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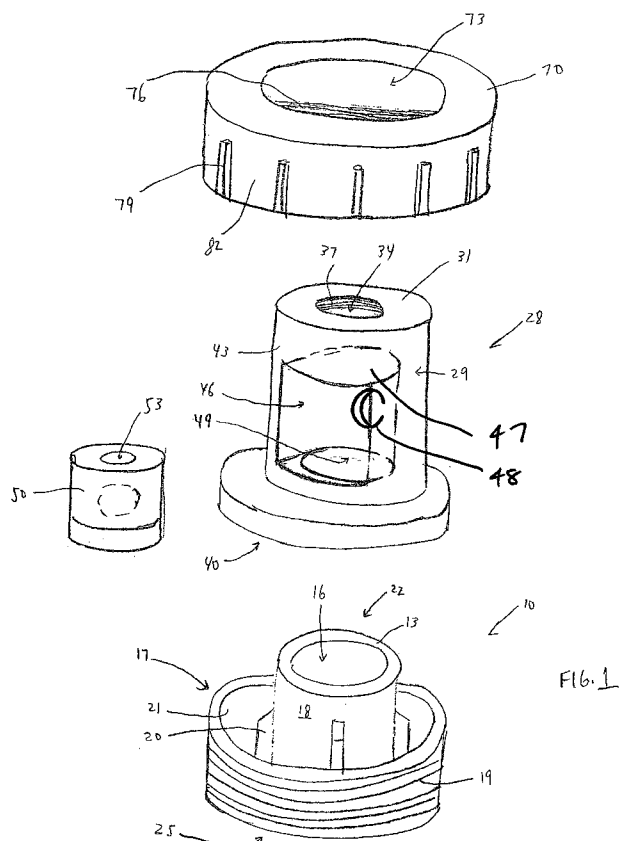
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(54) Title: QUICK CHANGE CHECK VALVE SYSTEM



(57) Abstract: A system for quickly removing and installing check valve parts without disturbing system piping attached to a pump. The system includes a first adapter attached to the outlet of the pump head. The first adapter (10) includes a valve seat and a housing with a side wall having external threads. A second adapter (28) includes a hollow body with a space for a check valve (50). The body has an opening (40) in the side wall for inserting the check valve. The second adapter fits over the first adapter and the adapters are attached by means of a collar (70). Tightening the collar onto the threads on the first adapter causes the check valve to be held firmly between the valve seat and the top wall of the second adapter.

WO 2008/121408 A1



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

QUICK CHANGE CHECK VALVE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to U.S. Provisional Patent Application No.: 60/920,725 filed on March 29, 2007
5 and entitled "Quick Change Check Valve System," which is hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to check valves for
10 reciprocating type fluid pumps.

BACKGROUND OF THE INVENTION

Reciprocating type fluid pumps typically use check valves built into the pump as part of the mechanism to produce flow. As normal wearing parts of the pump, these
15 check valves require cleaning or replacement on a regular basis. Existing methods of installing cartridge-type check valves require disassembly or extensive movement of system piping in order to remove the check valves for maintenance. One exception to this requirement is a tie-bar type, check
20 valve clamping mechanism. The tie-bar arrangements have some drawbacks such as leakage due to misalignment or due to variations in the tightening of the tie bar bolts. They also require metal components that may corrode when exposed to certain process fluids delivered by the pump.

25 There is a need for an improved system for removing the check valves for maintenance, cleaning, etc. that does not suffer from the drawbacks associated with tie-bar systems.

SUMMARY OF THE INVENTION

The present invention meets the above described need by providing a way to quickly remove and install check valve parts without disturbing system piping attached to the pump.

5 Replacement costs are also reduced by replacing only the necessary parts instead of a complete cartridge valve assembly. The system consists of a pump reagent head, one suction check valve, one discharge check valve, two union nuts, and adapters to fit customer supplied piping.

