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(54) **GLAND PIPE FITTING**

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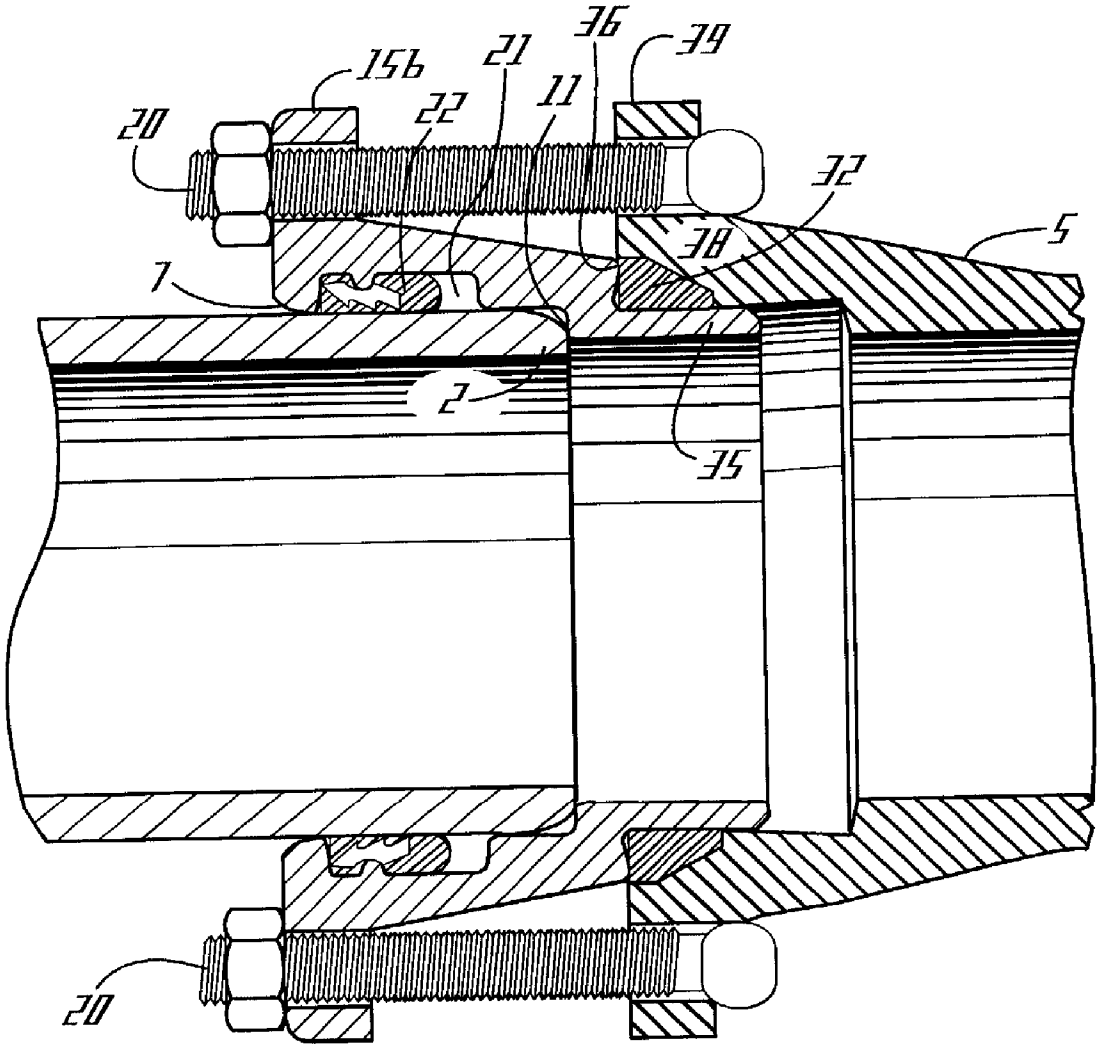
(57) **ABSTRACT**

A flange-pipe fitting for use in assembling and connecting pipe, allowing for a flange design with a push-on method for joining pipe thereby permitting the user to obtain a tight and secure seal between pipe components.



