

DRAIN VENT FOR PETROLEUM/CHEMICAL FLUID PUMPING DEVICES AND METHOD OF MAKING THE SAME

FIELD OF THE INVENTION

[0001] The present invention relates to a flange mounted drain and/or vent tube associated with the inlet to or the outlet from a fluid pumping device and to a method of attaching the flange mounted drain and/or vent tube to the casing of the fluid pumping device which provides simplification in the manufacturing process while substantially reducing the costs of manufacture, testing, inspection, and maintenance of the fluid pumping device.

BACKGROUND

[0002] Fluid pumping devices utilized in petroleum and chemical applications require the use of a multi-part drain and/or vent tube assembly operatively connected to the inlet to and/or outlet from of the fluid pumping device. The attachment of a drain and/or vent tube to a fluid pumping device used in petroleum and chemical applications is currently and has been done in the past by employing a series of weldments to operatively secure and connect the multi-part drain and/or vent tube assembly to the inlet or outlet of the cast fluid pumping device. Because such fluid pumping devices are used in petroleum and chemical applications, the American Petroleum Institute (API) has issued and requires stringent testing, inspection, and maintenance of each weldment. These tests include radiography and liquid penetrant examination of each weldment to insure that the weldments pass inspection. However, such tests and examinations are costly, time consuming, labor intensive and add significantly to the cost of manufacturing and maintenance of each petroleum and chemical pumping device because of the difficulties encountered in accessing each weldment for such inspections and testings.

[0003] Additionally, it is the practice in the petroleum and chemical pumping industries to mount a flange member to the end of the drain and/or vent tube extending from the casing or suction base of the pumping device. This flange mounting is accomplished by utilizing a weldment which again must pass inspection and testing.

Also, because such mounted flanges extends outwardly from the cast fluid housing or suction base of the pumping device, any bending or weight applied to the extended flange cause stress fractures of the weldment, particularly at the junction between the drain/vent tube and the pump casing, thereby necessitating further additional weldments and the attendant testing and inspection of the same.

SUMMARY OF THE INVENTION

[0004] The present invention is disclosed to solve the aforementioned problems associated with the assembly of drain and/or venting of fluid assist or pumping devices.

[0005] Additionally, it is an object of the present invention to provide a method of attaching or securing a drain or vent tube member to an inlet or an outlet of a fluid pumping device.

[0006] The significant disadvantages of the prior art pumping devices are overcome by eliminating the process of utilizing weldments in securing a multi-part drain and/or vent tube to the inlet or outlet of the pumping device. The process of the present invention is accomplished by drilling or fabricating a tubular drain/vent conduit within the cast fluid housing to communicate between the inlet or outlet of the pumping device and the outer surface of the cast fluid housing. The outer surface of the cast fluid housing, surrounding the outer tubular opening of the tubular drain/vent conduit is substantially vertical to permit the mounting of a flanged drain and/or vent adaptor member to the cast fluid housing coaxially with the tubular drain/vent member conduit. Additionally, the outer surface facing of the cast fluid housing, surrounding the tubular opening of the drain/vent is substantially planar to permit the mounting of the flanged adapter member to the cast fluid housing. The flange adapter member is secured to the cast fluid housing utilizing a plurality of bolt members engaging threaded openings in the fluid housing.

[0007] The flanged adapter member includes a bore extending therethrough and a machined projection portion structurally arranged to sealingly engage a recessed shoulder portion surrounding the opening to the tubular drain/vent member in the cast

fluid housing. Additionally, the projecting cast fluid housing surrounding the opening to the drilled tubular drain/vent member includes a recessed shoulder portion which is designed to recess the machined projection portion of the flange adapter member when the flange member is mounted to the fluid housing to provide a seal therebetween.

[0008] The present invention consists of certain novel structures and processes hereinafter fully described, illustrated in the accompanying drawings, and specifically pointed out in the appended claims, it being understood that various changes in the details may be made without departing from the spirit or sacrificing any of the advantages of the present invention.

DESCRIPTION OF THE DRAWINGS

[0009] The foregoing description and other characteristics, objects, features and advantages of the present invention will become more apparent upon consideration of the following detailed description, having references to the accompanying drawings wherein:

[0010] FIG. 1 is a perspective view of a drain and/or vent assembly connection to a cast fluid housing of a prior art petroleum and chemical pumping device;

[0011] FIG. 2 is a cross-sectional view taken through the cast fluid housing taken along line 2-2 through the drain and/or vent assembly connection in FIG. 1;

[0012] FIG. 3 is a perspective view of the attachment of a machined flange adapter member to the drain and/or vent conduit within the suction base of a petroleum and chemical pumping device in accordance with the present invention;

[0013] FIG. 4 is a cross-sectional view taken along line 4-4 in FIG. 3;

[0014] FIG. 5 is a perspective view of the machined flange adapter member in accordance with the present invention; and