10 **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention is illustrated in the drawings in which like reference characters designate the same or similar parts throughout the figures of which:

Figure 1 is an exploded view of the check valve system
15 of the present invention; and,

Figure 2 is a perspective view of the check valve system of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In Fig. 1, a first adapter 10 has a valve support 13
20 surrounding a central opening 16. The valve support 13 is disposed centrally on a upstanding member 18 with gussets 20. The upstanding member 18 is centered with respect to a housing 17. The housing 17 has a side wall 21 with a set of external threads 19 disposed thereon. The valve support 13
25 is disposed at a first end 22 of adapter 10. A second end 25 of adapter 10 is attached to the pump reagent head.

A second adapter 28 has a body 29 with a first end 31 having an opening 34 with a set of internal threads 37 disposed thereon. The first end 31 mates with customer supplied piping. The adapter 28 has a second end 40 that
5 fits over the first end 22 of the first adapter 10. The body 29 has a side wall 43 with an opening 46 defined therein. The body 29 also has an opening 49 capable of being disposed in registry with opening 16 when the parts are assembled as shown in Fig. 2. The opening 49 has female slots that engage
10 gussets 20 so that the adapter 28 does not rotate relative to adapter 10 when they are assembled. This also allows the opening 46 to be positioned at increments equivalent to the rib 20 angular spacing (facing forward, sideways, or backward) to improve accessibility to check the valves in
15 various installations.

A check valve 50 has a central passageway 53 where fluids pass in a single direction as will be evident to those of ordinary skill in the art based on this disclosure. The check valve 50 may be inserted into the adapter 28 through
20 the opening 46. The valve 50 is centered in the adapter 28 and engages with the valve support 13 at the bottom and engages with the inside top wall 47 of the adapter 28 at the first end 31 such that the passageway 53 is disposed in registry with the opening 34.

25 With the adapter 28 positioned on the adapter 10, a collar 70 with a central opening 73 is positioned over adapter 28. The collar 70 has a set of internal threads 76 that engage with the threads 19 on the outer wall of adapter 10. When the collar 70 is manually rotated by means of a set
30 of ribs 79 disposed on the outer wall 82, the check valve 50 is pressed between the top inner wall 47 of the adapter 28

and the valve support 13. When the engagement between the collar 70 and the threads on the adapter 10 is loosened, the check valve 50 can be removed for repair or replacement without tools and without disturbing the system piping. A
5 hole 48 in adapter 28 allows the check valve to be pushed out of the adapter 28 when the collar 70 is loosened.

Turning to Fig. 2, the quick change check valve system 80 is shown in the assembled position with the check valve 50 disposed inside adapter 28 but visible through opening 46.
10 In this configuration, the check valve 50 is compressed between the inside top wall of the adapter 28 and the valve seat 13. By rotating the collar 70 counterclockwise, the compression is removed and there is sufficient clearance to remove the check valve 50 through the opening 46 in adapter
15 28. The first adapter 10 and the second adapter 28 may be configured to interface with customer supplied piping. The system has an indexable servicing window for better accessibility to the check valve parts.

The present invention provides many advantages including
20 rapid removal and installation of valve parts without removal of piping. The system provides for even tightening and compression of sealing gaskets to prevent leakage. The system may be provided with a construction consisting of all corrosion resistant materials. However, metal parts can also
25 be used to achieve many of the other benefits of the invention. The system can be serviced without the use of tools. The system also allows for viewing the check valve operation through clear or opaque check valve guides. The upper section of adapter 28 is fully enclosed for strength
30 and to resist distortion in the molding process.

The discharge and inlet can be dual connection type- female pipe thread and raised face screw on flange system (universal ANSI/DIN).

Also, the system can be used with pump head, in-line, or
5 foot valves as will be evident to those of ordinary skill in the art based on this disclosure.

While the invention has been described in connection
with certain embodiments, it is not intended to limit the
scope of the invention to the particular forms set forth,
10 but, on the contrary, it is intended to cover such
alternatives, modifications, and equivalents as may be
included within the spirit and scope of the invention as
defined by the appended claims.