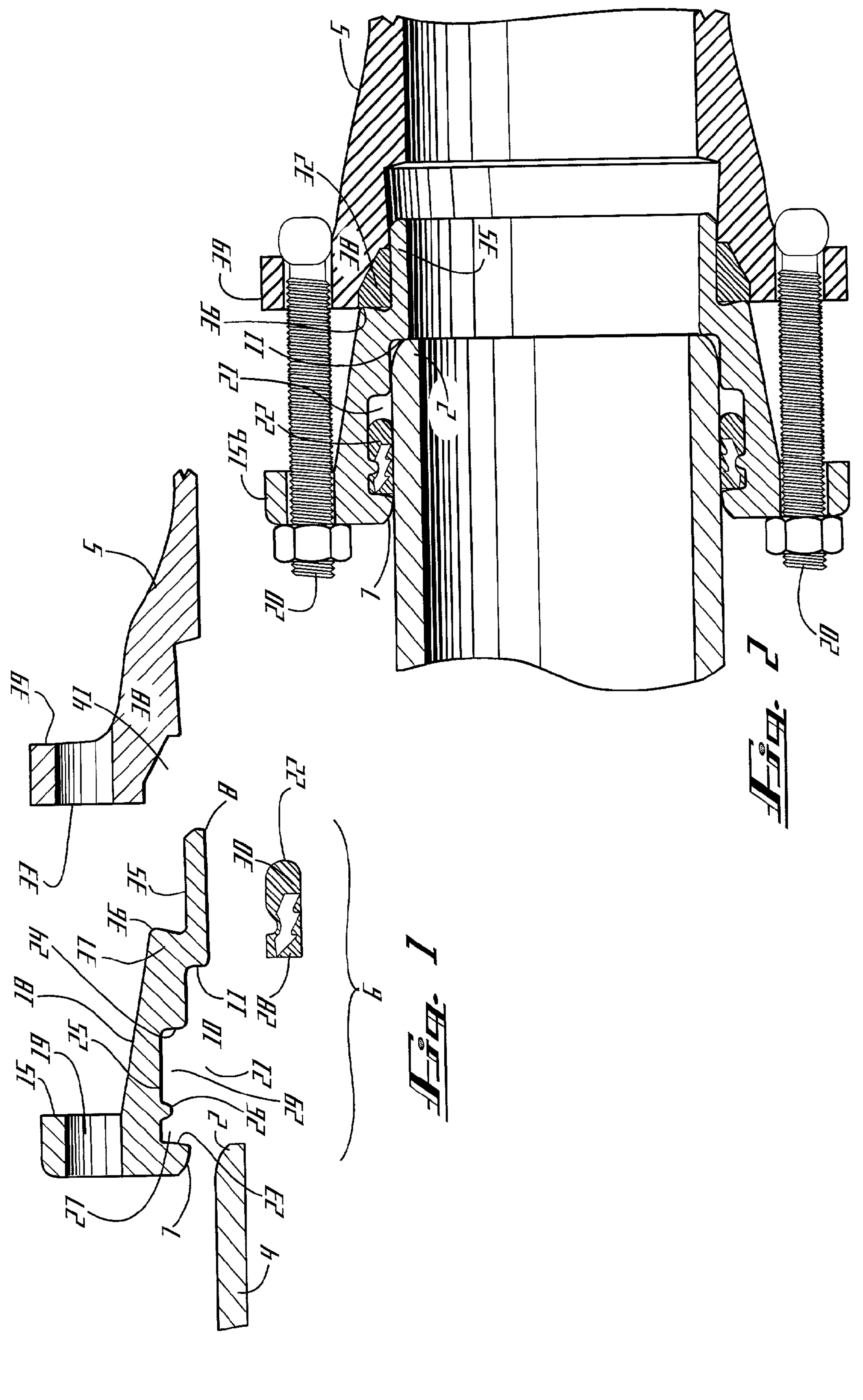


Fig. 1

Fig. 2

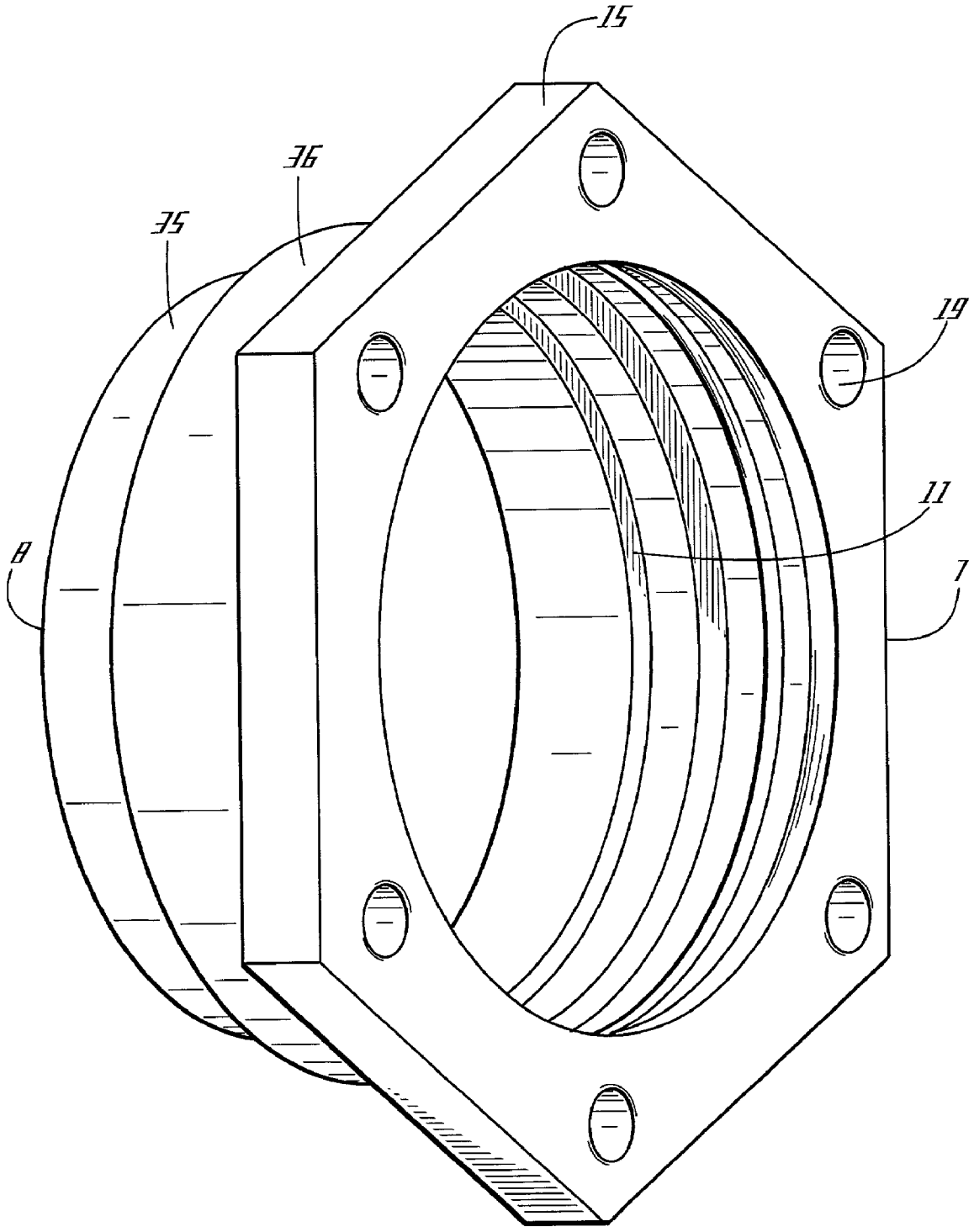


Fig. 3

GLAND PIPE FITTING

[0001] This is a divisional of application Ser. No. 09/335,298, filed on Jun. 16, 1999, and claims the benefit of and priority to said Application.

FIELD OF THE INVENTION

[0002] The present invention relates to devices used in the pipeline construction industry. More particularly, this invention relates to devices used to join the plain ends of pipe, as well as certain other ends of pipe.

