the conical part **152** is deflected by latch plate **164**. The latch pin **138** is biased against deflection by spring **142** acting on base plate **140**. Because base plate **140** is free to slide within latch pin housing **146**, when latch plate **164** deflects latch pin **138**, one side **184** of base plate **140** tilts against the force of spring **142**. When shoulder **150** passes latch plate **164**, the force of spring **142** acting on side **184** of base plate **140** causes latch pin **138** to snap back to the rest position along the axis of the housing so that shoulder **150** is locked behind latch plate **164**. The coupling is now locked in the position illustrated in FIG. **9**.

There are three possible means of disconnecting the latch assemblies. First, the assemblies may be disconnected

manually by depressing button **56** which acts through manual release pin **168** on the extended part **154** of latch pin **138**. The latch pin is then deflected to the position shown in FIG. **10**. The two parts **12** and **14** could then simply be pulled apart. However, since in the connected position the springs **74** and **118** in the channel assemblies **16** and **18** are in compression, the springs will cause the two parts **12** and **14** to spring apart as soon as the shoulder **150** is caused by the release pin **168** to clear latch plate **164**. That thus describes the manual disconnection.

In an emergency or other situation where unusual axial force is placed on the coupling and the conduits which are attached to it, it may be necessary to allow disconnection without manual intervention. For example, if the conduits were feeding heating fluid to a flying suit, and the pilot ejected from an aircraft, it is necessary that the conduits disconnect without impeding the pilots exit from the aircraft. The automatic disconnect feature is illustrated in FIGS. **11** and **12**. As axial forces are placed on the coupler tending to disconnect it, it begins to move apart as illustrated in FIG. **11**. This occurs because the base plate **140** moves axially within the latch pin housing **146**. As side **186** of base plate **140** abuts against plate **148**, continued axial force will cause base plate **140** to tilt, thus deflecting shoulder **150** of latch pin **138** out of engagement with latch plate **164**, thus allowing the coupler to spring apart under the influence of springs **74** and **118**, as described above. Once the two parts are disconnected, latch pin **138** is free to return to its rest position under the influence of spring **142**. In appropriate situations the coupler can be reconnected, since it will not have been damaged in any way by the automatic release.

Finally, should the automatic release feature fail, a clean break can still be made if either pair of shear pins **176** and **178** or **180** and **182** shear off. If the first pair shear off, then the assembly within the latch pin housing **146** is free to move out of the housing. Similarly, if the second pair **180** and **182** shear, then the latch plate **164** and associated structure will move out of receptacle housing **162**. In either case there will be a successful disconnect without leakage of fluid into or out of the system.

Obviously in the case of emergency release by shearing the shear pins, the coupling cannot be reconnected without repair work.

Thus, it is apparent that there has been provided in accordance with the invention a coupler that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with (a) specific embodiment(s) thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An auto-release latch in combination with a fluid conduit coupling that comprises first and second sides that are carried by respective sections of said fluid conduit, said latch comprising:

a first part associated with said first side of said coupling, and a second part associated with said second side of said coupling;

said first part comprising a latch pin and means for biasing said latch pin toward retention in said first side of said coupling;

said second part comprising a latch plate for securing said pin in a locked position when said first and second sides are axially brought together to effect coupling of said fluid conduit sections;

wherein said first and second coupling sides are free from attachment to any structure other than said fluid conduit sections and one another;

manual release means for selectively removing said pin from said locked position responsive to user activation; and

automatic release means responsive to a first predetermined tensile force for automatically removing said pin from said locked position.

2. The combination of claim **1** wherein said pin is deflectable against said means for biasing, wherein said pin includes a camming surface and a latching surface, and wherein said latch plate includes a cooperating camming surface whereby when said first and second parts are brought together, said camming surfaces cause said pin to deflect to pass over said latch plate and to then return to a position in which said latching surface is locked in engagement with said latching pin.

3. The combination of claim **2** wherein said manual release means comprises a deflection assembly within said second part of the latch for manually deflecting said pin when in said locked position to thereby release said pin for retraction over said latch plate.