What is claimed is:

1. A check valve system, comprising:

5 a first adapter having a side wall with external threads, a central opening and an upstanding member defining a valve seat;

10 a second adapter having a body with a side wall and a top wall bordering a central opening, the top wall having an opening defined therein in communication with the central opening, the side wall having an opening defined therein in communication with the central opening, the second adapter sized to fit over the first adapter such that the upstanding member on the first adapter is received in the central opening of the second adapter;

15 a check valve sized to fit through the opening in the side wall of the second adapter, the check valve having a first end, a second end, and a central passageway, the check valve sized to fit inside the body of the second adapter between the valve seat and the top wall of the second adapter; and,

20 a collar having a central opening capable of receiving the body of the second adapter there through, the collar having internal threads capable of engaging with the threads on the side wall of the first adapter to move the top wall of the second adapter toward the valve seat to secure the check valve in position.

2. The check valve system of Claim 1, wherein the upstanding member has a diameter that is smaller than the diameter of the side wall.

3. The check valve system of Claim 1, wherein the upstanding member has a plurality of gussets extending therefrom.

4. The check valve system of Claim 3, further comprising
5 slots bordering the central opening, the slots capable of receiving the gussets when the second adapter is placed over the first adapter.

5. The check valve system of Claim 1, wherein the opening
10 in the top wall of the second adapter has threads disposed thereon.

6. The check valve system of Claim 1, wherein the collar has a set of external ribs disposed thereon.

7. The check valve system of Claim 1, wherein the body has an opening disposed opposite to the opening in the side wall
15 for inserting a tool for pushing the check valve through the opening in the side wall.

8. A check valve system, comprising:

a first adapter having a valve seat surrounding a central opening and having a side wall with external threads
20 disposed thereon;

a second adapter having a body with a first end, a second end, and a central opening, the body being formed from at least one side wall and a top wall, the top wall having an opening therein, the side wall having an opening therein, the
25 second adapter sized to fit over the first adapter such that the valve seat is received in the central opening;

a check valve sized to fit through the opening in the side wall of the second adapter, the check valve sized to fit inside the body of the second adapter between the valve seat and the top wall of the second adapter; and,

5 a collar having a central opening capable of receiving the body of the second adapter therethrough, the collar having internal threads capable of engaging with the threads on the side wall of the first adapter.

9. The check valve system of Claim 8, wherein the valve
10 seat is formed on an upstanding member, the upstanding member having a diameter that is smaller than the diameter of the side wall.

10. The check valve system of Claim 9, wherein the
15 upstanding member has a plurality of gussets extending therefrom.

11. The check valve system of Claim 10, further comprising slots bordering the central opening, the slots capable of receiving the gussets when the second adapter is placed over the first adapter.

20 12. The check valve system of Claim 8, wherein the opening in the top wall of the second adapter has threads disposed thereon.

13. The check valve system of Claim 8, wherein the collar has a set of external ribs disposed thereon.

25 14. The check valve system of Claim 8, wherein the body has an opening disposed opposite to the opening in the side wall for inserting a tool for pushing the check valve through the opening in the side wall.

15. A method of installing a check valve on a pump head having an outlet, the method comprising:

attaching a first adapter to the outlet of the pump head, the first adapter having a side wall with external
5 threads, a central opening and an upstanding member defining a valve seat;

providing a second adapter having a body with a side wall and a top wall bordering a central opening, the top wall having an opening defined therein in communication with the
10 central opening, the side wall having an opening defined therein in communication with the central opening, the second adapter sized to fit over the first adapter such that the upstanding member on the first adapter is received in the central opening of the second adapter;