BACKGROUND OF THE INVENTION

[0003] Generally speaking, in constructing a pipeline, the ends of two pieces of pipe are axially joined to form a single conduit that is used to transport materials from one point to another. Often times, the materials being transported are fluid or gaseous in nature, and, particularly in those circumstances, it is desired that the pipeline be impervious to leaks. In order to accomplish that goal, and to achieve other objectives which will be herein described, those skilled in the business of pipe and pipeline construction are constantly in search of improved means for securing the joints formed by connecting the ends of pipe together.

[0004] There are numerous methods currently in use by those in the pipe and pipeline construction industry to obtain a secure joint. These methods employ different types of components and also can be distinguished by the various ways in which such components are employed. The selection of these different methods will usually depend on the overall design requirements of the pipeline. For instant, as mentioned previously, one important design requirement exists when it is desired that the pipe joints be sealed such that the material being transported within the pipeline can not escape and, conversely, foreign materials are prevented from entering the pipeline.

[0005] Another important design requirement exists when it becomes necessary to join the pipe components in a restrained manner. This is usually desired in order to prevent the pipe components from separating due to thrust forces that often occur when the pipeline is subjected to internal pressure, and sometimes, when earth tremors or other external events occur. Still another objective is to make assembly of the pipe joints as simple, economical and reliable as possible.

[0006] One current method for connecting pipe together employs the use of flanged fittings and gaskets. These are typical components in rigid piping systems, particularly above-ground systems such as water filtration plants, sewage disposal plants, wastewater treatment plants, pumping stations and chemical plants. Often times, the flanged fitting is threaded directly onto the pipe. This is accomplished by threading the plain end of a pipe (sometimes referred to as the spigot end) and threading a compatibly sized flanged fitting. The threaded flanged fitting is then machine-tightened onto the spigot end of the pipe and is often then transported to the field in this joined condition. In addition, it is common in the industry for the pipe and flanged fitting to have been "faced" after proper tightening of the flanged fitting on the pipe. This is done by excising the portion of the threaded pipe that extends from the face of the flanged fitting such that the face of the flanged fitting is flush with the spigot end of the pipe. The threaded flanged pipe is then connected to another flanged pipe, usually by bolting means. In order to obtain a leak-free joint, a gasket is often used between the faces of the two flanged fittings.

[0007] The use of threaded flanged fittings presents several limitations as will now be discussed. The threaded flanged fitting is custom machined to accommodate the exact diameter of the pipe and to provide a smooth surface across the end of the pipe and the face of the flanged fitting. Also, extremely high torques are required to tighten properly the flanged fitting onto the threaded pipe. Consequently, one major limitation of this system is that preparation of the flanged fitting and pipe requires sophisticated machinery not usually available on-site where the finished component will be assembled and installed. If assembled at the pipe manufacturing facility before shipment, the presence of the flanged fitting militates against efficient and space-saving packing and reduces the amount of pipe components which can be transported.

[0008] In addition, to assure a proper seal, it is important for the threaded portion of the flanged fitting and pipe to be cleaned of all foreign material such as dirt, sand, grit or rust. The presence of foreign materials such as rust can also increase the amount of torque required to install the flanged fitting onto the pipe. Thus, manufacturing and assembling threaded flanged fittings and threaded pipe is very difficult in the field. Still another limitation of this system is that threaded pipe and threaded flanged fittings are individually mated, and the flanged fittings are not interchangeable. Still another limitation of threaded flanged fitting systems is that the pipe walls must be of substantially greater thickness in order to accommodate the threading which will be machined onto its exterior surface.

[0009] An alternative method for joining pipe uses unthreaded flanged fittings which are of appropriate diameter and which are fitted onto pipe ends in facing relationship to one another. As with the threaded flanged fitting, a gasket is often deployed between the faces of the flanged fittings to obtain a sealed joint. This is usually accomplished by bolting the flanged fittings together. In order to secure the flanged fitting to the pipe ends, set screws are inserted radially through the collar of the flange into the exterior surface of the pipe ends. One such example of this type of apparatus is disclosed in U.S. Pat. No. 4,480,861, issued Nov. 6, 1984, to Frank E. Cann.