[0015] FIG. 6 is an enlarged view of FIG. 4 illustrating the engagement and attachment of the machined flange adapter member to the cast fluid housing of a pumping device to axially engage and seal the drain/vent tube member in accordance with the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0016] Referring now to the drawings wherein like reference numerals have been used throughout the several views to designate the same or similar parts, there is illustrated in FIGS. 1 and 2 the attachment of a multi-part drain and/or vent tube assembly 12 to the inlet or outlet 13 of a fluid pumping device 10 having a cast fluid housing 11, mounted on housing supports 11b, in accordance with the prior art. As shown in FIG. 2, the prior art drain/vent tube assembly 12 is comprised of several parts including an engaging portion 12a, an elbow portion 12b, and an elongated portion 12c extending through an opening 14 in the cast fluid housing sidewall 15. The several parts of the drain/vent tube assembly 12 are connected and secured together by weldments 16, which include weldment 16a which integrally secures engaging portion 12a of the multi-part tube assembly 12 to the inlet or outlet 13 of the cast fluid housing 11, weldment 16b which integrally secures the elbow portion 12b of the tube assembly 12 to the engaging portion 12a of the assembly, and weldment 16c which integrally secures the elongated portion 12c of the tube assembly 12 to the elbow portion 12b of the assembly.

[0017] Also, it is the practice of the prior art drain/vent tube assemblies 12 to extend the elongated portion 12c of the drain/vent tube member or assembly 12 outwardly through an opening 14 in the cast fluid housing 11 of the pumping device 10. In such assemblies, weldments 16d are required to secure a support gusset 14a for the drain/vent tube member 12 extending through the opening 14 in cast fluid housing 11 to prevent fracture of the drain/vent tube assembly from the pumping device. Finally, it is the practice in the petroleum and chemical industries to secure a flange member 17 having a bore 17a therein to the outer end 12d of the drain/vent tube member 12 by a flange weldment 16e to a valve to complete the connection to a vent pipe (not shown).

[0018] The fluid pumping device 10 is designed for usage in petroleum and chemical pumping applications. Accordingly, the American Petroleum Institute (API) has mandated stringent testing and inspections of each weldment associated with the fluid pumping device by requiring radiography and liquid penetrant examinations of

each weldment. However, such tests and examinations are costly and very time consuming. Thus, by reducing the number of weldments and thereby eliminating the difficulties and accessibility to the various weldments associated with the pumping device, substantial savings of labor and labor costs involved in such tests and examinations result in substantial cost savings in the manufacture and maintenance of the fluid pumping devices of the present invention.

[0019] Also, the fluid pumping device, in accordance with the present invention, has a longer operating life because of the fluid pumping device's resistance to breakage and leakage. It has been determined that the labor and costs saved by the present invention in eliminating the need for weldments can result in a 7-10 percent cost advantage savings for fluid pumping devices made in accordance with the present invention.

[0020] The present invention contemplates and discloses a simplified assembly and structure for communicating a drain/vent tube member 12 with the inlet or outlet 13 of a fluid pumping device 10. The fluid pumping device 10 includes a cast fluid housing 11 having a fluid inlet or outlet 13 therein. The cast fluid housing 11, is preferably comprised of 316L stainless steel, as is known in the art. However, it is within the scope of the present invention that the one-piece drain/vent tube member 12 communicates with the fluid inlet or outlet 13 of the pumping device 10. The cast fluid housing 11 of the fluid pumping device provides a structure which permits fabricating by machining or drilling a drain/vent tube member 12 through the cast fluid housing to communicate with and engage the inlet or outlet 13 of the pumping device, best as shown in FIG. 4. After machining or drilling the drain/vent tube 12 in the cast fluid housing 11, an enlarged annular bore 18 or recess is axially machined in the cast sidewall 15 of the cast fluid housing about the outer open end 12d of the machined drain/vent tube 12. Preferably, the cast sidewall 15 adjacent the annular bore 18 presents a planar surface 19 to permit attachment of a machined flanged adapter member 20 directly to the cast sidewall of the cast fluid housing, as will hereinafter be described.

[0021] The flanged adapter member 20 includes an axial bore 22 therein and an integral male projection portion 24 which is structurally arranged to align with and cooperate with the outer end 12d of the drain/vent tube member 12 when the adapter member is positioned within the annular bore 18. The male projection portion 24 of the flange adapter member 20 extending forwardly thereof includes at least one annular groove 25 or recess extending therearound. As shown in FIG. 6, two annular grooves or recesses 25 are provided in the outer surfaces of the male projection portion 24 of the flange adapter member 20. The annular recesses 25 are structurally arranged to received o-ring seals 26, as shown in FIG. 6.

[0022] Also, as shown in FIG. 6, the flange adapter member 20 is designed for attachment to the vertical planer casing surface 19 of the cast sidewall 15 through the use of a plurality of bolt members 28 engaging corresponding threaded openings 30 in the planar cast sidewall 15 of the cast fluid housing 11. The o-ring seals 26 positioned within the annular grooves or recesses 25 permits the projection portion 24 is to be sealingly mounted within the annular bore 18 by securing the adapter member 20 with the bolt members 28 engaging the threaded openings 30 in the planar surface 19 of the cast sidewall 15. The bolt members 28 are mounted through the flange member 20 through gusseted openings 32 in the flange adapter member to engage the threaded openings 30 to provide the engagement and seal between the machined flange adapter member 20 and the drain/vent tube member 12.