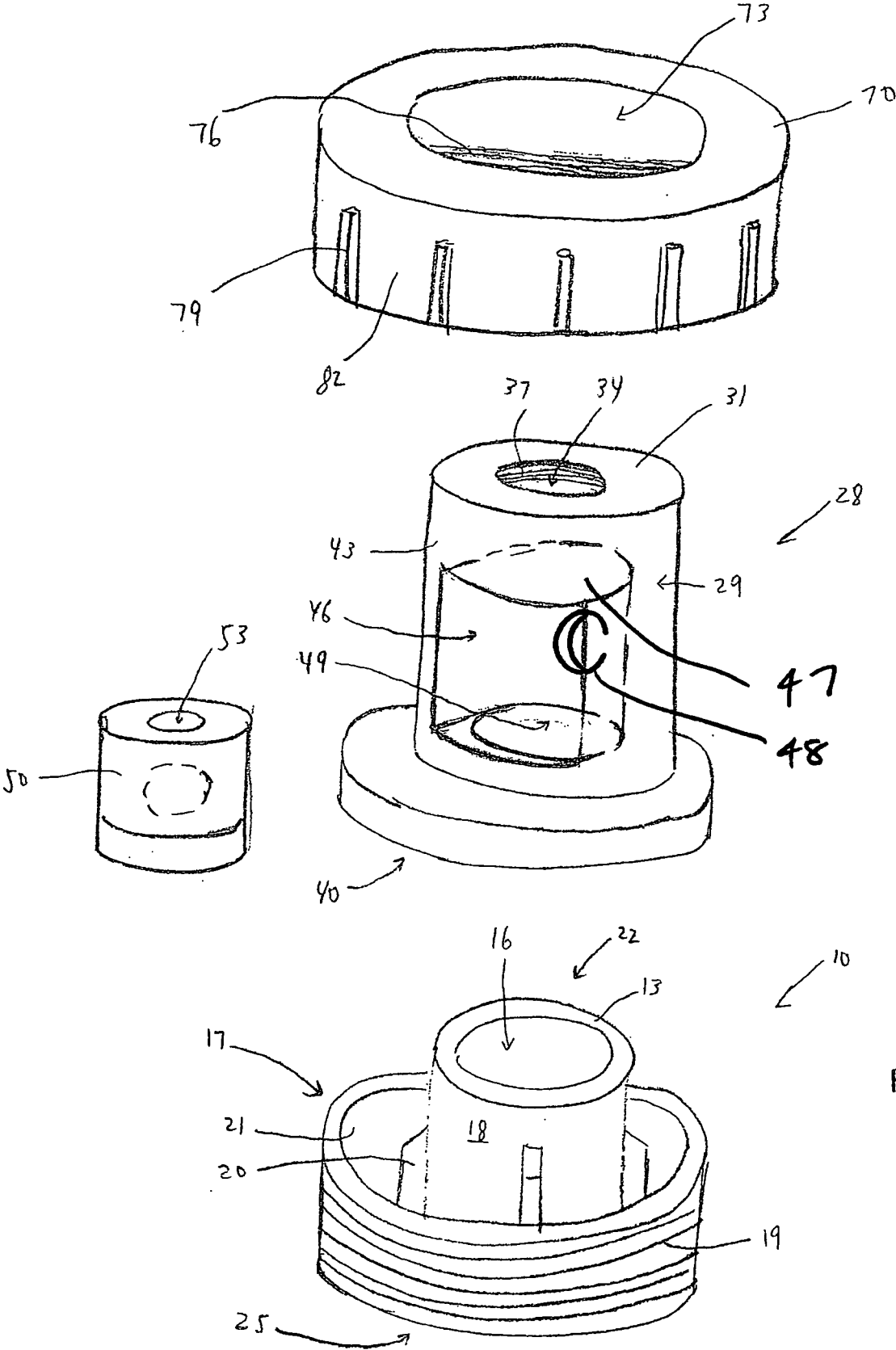
15 providing a check valve with the a first end, a second end, and a central passageway;

placing the check valve inside the body of the second adapter through the opening in the side wall;

placing the second adapter onto the first adapter such
20 that the check valve is positioned between the valve seat on the first adapter and the top wall of the second adapter;

proving a collar having a central opening capable of receiving the body of the second adapter therethrough, the collar having internal threads capable of engaging with the
25 threads on the side wall of the first adapter to move the top wall of the second adapter toward the valve seat to secure the check valve in position;

placing the collar over the second adapter and engaging the threads on the collar with the threads on the first adapter such that the check valve is secured between the valve seat and the top wall of the second adapter.