[0010] Although the device disclosed by Cann solves some of the problems presented by use of a threaded flanged fitting, it is not without problems of its own. For instance, the flanged fitting in Cann's device must be mated to one another and therefore limits the choices for joining pipe by those in the field. In addition, as those skilled in the art will appreciate, those assembling the flanged fitting in Cann's device must be skilled in recognizing the extent to which the set screws should be tightened. Unless care is used in tightening the set screws, they can often damage and even puncture the pipe end. Conversely, if the set screws are not sufficiently tightened, the flanged fitting can become unstable or dislodged altogether.

[0011] A second common method for connecting the ends of pipe involves inserting the spigot end of one pipe into the expanded end of a second pipe the interior profile of which has been specially fabricated to form a socket (the expanded

end sometimes being referred to as the "bell end"). The bell end is sized to accommodate the spigot end of the pipe to be received. The connection obtained by this method is also known in the industry as a "push-on joint."

[0012] There are several methods used to seal and/or secure the push-on joint. One such method involves inserting a fitted gasket within an annular recess formed within the throat of the socket of the bell. On such gasket is described in U.S. Pat. No. 2,953,398, issued Sep. 20, 1960, to L. Haugen and C. Henrikson. After the gasket is inserted into the annular recess of the socket, the spigot is aligned and forced through the gasket into the bottom of the socket, thereby compressing the gasket and sealing the two pipe ends together.

[0013] In order to restrain the spigot within the bell, a specially designed gasket is sometimes used. One such gasket employs stainless steel locking segments vulcanized circumferentially into the gasket as described in U.S. Pat. Nos. 5,295,697 and 5,464,228, issued to J. Weber and L. Jones on Mar. 22, 1994 and Nov. 5, 1995, respectively. The locking segments extend from the interior surface of the gasket, away from the interior surface of the bell end, such that they grip the spigot end of the inserted pipe when the pipeline is subjected to internal pressures.

[0014] Still another common method for connecting pipe is sometimes referred to as mechanical pipe joint. The bell end of a pipe has a flanged portion cast on it. The spigot end of a second pipe is fitted with a slidable gland fitting and a gasket that is conically shaped such that one face of the gasket is diametrically larger than the second face of the gasket. The conically shaped gasket is positioned between the gland fitting and the spigot end of the pipe with the smaller, second face of the gasket being closer to the spigot end than the larger, first face of the gasket. The gland fitting has a plurality of apertures for receiving standard bolts. The gland fitting also has an integrally formed, protruding lip which encircles the face of the gland fitting at its inside diameter such that the lip is adjacent to the surface of the pipe and faces the spigot end of the pipe when the gland fitting is positioned on the pipe. The face of the flanged portion has a tapered notch designed to receive the conically-shaped gasket when the spigot end is inserted into the bell. The joint is formed when the spigot is axially inserted into the bell, and the gland fitting and the flanged portion are bolted together, causing the lip of the gland fitting to compress the gasket thus sealing the two pipe pieces. Examples of this type of apparatus is disclosed in U.S. Pat. No. 5,398,980, issued Mar. 21, 1995, to T. Hunter, O. Jackson and M. Pannell; in U.S. Pat. No. 4,878,698, issued Nov. 7, 1995, to R. Gilchrist; and in U.S. Pat. No. 2,832,615, issued Apr. 29, 1958 to A. Summers. Although each of these devices embodies a system that purports to couple pipes in sealing relation to one another, each system requires that conventional metal pipe bells be used, thus limiting the flexibility of those assembling the pipeline, and increasing the transportation and storage difficulties incurred by the pipeline assemblers. There is, consequently, a need in the industry for a compact, lightweight, easy to install pipe fitting which converts plain pipe to various pipe joint configurations such as a flanged or a mechanical joint.

[0015] The present invention embodies a significant advancement in the field of pipe manufacture and assembly. The new fitting can be used on standard pipe which needs no special preparation such as welding or threading prior to attachment. As a one-piece pipe fitting, gland pipe fitting described herein is simple to manufacture (and therefore economical), is easy to assemble in the field, and is equally or more stable and secure than other alternatives now available. By accomplishing these and other objectives, the disclosed gland pipe fitting offers those in the business of constructing pipelines with a valuable new component for connecting pipe ends.