[0023] Preferably, a second flange member 34 having a bore 35 extending the length therein is secured to the annular bore 22 of the flange adapter member 20 by a weldment 36 to complete the assembly. The flange member 34 and annular bore therein provides the exit for the drain/vent member 12 from the fluid pumping device 10 to a valve to complete the connection to a vent pipe (not shown).

[0024] The present invention discloses a method of making a drain/vent tube 12 to structurally communication with the inlet or outlet of a fluid pumping device 10. This method of making broadly includes casting a fluid housing, drilling a drain/vent tube through the fluid housing to communicate with the inlet or outlet of the pumping device

and securing mechanically a flange adapter member to seal the adapter member to the fluid housing to cooperate with the drain/vent tube to permit release of fluid from the fluid pumping device.

[0025] The flange adapter member 20 is machined to include a male projection portion 24 having at least one annular groove or recess therein on the outer annular surface of the projection portion 24. The fluid housing provides a substantially planar mounting surface portion 24. The fluid housing provides a substantially planar mounting surface about the outer open end 12d of the drain/vent tube 12 and, preferably, includes an enlarged annular bore in the cast fluid housing about the outer open end of the drain/vent tube. The machined flange adapter member 20 and the integral male projection portion 24 is structurally arranged to sealingly engage the enlarged annular bore or recess 18 in the casing sidewall 15 when the machined flange adapter member 20 is secured to the fluid housing sidewall 15. This assembly provides a seal between the adapter member 20 and the cast fluid housing, as shown in FIG. 6.

[0026] In FIG. 6, two o-rings 26 are positioned, respectively, in two annular grooves or recesses in the male projection portion 24 of the machined flange adapter member 20. The o-rings provide a seal between the outer annular surface of the male projection portion 24 and the inner annular surface of the annular bore or recess 18 when the flange adapter member is secured to the planar surface surrounding the annular bore.

[0027] Additionally, it is desired that the cast sidewall 15 of the cast fluid housing provide a support projection ledge 15a above the mounting area of the adapter member 20 to the fluid housing. This protection ledge minimizes the likelihood that a force could fracture the junction between the adapter member and the cast sidewall of the fluid housing. This structure provides a longer operating life of the fluid pumping device.

[0028] While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the relevant arts that changes and modifications may be made without departing from the invention in its broader aspects.

Therefore, the aim of the appended claims is to cover all such changes and modifications as fall within the spirit and scope of the present invention.

What is claimed is:

1. A fluid pumping device for use in the petroleum and/or chemical industries, comprising:

- (a) a cast fluid housing member having an inlet to or an outlet from the fluid pumping device and having a sidewall thereon;
- (b) a drain/vent tubular connection positioned in said cast fluid housing to engage and communicate with said inlet to or said outlet from the fluid pumping device, with said drain/vent tubular connection exiting as said sidewall; and
- (c) a flange adapter member secured to said cast fluid housing and structurally arranged to communicate with said drain/vent tubular connection.

2. The fluid pumping device in accordance with claim 1 wherein said drain/vent tubular connection is positioned in said fluid housing to communicate with said inlet to or outlet from said pumping device by drilling said drain/vent connection in said fluid housing.

3. The fluid pumping device in accordance with claim 1 wherein said sidewall of said cast fluid housing is positioned substantially perpendicular to said exit of said drain/vent tubular connection from said fluid housing.

4. The fluid pumping device in accordance with claim 3, wherein said sidewall of said fluid housing includes an annular recess extending around the exit of said drain/vent tubular connection.

5. The fluid pumping device in accordance with claim 1, wherein said flange adapter member includes an axial bore extending therethrough and a male projection portion structurally arranged to engage said cast fluid housing to communicate with said drain/vent tubular connection.

6. The fluid pumping device in accordance with claim 4, wherein said flange adapter member includes a axial bore therethrough and a male projection portion

structurally arranged to engage said annular recess in said sidewall of said fluid housing.

7. The fluid pumping device in accordance with claim 5, wherein said male projection portion includes at least one annular groove extending therearound.

8. The fluid pumping device in accordance with claim 5, wherein each of said at least one annular groove in said male projection portion includes an -o-ring member to seal said flange adapter member to said fluid housing.

9. A method of providing a drain/vent tube to structurally communicate with the inlet or outlet of a cast fluid pumping device, comprising the steps of:

- a. drilling a drain/vent tubular connection in the cast fluid pumping device to engage and communicate with the inlet or outlet therein; and
- b. mounting a flange adapter member to the cast fluid pumping device to communicate with said drain/vent tubular connection to permit release of fluid from the pumping device.