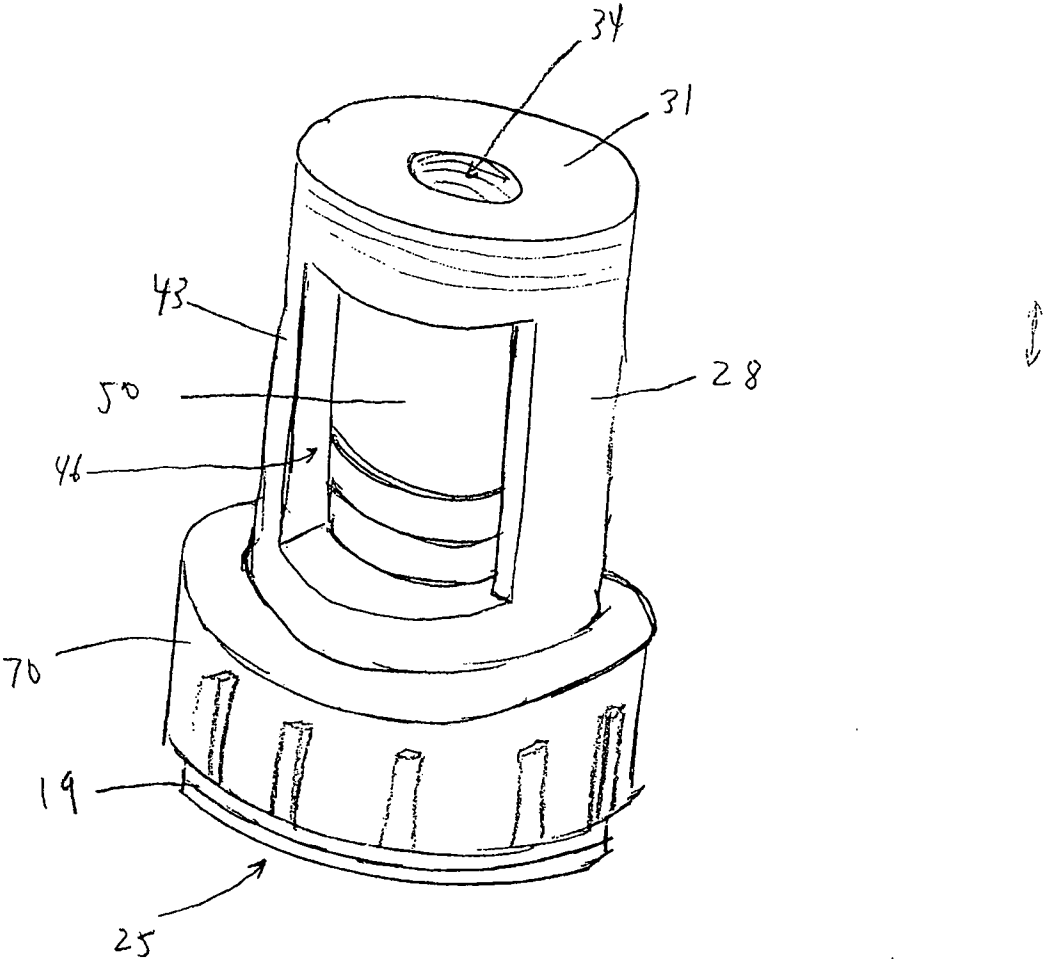


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER
INV. F16K27/02 F16K15/00

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)
F16K

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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003/089403 A1 (DUNCAN PATRICK WILSON [US] ET AL) 15 May 2003 (2003-05-15) figure 1	1,8,15
A	US 2004/134537 A1 (NOLL BRAD L [US] ET AL) 15 July 2004 (2004-07-15) figure 3	1,8,15
A	US 6 478 047 B1 (POWELL DOUGLASS H [US]) 12 November 2002 (2002-11-12) figure 8	1,8,15
A	US 5 143 117 A (KLEIN DONALD J [US]) 1 September 1992 (1992-09-01) figure 1	1,8,15
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/004206

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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