SUMMARY OF THE INVENTION

[0016] The improvements described herein have been achieved in a gland pipe fitting to be used in receiving and joining a first pipe and a second pipe. It will be appreciated by those skilled in the art that the fitting is best utilized to mate the bell end of one pipe with the spigot end of a second pipe.

[0017] The gland pipe fitting disclosed is a one-piece, tubular casting having an internal chamber and first and second openings at the first and second extremities, respectively, of said tubular casting. The tubular casting is fabricated such that the interior surface profile of the internal chamber forms a socket for receiving the spigot end of a pipe. This is accomplished by fashioning an annular member integrally attached to form the second extremity at said second opening of tubular body such that the diameter of said second opening is smaller than the diameter of said first opening and no greater than the inner diameter of the pipe to be axially inserted through said first opening. It will be appreciated that, so configured, the exterior surface of said tubular body forms a raised annular lip extending outwardly at the juncture of the annular member and the remainder of said tubular body. Said lip will serve to compress an external gasket during the formation of a mechanical joint as will be described more fully below. Said annular member extends a sufficient length from the remainder of said tubular body to seat comfortably within the bell end of a second pipe as will also be described.

[0018] The surface of the internal chamber is further fabricated such that the throat of the socket formed therein contains an annularly recess designed to receive an internal, cylindrical gasket for sealing, and where desired, for restraining purposes when used to form a push-on joint. One such gasket is disclosed in U.S. Pat. No. 5,464,228.

[0019] The tubular casting further has a shoulder, or flanged portion, extending radially outward at a substantially right angle relative to the exterior surface of said tubular casting thereby forming a cylindrical face encircling the tubular casting. In a preferred embodiment, the face of the flanged portion has a plurality of aperatures for receiving bolts or other connecting means in order to mate the apparatus to the bell end or other appropriately configured second pipe. However, it will be understood by those in the industry that alternative means exist for mating pipe fittings together, and the present invention is not restricted to the use of bolts and bolt apertures. The flanged portion can be cast in different locations along the exterior surface of the tubular casting to suit the needs of the user, although it will usually be located at the first extremity defined by the first opening.

[0020] The new gland pipe fitting facilitates connections between pipe in the field without the need for sophisticated

and time-consuming machining. Because the annular recess is fabricated within the socket of the pipe gland, the location of the gasket and the extent to which the spigot must be inserted into the flange component is predetermined, thus eliminating the need for making precise measurements as is required by the invention disclosed by U.S. Pat. No. 3,589,750, issued Jun. 29, 1971 to P. Dunmire. These same features of the present invention also reduce substantially the possibility that the gasket will be displaced or damaged during assembly as is the case with Dunmire. Thus, the instant invention provides a significant improvement over current devices because it is makes assembly of pipeline more efficient, economical and error-free.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The foregoing and other objects or features and advantages of the present invention will be made apparent from the detailed description of the preferred embodiments of the invention and from the following list of drawings which are for illustration purposes and are not to scale:

[0022] **FIG. 1** is an exploded vertical cross sectional view of the present invention.

[0023] **FIG. 2** is an assembled vertical cross sectional view of the present invention.

[0024] **FIG. 3** is a perspective view of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Referring to **FIGS. 1, 2** and **3**, the new gland pipe fitting is an apparatus for joining the spigot end **2** of first pipe **4** with the bell end **38** of a second pipe **5**. The pipe fitting comprises a tubular body **6** having an internal chamber **10** and first and second openings, **7** and **8** respectively, at the first and second extremities. respectively, of said tubular body.

[0026] Said tubular body **6** has an annular member **35** integrally attached to form the second extremity at said second opening **8** such that the inner diameter of said second opening **8** is smaller than the diameter of said first opening **7** and no greater than the diameter of the spigot end **2** of a first pipe **4** to be axially inserted through the first opening **7**. It will be appreciated that, so configured, the profile of the internal chamber **10** forms a socket such that spigot end **2** of the first pipe **4** seats against the bottom **11** of the socket when fully inserted through said first opening **7** into the chamber of the tubular body, as best reflected in **FIG. 2**.