4. The combination of claim **1** wherein said pin includes an annular base plate located within said first part of the latch and said biasing means comprises a coil spring acting on said base plate whereby deflection of said pin causes compression of one side of said coil spring.

5. The combination of claim **2** wherein said automatic release means comprises means for deflecting said pin out of said locked position responsive to said axial force.

6. The combination of claim **5** wherein said pin includes thereon a base plate; said base plate is axially moveable against said biasing means; said first part of said latch includes a stop means for limiting said axial movement of said base plate on at least one side of said pin by abutment of said base plate against said stop means; whereby continued axial force above said first predetermined force acting on said pin against said biasing means will cause said pin to deflect out of said locked position.

7. The combination of claim **6** wherein said latch plate is secured in position by at least one shear pin; wherein said at least one shear pin is chosen to shear under a second predetermined axial force which is greater than said first predetermined axial force.

8. The combination of claim **7** wherein said latch includes retaining means for retaining said biasing means and wherein said retaining means is secured in position by at least one said shear pin chosen to shear under a third predetermined axial force.

9. The combination of claim **8** wherein said second and third predetermined axial forces are equal.

10. An auto-release latch for use in a fluid conduit coupling, said latch comprising:

a first side for association with one side of said coupling, and a second side for association with an opposite side of said coupling;

said first side comprising a latch pin and means for biasing said latch pin toward retention in said one side of said coupling;

said second side comprising a latch plate for securing said pin in a locked position when said first and second sides are axially brought together to effect coupling;

manual release means for selectively removing said pin from said locked position responsive to user activation;

automatic release means comprising means responsive to a first predetermined tensile force for automatically deflecting said pin from said locked position;

wherein said pin is deflectable against said means for biasing, wherein said pin includes a canning surface and a latching surface, and wherein said latch plate includes a cooperating camming surface whereby when said first and second sides are brought together, said camming surfaces cause said pin to deflect to pass over said latch plate and to then return to a position in which said latching surface is locked in engagement with said latching plate;

wherein said pin includes thereon a base plate; said base plate is axially moveable against said biasing means; said one side of said latch includes a stop means for limiting said axial movement of said base plate on at least one side of said pin by abutment of said base plate against said stop means, whereby continued axial force above said first predetermined force acting on said pin against said biasing means will cause said pin to deflect out of said locked position; and wherein said latch plate is secured in position by at least one shear pin; said at least one shear pin being configured to shear under a second predetermined axial force which is greater than said first predetermined axial force.

11. An auto-release latch for use in a fluid conduit coupling, said latch comprising:

a latch pin housing for attachment to one side of the coupling and a latch plate housing for attachment to a opposite side of the coupling;

said latch pin housing supporting therein an elongate latch pin that has a tip portion that extends axially outwardly of said latch pin housing, biassing structure operative to resiliently retain said latch pin in an axially oriented disposition, said tip portion being transversely deflectable from said axially oriented disposition;

said latch plate housing having a recess for receiving said latch pin tip portion and a latch plate in said recess for securing said latch pin in a locked position, said latch plate being configured for engagement with said tip portion when the latch pin housing and latch plate housing are moved axially together upon engagement of said coupling, during such axial movement said tip portion being resiliently deflected until it moves Into a locking position with respect to said latch plate where said tip portion is restored to its axially oriented disposition by said biassing structure and is locked against withdrawal by engagement of said tip portion with said latch plate;

said latch including a manual release mechanism which is operative to disengage said pin from said latching plate in response to user activation, said manual release mechanism being enclosed within one of said housings; and

automatic release means for automatically disengaging said latch in response to a tensile force of predetermined magnitude, by deflecting the latch pin tip from its axially oriented disposition to release it from engagement with said latch plate.

12. The latch of claim **11** wherein said manual release mechanism comprises a button on a surface of one of said housings, said button being connected to a release pin located in the interior of said one housing, said button being biased to an inactive position but being manually displaceable when said housings are coupled to press said release pin against said latch pin and reflect the latter to disengage the tip portion thereof from the latch plate and thus free said housings for separation.

* * * * *