[0027] A raised annular lip **36** extending outwardly from the exterior surface of said tubular body is formed at the juncture **37** of the annular member **35** and the remainder of said tubular body. Said lip serves to compress an external gasket **32** during the formation of a mechanical joint as will be described more fully below. Said annular member **35** extends a sufficient length from the remainder of said tubular body **6** to seat comfortably within the bell end **38** of a second pipe **5** as will also be described below.

[0028] Tubular body **6** further has an annular flange **15** extending outwardly in roughly perpendicular fashion to the exterior surface **18** of tubular body **6**. In a preferred embodiment, the annular flange **15** has a plurality of apertures **19** that are parallel to the axis of the tubular body and distanced sufficiently from the exterior surface **18** of the tubular body **6** to permit the annular flange **15** to be affixed by bolting or other appropriate means **20** to the bell end **38** of second pipe **5**. The annular flange **15** can be positioned at any point along the exterior surface **18** of the tubular body **6**. However, a preferred embodiment locates the annular flange at the extremity at said first opening **7** of the tubular body **6**.

[0029] An annular recess **21** circumscribes the throat of the socket of internal chamber **10**. The annular recess **21** is shaped to receive an internal sealing gasket **22**, shown in **FIG. 1**, of dimensions corresponding to the dimensions of annular recess **21**. Referring to **FIG. 1**, the profile of the annular recess **21** will be determined by the exterior profile of the internal sealing gasket **22** to be used. The preferred embodiment shown in **FIG. 1** configures the annular recess **21** to be compatible with the profile of a gasket such as that described in U.S. Pat. No. 5,464,228 and U.S. Pat. No. 2,953,398. More particularly, in the preferred embodiment, the annular recess **21** is defined by a front radial wall **23** and a rear radial wall **24** which are joined by a third wall **25**, said third wall being substantially parallel with the surface of the throat of the socket. Said third wall **25** is divided into two compartments by a small annular protrusion **26** extending inwardly from the third wall **25** of the annular recess **21**. In the preferred embodiment, the first compartment **27** is generally smaller than the second compartment **29** and serves as a retainer seat to receive the heel **28** of the gasket. The second compartment **29** of the annular recess is fabricated for receiving the bulb **30** of the gasket as it is compressed by the insertion of the spigot end **2** of the pipe **4**, as reflected in **FIG. 2**.

[0030] Referring to **FIGS. 1 and 2**, the assembly of a pipe joint employing the present invention is now explained. The appropriate internal sealing gasket **22** is inserted into the socket with the heel **28** of the internal sealing gasket **22** in first compartment **27** of the annular recess **21**. The spigot end **2** of the pipe **4** is axially inserted through the first opening **7** of the tubular body **6**. The spigot end **2** is then forcibly inserted beyond the internal sealing gasket **22** until the spigot end **2** of the pipe **4** seats against the bottom of the socket **11** formed by the annular member **35**.

[0031] The annular member **35** is ready for insertion into the bell end **38** of an appropriately sized second pipe **5**. It will be appreciated that a standard bell end **38** generally has a flanged portion **39** extending generally radially outward from the external surface of the bell end. Flanged portion **39** has a plurality of apertures **33** that are in complementary allignment with the apertures **19** of the annular flange **15** of tubular body **6**. It will further be appreciated by those skilled in the art that the surface of the flanged portion **39** has fashioned at its internal diameter, at the juncture of flanged portion **39** and the bell end **38**, notched portion **41** designed to receive a complementally-shaped, external gasket. It will be appreciated by those skilled in the industry that a conically-shaped gasket, such as external gasket **32** shown in **FIG. 2**, is often employed.

[0032] Annular flange **15** of the tubular body **6** is joined by bolting means **20** to the flanged portion **39** of the bell end **38** of the second pipe **5**. As the joint is tightened by bolting or other means **20**, the lip **36** of the tubular body **6** compresses external sealing gasket **32** seated in notched portion **41** of the

bell end **38** of said second pipe **5**. It will be understood that said gland fitting is thereby used to form a mechanical joint.

[**0033**] While the preferred embodiments of the present invention are shown and described, it is envisioned that those skilled in the art may devise various modifications of the present invention without departing from the spirit and scope of the claims. The invention is not intended to be limited by the foregoing disclosure, but only by the following claims.

We claim:

1. A gland pipe fitting for receiving and joining a first pipe and a second pipe, the gland pipe fitting comprising:

(a) a tubular body having an interior cylindrical chamber, the chamber comprising a first opening at a first extremity and a second opening at a second extremity, the first opening being capable of receiving a pipe axially inserted there through, the first opening, the second opening and the first pipe each having a diameter, with the diameter of the second opening being less than the diameter of the first opening and no greater than the diameter of the first pipe;

(b) an annular member integral to the tubular body, the annular member forming the second extremity;

(c) a raised annular lip extending outwardly from the tubular body located, the lip located proximately to the juncture of the annular member and the remainder of the tubular body;

(d) an annular flange extending substantially radially from an exterior surface of the tubular body;

(e) a continuous annular recess within the interior cylindrical chamber; and

(f) an internal sealing gasket for insertion in the annular recess.

2. The gland pipe fitting according to claim 1 wherein an interior profile of the annular recess is configured to correspond to an exterior profile of the internal sealing gasket.

3. The gland pipe fitting according to claim 1 wherein the annular recess comprises a front radial wall, a rear radial wall and a third wall joining said front and rear radial walls, said third wall having a continuous annular protrusion extending inwardly from the third wall dividing the annular recess into a first and a second compartment and the first sealing gasket comprises a heel potion seated in the first compartment, and a bulb seated in the second compartment.

4. The flange-pipe fitting according to claim 1, wherein the annular flange has a plurality of apertures therein.

5. A pipe joint, comprising:

(a) a gland pipe fitting for receiving and joining a first pipe and a second pipe, the gland pipe fitting comprising:

i. a tubular body having an interior cylindrical chamber, the chamber comprising a first opening at a first extremity and a second opening at a second extremity, the first opening, the second opening and the first pipe each having a diameter with the diameter of the second opening being less than the diameter of the first opening and no greater than the diameter of the first pipe;

ii. an annular member integral to the tubular body, the annular member forming the second extremity;

iii. a raised annular lip extending outwardly from the tubular body located, the lip located proximately to the juncture of the annular member and the remainder of the tubular body;

iv. an annular flange extending substantially radially from an exterior surface of the tubular body; and

v. a continuous annular recess within the interior cylindrical chamber to receive an internal sealing gasket;

(b) the first pipe comprising a spigot end, the spigot end being inserted through the first opening so that the spigot end extends beyond the internal sealing gasket so that at least a portion of the internal gasket is compressed into the annular recess;

(c) a second pipe comprising a bell end, the bell end further comprising a flanged portion extending substantially radially from an exterior surface of the bell end, and an annular notched portion located substantially where the flanged portion meets the bell end, the notched portion receiving an external sealing gasket; and

(d) a bolting means to secure the annular flange of the tubular body to the flanged potion of the bell end of the second pipe so that the raised annular lip of the tubular body compresses against the external sealing gasket as the annular flange and flanged portion are secured by the bolting means.

6. The pipe joint according to claim 5 wherein the notched portion is tapered and the external sealing gasket is compatibly shaped to seat within the notch.

7. The pipe joint according to claim 5 wherein the notched portion is tapered and the external sealing gasket is conically shaped.

8. The gland pipe fitting according to claim 5 wherein the annular recess is configured to correspond to an exterior profile of the internal sealing gasket.

9. The pipe joint according to claim 5, wherein the annular recess comprises a front radial wall, a rear radial wall and a third wall joining the front and rear radial walls, the third wall having a continuous annular protrusion extending inwardly from the third wall into the interior chamber dividing the annular recess into a first and a second compartment and the first sealing gasket comprises a heel potion seated in the first compartment, and a bulb seated in the second compartment.

10. The pipe joint according to claim 5, wherein the annular flange of the tubular body and the flanged portion of the bell end of the second pipe each have a plurality of apertures therein, the apertures of the flanged portion being complementary with apertures of the annular flange.

11. The pipe joint according to claim 5 where the bolting means is nuts and bolts.

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